A Hockey-Based Persona: The Sociolinguistic Impact of Canadian English on American-Born Players

by

Andrew R. Bray

(Under the Direction of Chad Howe)

Abstract

In this dissertation, I analyze the acoustic data of vowel formant values of 20 American-born professional hockey players to establish if they have been influenced by Standard Canadian English (SCE). Specifically, I test for the presence of the Low-Back-Merger Shift (LBMS), the lowering and retraction of BIT, BET, and BAT, triggered by the Low-Back Merger of BOT and BOUGHT, Canadian raising (CR) of the nuclei in TIGHT and HOUSE before voiceless obstruents creating allophonic distinctions between TIE/TIGHT and COW/HOUSE, and monophthongal and more peripheral FACE and GOAT. The purpose of this study is to document the presence of any of these variables and provide a rationale for this presence.

Based on data from sociolinguistic interviews, I use three variable-specific metrics to quantify the presence of each variable. The LBMS is measured using the LBMS Index score which captures the Euclidean distances of BIT, BET, and BAT from BEET. The degree of CR is established by calculating the differential in formant values between unraised and raised variants. Monophthongization of FACE and GOAT is measured by the trajectory length between formant values throughout the vowel's duration.

The results demonstrate that American-born hockey players have adopted two of the variables but to differing degrees. The LBMS was largely absent from players outside of the West region where this shift has been well-documented. CR was found to be commonly occurring, but only TIGHT raising was uniformly present. HOUSE raising was far more common across the players when pre-nasal DOWN was the vowel which HOUSE was measured against. FACE was largely monophthongal but did not reach the peripheral state. GOAT was neither monophthongal or peripheral but was non-upgliding a variant pronunciation unique to the players.

The players' CR was distinct from what has been attested in SCE but could not be accounted for based on the players' regional dialect. Furthermore, the placement of TIE and COW showed further differentiation from SCE. Additionally, FACE and GOAT were uniform across players and inexplicable by regional dialect. I argue these variables have gained indexical value linked with hockey and their usage constitutes a hockey-based linguistic persona.

INDEX WORDS: Canadian raising, hockey, indexicality, Low-Back-Merger Shift, monophthongization, Standard Canadian English, sociolinguistics

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Chapter 1

Introduction

"Well I don't think an American is trying to sound Canadian. I think a hockey player is trying to sound like a hockey player."
— Jones

1.1 Do American Hockey Players Sound Canadian?

I began playing hockey as a four-year-old; the sport became my passion and a pivotal aspect of my identity. It was not until my freshman year of college that I realized how hockey had come to impact not only my speech but also the speech of all my teammates. It was at this time I started to develop a vast lexicon, specific to the sport. Rapidly, this lexicon became indicative of my identity; I was a hockey player, and I wanted others in the community to know I was. While I was unprepared to study this lexicon systematically at the time, I hoped to one day be able to analyze how these terms were created, introduced, and adopted by so many hockey players across state and international borders. Years later, I was able to document this lexicon while conducting research for my master's thesis, (Bray, 2015), in 2014 and 2015. I interviewed hockey players from the National Hockey League (NHL) and colleges across the United States, compiling just under 50 hockey-specific terms and gaining better insight into how they were adopted throughout the community. It was also during this research, I was asked a question, which I was unprepared to answer at the time, that would spark my dissertation research, "Are you trying to figure out why the Americans sound like fake Canadians?"

Throughout the interview process, this potential Canadian influence on the speech of the players came to the forefront in two distinct ways. With respect to the lexicon, some players argued that hockey-specific terminology was of Canadian folk origin. However, others argued that the influence seemed to rise above this level of just terminology, manifesting more generally in the way players spoke. According to a Canadian-born player at the University of Michigan explaining the speech of his American teammates, "For me, the thing that I think I hear most is the way that they hold vowels and letters and kinda exaggerate and enunciate different" (Bray, 2015, p. 20). For this player, it seemed clear that his American teammates were not speaking as expected based on American regional dialects. Interestingly, one of his American teammates gave potential justification for this shift away from American regional dialects, "I don't think anyone originally thought let's go sound like Canadians [...] there is such a Canadian influence, and there are so many Canadians that come play" (Bray, 2015, p. 20). Whether or not this adoption of Standard Canadian English (SCE) variables was occurring at the conscious level, there appeared to minimally be an awareness of the importance of Canada to the sport and its potential influence on players. While Bray (2015) focused mostly on the lexicon of the sport, this dissertation will examine this possible SCE influence on the speech of American-born professional hockey players to explore the extent to which SCE variables have been adopted by the players. With this Canadian influence in mind, this dissertation intends to demonstrate that American-born hockey players are not simply assimilating to their Canadian teammates but using SCE variables in an attempt to construct and index a hockey-based linguistic persona.

To test this hypothesis, this dissertation must address two distinct research questions regarding the speech of American-born hockey players. First and foremost, have American-born players adopted any variables of SCE? If so, which variables specifically have been adopted, and is this adoption uniform across all players? To test this, SCE variables will be studied individually to assess if they are present and also what, if any, social factors condition usage. Traditional social factors such as region and age will be accounted for in addition to other more hockey-specific factors to better understand the utilization of these variables. Second, what possible explanations are there for the presence of these variables, if in fact they are attested in the speech of American-born players?

1.2 Variables of Study

To answer these questions, what differentiates SCE from other dialects of North American English must be analyzed. In doing so, it can be determined if American players are adopting these variables, and questions can be raised about potential motivations and or causes. Given in Table 1.1 are IPA representation of Standard American English vowels, paired with keywords which represent their pronunciation and the phonological environments where allophones occur if they are relevant to vowel realization. They keywords will be used to identify each vowel throughout the duration of this dissertation.

Table 1.1: IPA phonemes paired with keywords and phonological environments

IPA phoneme	*Keyword*	*Phonological Environment*
/i/	BEET	
/ɪ/	BIT	
/ɛ/	BET	
/æ/	BAT	
/ɑ/	BOT	
/ɔ/	BOUGHT	
/aɪ/	TIE	Pre-voiced obstruent, sonorant, and Open Coda
	TIGHT	Pre-voiceless obstruent
/aʊ/	COW	Pre-voiced obstruent, non-nasal sonorant, and Open coda
	DOWN	Pre-nasal
	HOUSE	Pre-voiceless obstruent
/eɪ/	FACE	
/oʊ/	GOAT	

According to *The Atlas of North American English* (Labov et al., 2006, p. 223), henceforth referred to as *ANAE*, SCE is distinguished based on the following criteria:

- The Low-Back-Merger Shift (LBMS)[1]: the lowering and retraction of BIT, BET, and BAT, triggered by the Low-Back Merger (LBM) of BOT and BOUGHT.
- Canadian Raising (CR): the raising of the vowel nuclei before voiceless obstruents creating raised variants TIGHT and HOUSE and unraised variants TIE and COW before voiced sounds or in open codas and also the back positioning of the nucleus of COW.
- Monophthongal high-mid vowels: more peripheral and almost monophthongal nuclei in FACE and GOAT.

[1] Labov et al. refers to this as the Canadian Shift but it has more recently been renamed as the LBMS (Becker, 2019) due to the prevalence of the shift in dialects outside of Canada.

The keywords being used for the vowels involved in the LBMS are taken from Becker (2019), using the consistent phonological environmental frame of [b_t]. For CR, more specific keywords were required to capture the expected allophony of SCE. These keywords come from *The English Language in Canada* (Boberg, 2010), which henceforth will be referred to as *ELC*. Boberg establishes an additional allophone of DOWN, preceding nasal sound. This dissertation will follow Boberg's pre-nasal categorization. Finally, the keywords for the monophthongal high-mid vowels are taken from Wells Lexical sets (Wells, 1982).

If American-born players are utilizing these SCE variables and if there is no overlap in the regional dialect with SCE, then their presence would have to be explained by other social factors. Due to the heightened importance of Canada to the sport of hockey, it is possible that SCE has become influential on the American-born players in constructing a linguistic persona that is centered on the sport. The presence of SCE variables in the speech of American-born players would suggest that a construction of a hockey-based linguistic persona has taken place, centered on the sport and influenced by the historical and demographic prevalence of Canada. Via the notion of indexicality (Eckert, 2008a; Silverstein, 2003), it is possible to show how these SCE variables can come to attain new social meanings which potentially index inclusion within the larger hockey community, creating a linguistic persona for the sport's athletes. If this process is currently ongoing within the hockey community, this suggests that athletics, which has historically been understudied in the (socio)linguistics literature, can be influential as a social motivator for linguistic performance, potentially creating a new focus of study for sociolinguistic research.

1.3 Hypotheses for this Study

As this dissertation analyzes multiple SCE variables and also examines the influence of different social factors on the realization of said variables, there must be multiple hypotheses for the results of this research. The first three of these hypotheses pertain to the expected results of the phonetic analysis measuring the degree of SCE variable utilization for the data while the fourth and fifth pertain to the sociolinguistic analysis of the influence of each social factor examined.

1. Every player interviewed will utilize at least one of the SCE variables, and likely more than one. The most common SCE variable utilized will be monophthongal FACE and GOAT. Although, outside of Canada, this is only expected to occur in the Upper Midwest, it is the most likely to be present in all players' speech due to the historically high level of Canadian and Upper Midwestern hockey players, offering a variable that is not entirely "Canadian." I hypothesize that monophthongal FACE and GOAT will have been adopted by every player and will also be uniform across all players. Monophthongal vowels will be indicated by lower trajectory lengths which capture the total degree of tongue movement throughout the vowel duration.

2. CR will be found in the speech of all players, but possibly not of both traditionally raised variants TIGHT and HOUSE. Due to a relatively high prevalence of TIGHT raising in the United States, I expect to see all players interviewed having both TIE and TIGHT variants which differ to a statistically significant degree and exceed the *ANAE* benchmark difference between variants for raising. However, it is possible that HOUSE raising will be less prevalent as it is potentially too "Canadian." I still expect moderate HOUSE raising to be common; however, it is more likely that these players will produce variants which differ at statistically significant degree but do not exceed the *ANAE* benchmark F1 difference for raising. This benchmark difference provides a minimum expected difference between "raised" and "unraised" variants of 60 Hz in F1 values. Players who exhibited CR will likely have variants which differ by more than the 60 Hz difference, but this benchmark provides a minimum difference to establish the presence of "raised" and "unraised" variants. The F1 value differentials of "unraised" and "raised" will be used to establish if CR is occurring in the players' speech.

3. The LBMS is the least likely to be occurring throughout the speech of all players as it impacts the largest number of vowels. However, this is somewhat complicated by the prevalence of the shift in the different American regional dialects. Furthermore, additional shifts, such as the Northern Cities Shift, may inhibit the LBMS. Therefore, I hypothesize that players will not exhibit the LBMS in its entirety. Players from the Inland North and Upper Midwest potentially do not exhibit the LBM, which further could restrict the LBMS. Players from the Eastern New England, the Mid-Atlantic, the West, and Western Pennsylvania potentially have merged BOT and BOUGHT creating the ideal situation for the shift to occur. Pillai scores will be used to measure the degree of overlap between BOT and BOUGHT to quantify the LBM. Players with higher Pillai scores will be more likely to be undergoing the LBMS. The LBMS Index score, which measures the Euclidean distance of the short front vowels the anchor point of BEET, will be analyzed regardless of Pillai score, but if the merger has not occurred, it unlikely that these vowels will have shifted, and players will have low LBMS Index scores.

4. Turning to the analysis of the impact of social factors on usage, region should have little to no effect on the usage of monophthongal FACE and GOAT, and CR, but could potentially impact the LBMS. If monophthongal high-mid vowels are being used to construct a hockey persona,

where a player was born should have very little influence on their usage. But as I hypothesize that the LBMS will likely be less uniform across the players and therefore less impactful towards a hockey-based persona it is possible that region will influence this variable. Furthermore, I do not predict region will influence the degree of TIGHT and HOUSE raising.

5. I do not hypothesize any of the hockey-specific factors, i.e., current league of play, status on their team, and pre-professional developmental pathway, will significantly impact the degree of variable usage exhibited by the players. However, if this hypothesis proves to be inaccurate, it is more likely that players who played major junior hockey will be more likely to utilize each variable than their collegiate counterparts. This is largely due to the increased time spent in Canada in their late teenage years, paired with the idea of being a professional at a younger age. Major junior hockey is often looked at as a semi-professional level, and players are treated as such (i.e., receiving payment, longer season with more games, and a largely more sports-focused schedule). Players in the AHL are more likely to be utilizing these variables than those in the ECHL largely due to the fact that they are closer to becoming NHL players, lengthening their career within the sport. Furthermore, the increased salaries in the AHL allow players to have their entire source of income be linked to the sport. Younger players might be more likely to utilize these variables than their older teammates as they are still trying to establish themselves at the professional level. I suspect that the rookies could have higher degrees of usage paired with a decline as players start to get closer to retirement and identify less with the sport. The influence of these social factors will be tested by examining if and how they impact LBMS Index scores, degree of difference between raised and unraised CR variants, and trajectory length of the monophthongal high-mid vowels.

Based on these hypotheses, I expect to find that SCE variables will be attested in the speech of all players but potentially occurring to differing degrees. Due to the largely Canadian historical influence on the sport, paired with the multitude of Canadian players, a hockey-based persona would likely feature variables common to, and potentially borrowed from, SCE. Players that strongly identify with the sport, i.e., those who hope to have a long career playing it at the professional level, are thus most likely to be adopting these variables and further establishing a linguistic hockey persona. As these players are all professional, it is likely that they will be incorporating SCE variables into their speech. However, it is likely that they have reinterpreted SCE variables as indexing a hockey-based persona and the usage of these variables is not an attempt to sound Canadian, but rather to sound like a hockey player.

1.4 Organization of Chapters

In Chapter 2, I provide an in-depth history of professional hockey in North America. While this might seem a little misplaced in a dissertation focusing on sociolinguistics, it is important to establish the historical dominance Canada has had on the sport of hockey. Throughout the history of professional hockey in North American, Canadian players have vastly outnumbered their American counterparts which no doubt has left a legacy of Canadian influence on the sport. However, more recently, the trend has been towards increased American participation, leading to more balanced leagues and teams. In this chapter I explain how this early Canadian dominance created an identity tied with the nation, one which was known in the United States and world-wide. I present nationality breakdowns of the three major North American hockey leagues, the NHL, the American Hockey League (AHL), and the ECHL[2] to demonstrate the long-lasting period and more recent decline of the Canadian majority. I also present evidence from youth hockey statistics in both countries to highlight the importance of the sport to each nation's identity and subsequently that nation's impact on the identity of the sport.

[2] The ECHL began as the East Coast Hockey League but later opted to utilize the initialism as the league had expanded across the United States and into Canada. It is no longer referred to as the East Coast Hockey League and simply goes by the ECHL.

In Chapter 3, I provided a review of the relevant literature on SCE, highlighting the defining variables. I begin by examining the state of the LBM, as it is said to be a potential catalyst in the LBMS. After this, I focus on the history of the LBMS, beginning with its inception as the Canadian Shift and then the Short Front Vowel Shift. I continue the chapter by reviewing the history, documentation, and establishment of CR. After outlining the rules of CR in their present-day form, I analyze the state of raising across Canadian dialects to establish if it is a uniform feature of SCE. I then examine the status of FACE and GOAT as monophthongal and on the periphery of the vowel space. Throughout the chapter, I pause to highlight areas of overlap with various American regional dialects. As each of these variables have been historically attested in the United States, it is vital to note if the occurrences of a variable could be linked to a certain non-Canadian dialect. If a variable has been attested in a player's regional dialect, then it is possible that they are not using it to index a hockey-based persona.

Chapter 4 is a continuation of literature review, but with a focus on indexicality. Working through Silverstein's (2003) framework of indexicality, I analyze how previous sociolinguistic studies present indexical findings similar to what

I hypothesize is occurring within the speech of American-born hockey players. After addressing how indexical value can be established, interpreted, and reinterpreted, I review Eckert's (2008b) notion of the indexical field, which is a key component of my argument that the presence of SCE variables in players' speech is not an attempt to index being Canadian, but rather that these variables have gained multiple indexical values, including ones linked to the hockey-based persona. I end the chapter by outlining how this process could be occurring for the players in this study, if in fact they are exhibiting any of these SCE variables.

In Chapter 5, I outline the methodology of this study including the procedures used to recruit teams and individual players after teams had been selected. I provide all relevant metadata[3] for the players who have been included in the analysis. I then explain the sociolinguistic interview structure and implementation, along with the relevant literature which helped craft the interview used to collect data. I then outline how interviews were transcribed and prepared for forced alignment. After establishing how the data was obtained, I address how it was filtered to remove potential outliers and the different normalization procedures used to analyze the state of each variable. I include information about the size of the players' corpus including total number of tokens and also the most common token types for each vowel. I then describe the metrics being used to establish the degree of merger in the LBM, the degree of shift occurring in the LBMS, the degree of raising for CR, and the degree of monophthongization for FACE and GOAT. After establishing how each variable will be quantified, I outline how various social factors will be analyzed to establish if they impacted variable realization.

[3] Some metadata is not paired with players' pseudonyms to protect their anonymity.

Chapters 6, 7, and 8 present the results of the study divided by variable. Each chapter begins with a brief comparison of the player's results to the corresponding formant values attested in SCE taken from *ANAE* and *ELC*. Chapter 6 focuses on the LBMS. After comparison with SCE, I begin my analysis with the state of the LBM. In doing so, I address the status of tokens of *hockey*, as a potentially distinct low back vowel which is neither BOT nor BOUGHT. I compare the degree of overlap for BOT and BOUGHT, while also establishing a new vowel for *hockey* tokens. I then use the LBMS Index score to establish the degree of movement based on the LBMS. Chapter 7 highlights the degree of CR occurring in the players' speech. I separate TIGHT and HOUSE raising to test if both are occurring. Following Boberg's categorization of vowels, I analyze HOUSE raising against COW and also DOWN. I present data through the duration of the vowel to establish if raising is prevalent and map the F1 trajectories of each variant throughout the duration of the vowel. I then analyze the position of TIE and COW to account for any COW fronting occurring in the players' speech. Chapter 8 analyzes the total degree of monophthongization of FACE and GOAT. I present data throughout the duration of the vowel to capture the degree of movement of the tongue in both the height and frontedness dimensions. Due to the potential for larger movement in frontedness, I outline how these values were converted to the Bark scale. I then establish if the players were producing movement indicative of monophthongal or diphthongal pronunciations. I end each of these chapters explaining which social factors impacted variable usage.

Chapter 9 is a discussion of the findings of Chapters 6, 7, and 8. I present evidence from previous research to establish in which American regions these SCE variables have been previously attested. This is to establish if the results from this study correlate with previous research. After this process, I summarize the players' results by region, to see if they pattern with their expected regional dialect. As the players do not correspond to regional dialect for the majority of variables, I then turn to another rationale for their occurrence and uniformity. I argue that indexical value has been placed on the variables which is linked to a hockey-based linguistic persona. I then focus on the perceived indexical value of these variables to the players and also those outside of the sport. I propose that the players have reinterpreted perceived Canadian indexical value as now indexing a hockey-based persona.

The final chapter, Chapter 10, provides a summary of findings, examines the limitations of this study, and presents the direction of future research. There were many topics which came up throughout the interview process which were unable to be included in this analysis due to various reasons. In the future, I plan to analyze the speech of Canadian hockey players to see how it compares to American players as well as other non-hockey playing Canadians. Further research will also be needed into how hockey-specific terminology impacts the realization of the vowels being studied here. Finally, the impact of additional social factors with be vital in truly establishing a hockey-based linguistic persona for all hockey players. It will be important to analyze at what age the creation of a hockey-based persona begins. This dissertation only includes male players. In the future, I plan to research the impact of gender on this persona. Furthermore, ethnicity has not been accounted for in this study. An analysis of the influence of ethnicity on the hockey persona will be needed in the future.

There are four appendices after at the conclusion of the text for this dissertation. The first of these contains the interview script used with the players. The remaining three contain tables and figures which were not included in the text divided by variable. The second appendix contains plots for each players of the vowels involved in the LBMS including, BEET, BIT, BET, BAT, BOT, and BOUGHT. The third appendix contains individualized F1 values for TIE, TIGHT, COW, DOWN, and HOUSE. Additionally, trajectory plots for each player highlighting the difference between unraised and raised variables are given. The last appendix contains Bark-converted trajectory plots for FACE and GOAT by player. Each variable-based appendix also includes the results from ANOVA tests for social factors which do not significantly impact the measurements for that variable.

Chapter 2

Hockey: Canada's Game?

> "In the hockey world, Canadians are number one. It's where hockey came from. It's their pastime. It's their life. It's what they do, and they hold that to their heart till they die." — Carter

In this chapter, I outline the history of hockey in North America. I begin with the creation of the modern sport in Montreal in the 1800s, before moving to the history of the three major professional leagues in North America. I then analyze the state of amateur hockey in both the United States and Canada to offer rationale for the Canadian mythos attached to the sport. It is important to analyze the historical prevalence of Canada on the creation, expansion, and modernization of the sport of hockey, as I argue that American-born players are borrowing from Standard Canadian English (SCE) in the construction of the hockey persona. Although this chapter demonstrates that the demographic construction of professional hockey leagues is shifting, and more Americans are playing hockey than ever before, there is a rationale for the hockey persona being influenced by Canada due to this history of the sport. The information presented throughout this chapter comes from each of the official websites of the leagues being discussed unless otherwise noted.

2.1 Creating the Modern Game

To understand the importance of Canada to the sport of hockey, it is first vital to establish Canada's role in the creation of the modern sport. While the history of hockey is not the focus of this dissertation, evaluating the beginning of the modern game, and its importance on the identity of the sport, must be done to establish the heightened importance of Canada, and therefore SCE, to the sport. Robidoux (2002) elaborates on the purpose of lacrosse and hockey, the summer and winter national sports of Canada in establishing identity of a post-confederation Canada. He explains:

> Canada was a disparate nation, divided in terms of language, region, and ethnicity–lacking in identity and national unity. Thus, while hockey was used ideologically to express national sentiment, its value as a vernacular entity was equal to, if not greater than, its symbolic value. From the outset, hockey's violent and aggressive style separated itself from other bourgeois (European) pastimes, including the increasing popular games of baseball that was entering Canada from the United States. (p. 219)

Hockey: A Global History, (Hardy & Holman, 2018) presents an in-depth history of the "Montreal birthing" of the modern game, in 1875, based on an article in the *Montreal Gazette* from March 3rd of that year. This early form of hockey seemingly borrowed many aspects from other more established sports such the offside rule from rugby, which outlawed forward passing of the puck, and referees, goal judges, and goals from lacrosse, which were constructed of poles six feet apart. There were two entire novel aspects of the new sport; nine men from each team were on the ice at a time, reduced to eight by 1880, and the game was played with a wooden disc, which would be replaced by the more modern vulcanized rubber puck in 1876 (pp. 66-7). This Montreal iteration of hockey thus created a distinct sport, one which would lend itself to the identity that a young Canadian nation was looking to nurture. However, it was the inclusion of the sport in the Montreal Winter Carnivals of 1883, 1884, 1885, 1887, and 1889 that introduced the sport to the world. These carnivals further shaped the rules of the game, reducing the number of players from eight per team to seven and establishing a height of four feet for the net. Finally, through inclusion in the Winter Carnival, hockey started to garner support from key backers such as Lord Fredrick Arthur Stanley of Preston, who, as Governor General of Canada, donated a challenge trophy, the Dominion Hockey Challenge Cup, now known as the Stanley Cup, for the amateur hockey teams in Canada to compete (pp. 68-9). Hardy and Holman summarize, "[t]he Montreal Winter Carnival happened at a critical time for ice hockey. It provided a popular national and international venue for a new sport and stamped it as a symbol of Canadian winter" (p. 69). In 1886, the Amateur Hockey Association of Canada (AHAC) was formed from the early teams of Montreal, Ottawa, and Quebec. The AHAC would serve as the "gold standard" as the game rapidly spread across Canada and later made its way across the border into the United States (p. 70).

States on the Canadian border saw the game slowly arrive through the interaction of American and Canadian populations. Hardy and Holman explain that transportation routes connected the two nations allowing Canadian players and promoters to grow the game in new American regions. Between 1886 and 1900, hockey started to be played in places such as Vermont, New York, and the Upper Peninsula of Michigan. However, they note that these early American players were largely replaced by 1903 when Canadian players left their amateur leagues to profit from the openly professional International Hockey League. Furthermore, teams in North Dakota, Washington, Idaho, and Montana all began regularly playing Canadian teams in international games (pp. 100-2).

Although hockey was being played in certain areas of the United States, specifically the border states, a similar game called polo, dominated the major American markets. A tour of American collegiate polo players from Yale, Harvard, Brown, and Colombia travelled to Eastern Canada in 1895 to play teams in Hamilton, Kingston, Montreal, and Toronto. Although the games were sectioned into two halves, with one half following the rules of either variation of the sport, the American team was over-matched by their Canadian counterparts, losing every single half played following the rules of hockey. The same year also saw numerous tours of Canadian teams into the major American markets of Baltimore, Pittsburgh, Washington D.C., New York City, and Minneapolis. Although American teams saw very little success in these early games, these tours helped shift the game in American from polo to the Montreal style game of hockey (pp. 103-12). By this point its importance to the game was no longer a question but a matter of fact. Hardy and Holman explain:

> [E]ven as more and more non-Canadians embraced the game after 1895, even as it diffused broadly across international boundaries, Canada's national identification with hockey seemed to tighten [...] By 1920, Canadian hockey became construed as the genuine article, the gold standard, and the center against which rivals in America, Britain, Europe, and other places would be measured and found wanting. In short, by 1920, Canada became the 'hockey-nation' in minds of both Canadians and non-Canadians. (pp. 162-3)

It is this hockey identity that is so tightly intertwined with Canada that is the basis of the current analysis. Between birthing the modern game, presenting it to the world, and fostering growth abroad, hockey became a Canadian game. The question that then must be asked is what impact does the notion of Canada as a "hockey-nation", which has been prevalent since the turn of the 20th century, have on players from the other countries, specifically the United States?

2.2 Canadian Dominance of Professional Hockey

It is impossible to explain the historical importance of Canada on the sport without first analyzing how professional hockey reached its current state in North American. As it is the premier hockey league throughout the world, the history of the National Hockey League (NHL) is inherently tied to all the other professional leagues that it supersedes in North America and abroad. The players interviewed for this dissertation were all playing in either the American Hockey League (AHL) or the ECHL[4] at the time of their interviews. These two leagues are currently viewed as the primary North American developmental leagues for the NHL. The NHL has helped shaped both the AHL and the ECHL not only in the number of member teams but also the location of these franchises. The historical demographics of each league demonstrate a great deal of correlation, being historically Canadian though experiencing a modern shift toward a more balanced national make up. A brief analysis of the history of these three leagues will help shed light on the historical Canadian influence on the sport which I argue provides a rationale for SCE influence in the speech of American-born hockey players.

[4] The ECHL began as the East Coast Hockey League. In 2013, the league decided to re-brand as the initialism ECHL.

2.2.1 The National Hockey League

Established in 1917, the NHL is the premier professional hockey league in the world. Currently, there are 32 teams spread throughout the United States and Canada, with 25 franchises in the United States and the remaining seven in Canada. A map from the website Elite Prospects, a website that tracks statistics for hockey players, of all the current NHL teams is given as Figure 2.1. The red and blue portions of the map represent the Eastern and Western Conferences of the league, respectively.

Looking at the breakdown of nationalities for players in the NHL throughout the first half century of its existence, it is apparent that Canada had a stranglehold on the game. Throughout those 50 years, American players struggled to find their place in the NHL. Table 2.1 presents NHL player demographics in five-year intervals ranging from the 1919-20 season through the 1964-65 season taken from QuantHockey (https://www.quanthockey.com/), a website which compiles statistics for all major hockey leagues. The number of teams is given for each season along with the total number of players in the league during that

Figure 2.1: Map of NHL teams

season. The total number of players by nationality is paired with the percentage of the league that each nationality made up for that season.

In 1919-20, only three Americans managed to make NHL rosters. Two of these three found themselves on the same team in Quebec, meaning half of the league was devoid of any American-born player. The few Americans that made it to the NHL would have had to relocate to Canada to play for any of these teams. The first American team, the Boston Bruins, did not join the league until the 1924-25 season. The Bruins came into the NHL in tandem with the Montreal Maroons, providing Montreal a second team for the first time since 1918. Although the league was expanding, the 1924-25 season would be the final for the Hamilton Tigers franchise. During the 1924-25 season, 91.7% of players were Canadian, the same percentage seen five years prior. Of the five American born players, only one was on the Boston Bruins' roster; the four others played for Canadian teams. By the time the league expanded to the United States, from 1918 and 1925, only nine American players had ever managed to make an NHL roster.

Table 2.1: Early NHL demographics by nationality

Season	*Teams*	*Players*	*American*		*Canadian*	
			Number	*Percent*	*Number*	*Percent*
1919-20	4	48	3	6.3%	44	91.7%
1924-25	6	83	5	6.3%	77	91.7%
1929-30	10	159	8	5.0%	147	92.5%
1934-35	9	176	11	6.3%	156	88.6%
1939-40	7	148	10	6.8%	133	89.9%
1944-45	6	127	10	7.9%	115	90.6%
1949-50	6	164	4	2.4%	154	93.9%
1954-55	6	154	2	1.3%	151	98.1%
1959-60	6	153	2	1.3%	150	98%
1964-65	6	166	2	1.2%	161	97%

The league would continue to expand into the United States adding two more teams for the 1925-26 season, the New York Americans and Pittsburgh Pirates, and an additional three teams the following season: the Chicago Blackhawks, Detroit Cougars (known today as the Red Wings), and New York Rangers. Another milestone occurred during the 1926-27 season, for the first time, American teams outnumbers Canadian teams six to four, an imbalance that remains to this day. During this season, the NHL was split into two divisions, the American division, which ironically contained all the American teams with the exception of the New York Americans, and the Canadian division. Even with this increased presence in the United States, between the 1924-25 and 1929-30 seasons, the percentage of Americans decreased from 6.3% to 5%. Intriguingly, all eight Americans found themselves playing in the United States during the 1929-30 season, spread between Boston, Chicago, Pittsburgh, and New York. After an already tumultuous start, further issues plagued the league as Pittsburgh was forced to relocate, due to the poor state of their home arena, to Philadelphia for the 1930-31 season before ceasing operations entirely at the end of that season. Additionally, a decrease in attendance created an unsustainable situation in Ottawa and saw the team moved to St. Louis for the 1934-35 season. As the league started to retract in size to nine teams in 1934-35 the total number of Americans rose from eight to 11 as did their overall percentage of the league, returning them to 6.3%. This increase in American representation came at the direct expense of Canadian players, who underwent a decrease from 92.5% of the league in 1929-30 to 88.6% in 1934-35.

Eventually the Montreal Maroons and New York Americans would suspend operations after the 1937-38 and 1941-42 seasons, respectively, establishing what is still referred to as the "Original Six" teams: the Boston Bruins, the Chicago Blackhawks, the Detroit Red Wings, the Montreal Canadiens, the New York Rangers, and the Toronto Maple Leafs. The number of teams in the league would remain unchanged for 25 years. American players experienced a brief level of stability from 1934-35 through 1944-45. The percentage of the league they comprised increased as the league continued to shrink back to the Original Six teams. However, this same period seemed to solidify a base percentage of Canadian players of nearly 90%, a percentage which would continue increasing for nearly 25 years. By the 1949-50 season, there were only four Americans left in the league. This number dropped to only two by 1954-55. That same season, Canadian representation surpassed 98.1% of the league. This Canadian dominance remained unchecked throughout the remained of the Original Six era. During the decade from 1954-55 to 1964-65, the number of American players ranged from one to four players. The number of Canadian players never dropped below 140.

Throughout the league's first half century in existence, the sport would no doubt have been viewed as being extremely Canada-centric with a nationality demographic distribution to back up that observation. Even thought four of the six teams were based in American cities, American players never managed to make up more than 9.3% of the league. This percentage high point accounted for a total of only 14 American players during the 1943-44 season. During the 1955-56, 1956-57, 1958-59, and 1961-62 seasons, only a single American found themselves playing in the league totaling 0.7% of the league in each of those seasons. In that same span, the percentage of Canadian players never dropped below 86.2% and reached a max of 98.7% of the league. This massive imbalance in nationality would explain why many current players talk about the heritage of the game being strongly Canadian. Beyond inventing the modern version of hockey in Montreal in 1875, it seems the first 50 years of the NHL were almost exclusively played by Canadian players, and Americans players were lucky to find themselves in the league at all.

While the modern league has been mostly comprised of teams in American cities, the nationality of the players has only begun to shift in the last 50 years from the heavily Canadian demographics seen up to and including the Original Six era. Table 2.2 presents nationality demographics from the 1969-70 season through the 2019-20 season in five-year increments. The number of teams is once again provided for each season to account for the ranging number of total players. The total number of players is paired with the percentage of the league which they made up during that season.

Table 2.2: Modern NHL demographics by nationality

Season	*Teams*	*Players*	*American*		*Canadian*	
			Number	*Percent*	*Number*	*Percent*
1969-70	12	322	6	1.9%	309	96%
1974-75	18	501	36	7.2%	454	90.6%
1979-80	21	654	72	11%	547	83.6%
1984-85	21	672	96	14.3%	509	75.7%
1989-90	21	672	120	16.6%	538	74.2%
1994-95	26	806	148	18.4%	507	62.9%
1999-00	28	924	150	16.3%	526	57.1%
2005-06*	30	961	182	18.9%	513	53.4%
2009-10	30	962	212	22%	515	53.5%
2014-15	30	974	237	24.3%	495	50.8%
2019-20	31	970	253	26.1%	413	42.6%

*2004-05 season was cancelled due to labor lockout

The NHL would go on to expand to 12 teams for the 1967-68 season with the addition of six new teams deemed the "Second Six." However, the imbalance between American and Canadian players was only exacerbated even though all six of the new teams were based in American cities. The teams added were the Los Angeles Kings, the Minnesota North Stars, the Oakland Golden Seals, the Philadelphia Flyers, the Pittsburgh Penguins, and the St. Louis Blues. As the league doubled in size, American players saw very little increase in representation. Only four additional American players were on NHL rosters during the 1969-70 season compared to the two who had played during the 1964-65 season, a percentage increase of only 0.5%.

The league would test expansion again multiple times throughout the 1970s, adding a total of six teams: the Buffalo Sabres and Vancouver Canucks for the 70-71 season, the Atlanta Flames and the New York Islanders in 1972-73, and the Kansas City Scouts and Washington Capitals in 1974-75. While Canada did gain a third team in Vancouver, after the 1974-75 season, 15 of the 18 teams were in the United States. By 1974-75, the percentage of Americans rose from 1.9% to 7.2% as 30 more American players found themselves in the NHL as the league increased from 12 to 18 teams. A percentage decrease of nearly identical proportions occurred for Canadian players in that span, falling from 96% to 90.6%. The expansions of the 1970s was not without the unpredictability that plagued the earlier iterations of the league. The Kansas City Scouts relocated to Colorado, and Oakland eventually merged with Minnesota after the 1977-78 season.

The league once again saw mass expansion with the merger between the World Hockey Association (WHA) and the NHL. The WHA had been the only league in direct competition with the NHL from 1972 until the eventual merger before the 1979-80 season. At the time of the merger, there were a total of six WHA franchises; however, the NHL originally sought to only incorporate three: the Edmonton Oilers, the Hartford Whalers, and the Winnipeg Jets. After multiple votes by the NHL Board of Governors, the eventual merger included a fourth team, the Quebec Nordiques. For the first time, a large expansion contained multiple Canadian teams, doubling the total number of teams in the nation to six. American players gained more ground by the 1970-89 season, doubling the total number of players from 36 to 72, and increasing the percentage of the league from 11% to 14.3%. The actual number of Canadian players also increased during these five years, largely due to the increase from 18 to 21 teams, although their overall percentage of the league dropped by 7%, down to 83.6%.

The 1980s presented a far more stable period for the league, though it was not without some change. The entire decade would only see two relocations. Atlanta relocated to Calgary for the 1980-81 season, and shortly after, in the 1982-83 season, Colorado moved to New Jersey and become the Devils. By the 1993-94 season, five more expansion franchises had been added to the league: the Anaheim Ducks, the Florida Panthers, the Ottawa Senators, the San Jose Sharks, and the Tampa Bay Lightning; that same season, the Minnesota North Stars relocated to Dallas where they dropped "North" from the team's name. The early 90s also saw the greatest number of Canadian NHL franchises, as a total of eight competed up until the 1995-96 season. Between 1984-85 and 1994-95, the number of Americans in the NHL continued to rise from 96 to 148 players. By 1994-95, 18.4% of the players in the league were American. The percentage of Canadians continued to drop hitting 62.9% that same season. Between 1989-90 and 1994-95 another phenomenon occurred; not only had the overall percentage of Canadians decreased, the actual number of players had also dropped even though the league had continued expanding to 26 teams.

By 2000, Atlanta, Columbus, Nashville, and St. Paul would all have expansion franchises, bringing the league to 30 teams with the addition of the Thrashers, Blue Jackets, Predators, and Wild. However, this period of expansion was paired with a string of relocations that predominantly saw NHL teams leaving Canada for untested markets in the United States. Quebec was forced to move to Denver for the 1995-96 season. The following season, Winnipeg saw their franchise leave for Phoenix and become the Coyotes. By 2009-10, American players had surpassed two milestones: they made up more than 20% of the league and there were more than 200 total players, both firsts in the history of the NHL. Furthermore, an increase of between 2% and 3% every five years can be seen beginning in 1999-00 continuing all the way through last season. Since 2010, Atlanta once again lost their team, leaving for Winnipeg in 2011. This new iteration of the Winnipeg Jets brought Canada back to a total of seven teams where they still stand today. Additionally, two more teams have been added to the league: The Vegas Golden Knights in 2016 and the Seattle Kraken in 2021. With these additions to the league, there are now a total of 25 teams based in American cities, more than tripling the total of their Canadian counterparts.

Since 1969-70, American players have seen a tenfold increase, while the number of Canadians has reduced by more than half. While they are still the largest single demographic by nationality, Canadians no longer represent the majority of the league. In addition to the increase in American players, Europe has come to make up more of the league each year. The Czech Republic, Finland, Sweden, and Russian have all produced hundreds of NHL players, though only Sweden has managed to represent 10% of the league in any given season. Furthermore, the total number of Canadian players had been dropping since 2009-10 along with the overall percentage of the league. While it is abundantly clear that the NHL was dominated by Canadian players for over three quarters of a century, the current trends suggest that their dominance on professional hockey in North American is no more. The importance of the large Canadian majority cannot be overlooked. As Canadians were over-represented in the locker room, there would have experienced more control on the league and the sport as a whole. I argue that this early influence would also include the language used by the players. The duration of their over-representation in the NHL offers an explanation for the Canadian heritage mentioned by several players interviewed for this project.

2.2.2 The American Hockey League

The AHL is currently considered the primary developmental league for the NHL and the most prominent minor league in North America. The AHL is one of two leagues recognized by the current collective bargaining agreement of the NHL and the National Hockey League Players' Association (NHLPA) as a minor league. As part of this agreement, each NHL team has an affiliation agreement with an AHL team. Due to these affiliation agreements, the AHL is the where many NHL players spent developmental time after junior or collegiate hockey. This means that AHL players are only a single step away from playing in the NHL. Many AHL players have two-way contracts dictating their salary on both the NHL and AHL level as they are expected to split time between the leagues throughout the season. The vast majority of players in the AHL have either been drafted by an NHL team, or have signed contracts with NHL teams, but currently are playing in the AHL. The minimum age to play in the league is 18 years old. As it is a developmental league, each team must dress 12 players per game who have played in 260 or fewer professional games, specifically in the NHL, AHL, or European Elite leagues. A 13th player with fewer than 320 games is required to round out the roster for each game. The remaining players are not subject to any developmental restrictions and are often veteran players who have made a career mostly on their AHL team with brief stints in the NHL. Currently, there are 31 teams in the AHL. 27 teams are spread throughout the United States with the additional four teams being housed in Canada. A 32nd AHL team in Palm Springs (California) will be joining the league as an affiliate to the Seattle Kraken for the 22-23 season. An Elite Prospects map of all the current AHL teams is given as Figure 2.2. Again, the red and blue portions of the map represent the Eastern and Western Conferences of the league, respectively.

Figure 2.2: Map of AHL teams

The AHL's inaugural season occurred in 1938, though under the different name of International-American Hockey league (I-AHL), after two other professional leagues, the Canadian-American Hockey League (Can-Am League) and the International Hockey League (IHL) were forced to consolidate due to each leagues having fallen to only four member teams. However, the idea of major and minor leagues predated the formation of the AHL which has now become the premier minor league in North America. Hardy and Holman (2018) outline an early affiliation agreement between Frank Calder, the first president of the NHL, and the Can-Am league:

> Between 1926 and 1936, Calder negotiated affiliation agreements with each of the developing leagues to secure labor supply to the NHL and to prevent minor leagues from locating in NHL cities [...] The agreement that Can-Am executives signed adopted the NHL constitution and playing rules, a standard player contract similar to the NHL's, a provision whereby NHL teams could loan players to Can-AM clubs and a clause that allowed an NHL team to draft minor-league players for $5,000. (p. 224)

Even with this affiliation agreement in place for the Can-Am league, after the 1935-36 season, the only remaining franchises where in Springfield (Massachusetts), Philadelphia, Providence, and New Haven. The rival IHL had teams in Buffalo, Cleveland, Syracuse, and Pittsburgh. To provide stability for the remaining clubs, the two leagues began to play interlocking schedules during the 36-37 season. The Can-Am teams, all situated in the Northeast, played in the I-AHL East division, while the former IHL teams, all from the Great Lakes region, played in the I-AHL West division. However, this consolidation was not enough to save all eight franchises, as Buffalo folded in December of 1936, due to a struggling financial situation and lack of a suitable home arena. After two years of playing interlocking schedules, the two leagues fully consolidated for the 38-39 season. This season also saw the addition of the Hershey Bears, who previously had been successful in the Eastern Amateur Hockey League. Hershey is the longest continually operating franchise in the AHL. Both Providence and Springfield franchises still exist in some form today, though each has relocated multiple times. The Providence franchise is the modern-day Hartford Wolf Pack and the Springfield franchise the Abbotsford (British Columbia) Canucks.

Although there was an affiliation agreement in place in 1936, only two of the NHL teams operated minor league teams, the Toronto Maple Leafs and the New York Rangers. By the time the I-AHL was officially established in 1938, this number doubled to four: Philadelphia was affiliated with the New

York Rangers, Pittsburgh with the Detroit Red Wings, Springfield with the Montreal Canadiens, and Syracuse with the Toronto Maple Leafs. By 1940, the I-AHL had rebranded as the American Hockey League (AHL). Table 2.3 provides nationality demographics of the AHL in five-year intervals ranging from the 1939-40 season through the 1974-75 season. The number of teams is given for each season along with the total number of players in the league during that season. Total number of players by nationality is paired with the percentage of the league that each nationality made up for that season.

Table 2.3: Early AHL demographics by nationality

Season	*Teams*	*Players*	*American*		*Canadian*	
			Number	*Percent*	*Number*	*Percent*
1939-40	9	88	6	6.8%	81	92%
1944-45	7	121	9	7.4%	11	90.9%
1949-50	10	209	6	2.9%	200	95.7%
1954-55	6	145	4	2.8%	140	96.6%
1959-60	7	172	5	2.9%	167	97.1%
1964-65	9	232	4	1.7%	227	97.8%
1969-70	9	257	8	3.1%	248	96.5%
1974-75	10	278	29	10.4%	247	88.8%

The early AHL seasons were shockingly similar to those of the NHL with respect to nationality breakdown. In 1939-40, only 6.8% of players in both leagues were American; a total of 10 players in the NHL and six in the AHL. However, two players played in both leagues, so only a total of 14 Americans played in either league that season. Much like the NHL, the first decade of the AHL was also mired with excessive relocation and expansion exacerbated by the financial impact of World War II. Only Cleveland, Hershey, and Providence were able to avoid this cycle of relocation and folding throughout the 40s and 50s. By the 1944-45 season, the percentage of American players had increased in the NHL to 7.9% and in the AHL to 7.4%, a total 10 and nine players, respectively. Once again, four Americans played in both leagues, meaning only 15 Americans played across the two leagues that season, an increase of only one player from five years prior. The 1947-48 season was the first in which every NHL team affiliated with an AHL team; however, due to the imbalance in number of teams, there were still two independent AHL teams. By 1949-50, there were only 10 Americans playing in either league, dropping the percentages to 2.4% in the NHL, four players, and 2.9% in the AHL, six players. Only five players made NHL or AHL rosters during the 1954-55 season. The Rochester Americans joined in 1956. The Americans, one of the four teams included in this study, are the second oldest continually operating member of the AHL and one of only six franchise that has never relocated. During the 59-60 season, the league finally broke into Canada with an expansion team in Quebec.

The vast disparity between American and Canadian players in the two premier hockey leagues in North American continued throughout the 1960, reaching a low point by the 1964-65 season when only 1.2% of the NHL and 1.7% of the AHL players were American. At the same time, 98% of NHL players and 97.8% of AHL players were Canadian. When the NHL expanded to twelve teams in 1967, the AHL teams in Pittsburgh and Buffalo were effectively forced to cease operations. For the 1969-70, a second Canadian team was added to the league in Montreal. This was even more significant as the Montreal Canadiens, their NHL affiliate, became the first team to own their AHL affiliate. The franchise has subsequently relocated numerous times, never leaving Canada, and now are The Laval (Quebec) Rocket. This season, 1969-70, was the first in which every AHL team was directly affiliated with an NHL team. The formation of the WHA in 1972 wreaked further havoc on the league. Between 1974 and 1977, half of the teams in the AHL paused or ceased operations for one reason or another, and only six teams competed in the 1976-77 season. The only surviving teams from this era outside of present-day Hartford, Hershey, Laval, and Utica, were the New Haven Nighthawks, now the Belleville (Ontario) Senators, and the Virginia Wings, now the Henderson (Nevada) Silver Knights. However, the 1970s also seemed to spark a transition in the breakdown of nationalities in both the NHL and the AHL, though more so for the latter. By the 1974-75 season, the number of American players had jumped to 36 in the NHL and 29 in the AHL, 7.2% and 10.4% of each league respectively. Ten Americans played in both leagues that season totaling 55 Americans.

Table 2.4 presents a breakdown of nationalities for American and Canadian players including total number and percentage of league from the 1979-80 season until the 2019-20 season in five-year increments. Once again, the number of teams in the league and total players are also given, as these numbered varied a great deal as the AHL struggled to establish itself as the premier developmental professional hockey league in North America.

Fortunately for the AHL, the NHL-WHA merger in 1979 led to the downfall of their rival developmental league, the North American Hockey League (NAHL) before the 77-78 season. That same year, the Philadelphia Flyers became the second NHL team to own an AHL team with the addition of the Maine Mariners, present day Stockton (California) Heat. The following season, 78-79, an expansion team in Moncton (New Brunswick) joined the league jointly owned by the Chicago Blackhawks and Toronto Maple Leafs continu-

Table 2.4: Modern AHL demographics by nationality

Season	*Teams*	*Players*	*American*		*Canadian*	
			Number	*Percent*	*Number*	*Percent*
1979-80	10	371	57	15.4%	310	83.6%
1984-85	13	495	72	14.5%	404	81.6%
1989-90	14	487	80	16.4%	388	79.8%
1994-95	16	585	112	19.1%	393	67.2%
1999-00	19	744	138	18.5%	490	65.9%
2005-06*	27	1051	282	26.8%	621	59.1%
2009-10	29	1143	354	31%	665	58.2%
2014-15	30	1184	369	31.2%	634	53.5%
2019-20**	31	1118	372	33.3%	532	47.6%

**2019-20 season was suspended on March 16 due to COVID-19 pandemic

ing the trend of NHL teams owning their affiliates. Similar to Laval, this franchise relocated numerous times throughout Canada, eventually becoming the Toronto Marlies now owned exclusively by the Maple Leafs. By 1979-80, more than 10% of players in the NHL and AHL were Americans, with the AHL skewing more American at 15.4% compared to 11% in the NHL; the percentage of Canadians in each league was identical at 83.6%. In 1981, the modern-day Springfield (Massachusetts) Falcons and Wilkes-Barre/Scranton Penguins joined the league in Erie (Pennsylvania) and Fredericton (New Brunswick), respectively. For the 1984-85 season, Halifax was given an expansion franchise eventually becoming the Bakersfield (California) Condors. In 1984-85, the percentage of Americans players was virtually identical, with the NHL at 14.3% and the AHL 14.5%. The final expansion franchise of the 80s entered the league for the 87-88 season in Portland, replacing the Maine Mariners that had left at the end of the previous season. This second iteration of the Mariners eventually relocated as well becoming the Providence Bruins, returning AHL hockey to one of the league's first eight cities. The percentage of American players increased in 1989-90 to 16.6% in the NHL and 16.4% in the AHL.

The 90s saw the creation of nine of the modern 31 franchises, though none occupy the original city where they began play. The Charlotte Checkers, the second team included in this study, began play in 1990, spending the first 20 years of their existence in New York before relocating to North Carolina in 2010. In 1994, Syracuse regained a team after the Vancouver Cancuck's AHL team relocated from Hamilton, Ontario where they had spent their first two seasons. That same year, the modern-day Tucson Road Runners joined the league though originally in Springfield (Massachusetts). By the 1994-95 season, only 62.9% of NHL players and 67.2% of AHL players were Canadian. However, the percentage of American players in the league was also greater than the NHL equivalent that season though much closer at 19.1% compared to 18.4%. Over the next couple seasons, the league expanded into Baltimore, Philadelphia, and Lexington (Kentucky). Today, these teams are the Rockford (Illinois) IceHogs, the Leigh Valley (Pennsylvania) Phantoms, and the San Jose Barracuda respectively. Two more franchises, the Utica Comets, originally in Lowell (Massachusetts) and then Binghamton (New York), and the Texas Stars, twice relocated from Louisville and Des Moines, began AHL play before the turn of the millennium during the 1998-99 and 1999-00 seasons. For the 1999-00 season, the AHL saw percentages of American and Canadian players much greater than the NHL: 2.3% for Americans and 8.8% for Canadians. It should be noted that between the 1994-95 and 1999-00 seasons, Canadian players outnumbered Americans more than three to one in both the AHL and NHL. American players only represented 18.5% of the AHL and an even smaller percentage of the NHL 16.3%.

In 2000, The league added one more expansion team in Norfolk, which relocated and became the San Diego Gulls in 2015. In 2001, the International Hockey League (IHL), an alternate developmental league used by the NHL folded, leading to the AHL absorption of six IHL franchises: the Chicago Wolves, the Grand Rapids Griffins, the Houston Aeros, the Milwaukee Admirals, the Utah Grizzlies, and the Manitoba Moose. Though the Aeros and Grizzlies would eventually relocate to Cleveland and Des Moines, becoming the Monsters and Wild, respectively, the other four teams remain to this day. In addition to the six IHL franchises, two expansion teams began play during the 01-02 season, the Bridgeport Islanders and the Manchester Monarchs, though the Monarchs became the Ontario (California) Reign in 2015. By the 2005-06 season, Americans in the AHL had experienced a large boost in representation, jumping over 8% from the 1999-00 season; however, the same boost was not seen in the NHL, where the percentage only increased from 16.3% to 18.9%. By the 2009-10 season, gained an additional 4.2%, and now represented 31% of the league. However, this did not seem to impact the Canadian percentage much which only fell by 0.9%, from 59.1% to 58.2%. Intriguingly, nearly identical percentage changes were occurring in the NHL simultaneously. For the 2009-10 season, 22% of NHL players were American, an increase of 3.1% from 2005-06, while 53.5% were Canadian, realistically identical to the 53.4% from 2005-06. The increase in the percentage of American players in the AHL briefly plateaued between the 2009-10 and 2014-15 seasons, only increasing by

0.2%, before rising to the current 33.3%. During that span, the AHL expanded again in 2018, when the Colorado Eagles left the ECHL in favor of the AHL to coincide with addition of an NHL franchise in Las Vegas. Between 1979-80 and last season, the percentage of American AHL players more than doubled. Although it took nearly 40 years for Americans to surpass 10% of the AHL, in the 45 years since, they have risen to now represent one third of the entire league. Due to the addition of the Seattle Kraken to the NHL for the 21-22 season, an affiliate AHL team will begin play in 22-23 in Palm Springs (California). As the name suggests, the league is very heavily situated in American cities; only five of the current franchises are in Canadian cities: the Abbostford Canucks, the Belleville Senators, the Laval Rocket, the Manitoba Moose, and the Toronto Marlies, with the remaining 26 teams spread over 16 states. This imbalance is even greater than that seen in the NHL, where there are currently seven Canadian teams.

The NHL and AHL have been entirely intertwined since the 2010-11 season, the first season where every AHL team was in a direct affiliation agreement with a single NHL team. More recently, the NHL has gained even more control over the AHL, as many NHL owners have purchased ownership stakes in their AHL affiliate. While the Montreal Canadiens were the first NHL team to directly own their AHL affiliate, the number of NHL teams to do so steadily rose to where it currently is today with 20 teams sharing ownership groups. In fact, NHL teams taking ownership of their AHL affiliates was one of the major driving forces of the recent string of relocations of AHL teams. Most NHL teams who own their AHL affiliate have them playing in the same state or region. San Jose and Winnipeg have both NHL and AHL teams operating out of the same arenas. The importance of geographic distance is not lost on those teams that are not directly owned by NHL teams, as an additional five AHL teams share the same state, with two more in border states to their NHL affiliates. This is done to ease the travel costs when players are sent between leagues, which is a very common occurrence throughout the season. Throughout the interview process, the Charlotte Checkers were affiliated with the Carolina Hurricanes at the time of this study and the Rochester Americans with the Buffalo Sabres. During the 2018-19 season, the Checkers had a player recalled to their NHL affiliate 36 times throughout the regular season, while Rochester had 29 instances of recalls to their NHL affiliate. Recalled players normally substitute for injured players on the NHL team and are typically returned to the AHL team after the injured NHL player recovers, though some do end up remaining in the NHL after being recalled. During the regular season, an NHL team can only carry a roster of 23 players; however, that rule is suspended for the playoffs and AHL players are typically recalled to the NHL as "black aces," or players that will fill in for any injuries throughout the lengthy Stanley Cup Playoffs.

2.2.3 The ECHL

The ECHL is a minor hockey league considered to be a tier below the AHL. Like the AHL, it is recognized by the current collective bargaining agreement of the NHL and the NHLPA as a minor league. This means that players on NHL contracts are eligible to play for ECHL teams if they are assigned to them. Due to this, there are some players in the ECHL who were drafted by an NHL team, while others have signed contracts either at the AHL level or the ECHL level. Players on AHL contracts can be loaned to their affiliated ECHL team or an agreed upon ECHL team if they are not directly affiliated with one. Like the AHL, the ECHL restricts the number of veterans each team is allowed to have on their roster. Only four veteran players, apart from goaltenders, are allowed to be on a single roster. The ECHL classifies anyone who has played more than 260 games in either the ECHL, AHL, NHL, or the elite European leagues as a veteran. Players on an NHL or AHL contracts above the age of 24 are also considered veterans unless their contract specifically has an ECHL assignment provision. Because there are so few spots for veteran players, most of the roster is made up of players on ECHL contracts, who can be loaned to the AHL or even NHL level, though it is very uncommon to see an ECHL player sent directly to an NHL team. As of the 2019-20 season, the second of the two seasons in which these interviews occurred, 678 ECHL players had made it to the NHL. Currently, there are 27 teams in the ECHL; 25 of them are in the United States. An Elite Prospects map of the current ECHL teams is given as Figure 2.3. Again, the red and blue portions of the map represent the Eastern and Western Conferences of the league, respectively.

Table 2.5 provides nationality demographics for American and Canadian players in the ECHL including total number and percentage of league from the 1989-90 season until the 2019-20 season in five-year increments. Once again, the number of teams in the league and total players are also given.

Of the three leagues discussed here, the ECHL is by far the youngest. The league began in 1988 when teams from two defunct leagues, the Atlantic Coast Hockey League and the All-American Hockey League, established the new league. Two of the five teams that played in the inaugural season are still in the league today: the Carolina Thunderbirds, now the Wheeling Nailers, and the Johnston Chiefs, present-day Greenville Swamp Rabbits. The Greenville Swamp Rabbits are the third team included in this study. The franchise spent its first 28 years in Johnstown before relocating to Greenville for the 2010-11

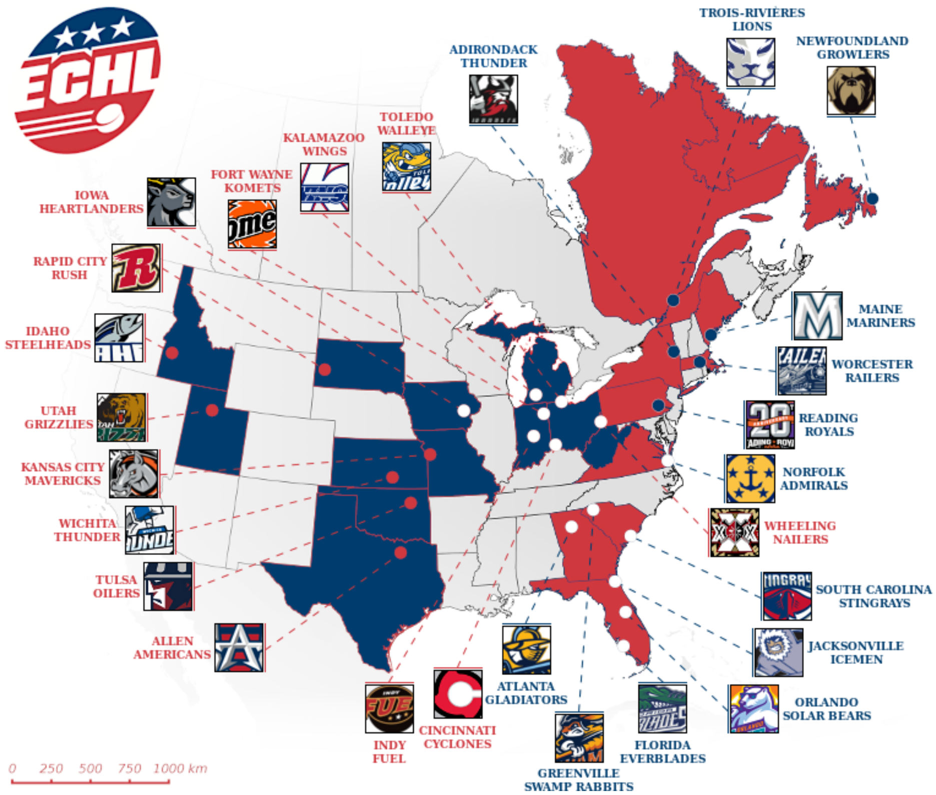

Figure 2.3: Map of ECHL teams

season. They are the second ECHL team to play in Greenville, replacing the Greenville Grrrowl, which had folded in 2006. Over the next two seasons, six more teams joined the league though only one, Cincinnati, would survive to the present day. The Cincinnati Cyclones were forced out of the city after the team owner was granted an IHL franchise under the same name for the 1992-93 season. After numerous subsequent relocations, that franchise became the modern-day Adirondack (New York) Thunder in 2015. Early into the existence of the ECHL, American players found a league where they made up a larger percentage than that in the NHL and AHL. During the 1989-90 season, American players made up 33.8% of the league, far greater than the 16.6% in the NHL and 16.4% in the AHL. However, as the league expanded and further established itself, the percentages started to become more consistent with the NHL and AHL.

The 1991-92 season saw the addition of four more teams to the league. Two of these expansion teams, the Toledo Storm, renamed the Walleye in 2009, and the Columbus Chill, relocated to Reading (Pennsylvania), are still part of the ECHL. Two years later, the South Carolina Stingrays, the fourth and final team

Table 2.5: ECHL demographics by nationality

Season	*Teams*	*Players*	*American*		*Canadian*	
			Number	*Percent*	*Number*	*Percent*
1989-90	8	237	80	33.8%	154	65%
1994-95	18	517	179	34.6%	299	57.8%
1999-00	28	802	209	26%	509	63.3%
2005-06*	28	867	287	34.7%	491	59.4%
2009-10	20	708	272	38.4%	403	56.9%
2014-15	28	1005	411	40.9%	540	53.7%
2019-20**	26	869	411	47.3%	411	47.3%

**2019-20 season was suspended on March 15 due to COVID-19 pandemic

in this study, began play as an expansion team in Charleston. The Stingrays are the oldest continually operating ECHL team that has not relocated at any point in their history. The Charlotte Checkers, now in the AHL, began as an ECHL team that same season. Two additional teams joined with the Checkers and Stingrays, bringing the league to 19 teams. The ECHL would add 10 more teams by the end of the millennium; however, only two of these teams has managed to survive to this day, the Atlanta Gladiators, relocated from Mobile in 2003, and the Florida Everblades. By 1999-00, the percentage of American players had decreased to 26% compared to the 16.3% in the NHL and 18.5% in the AHL.

Many of the current ECHL teams began playing in the early 2000s. The Reading Royals joined for the 2001-02 season. Originally the Columbus Chill, the franchise paused operations and relocated to Reading to make way for an expansion NHL franchise after the 1998-99 season. The same season, the Cincinnati Cyclones returned to the ECHL after the IHL disbanded. In 2003, the West Coast Hockey League (WCHL) ceased operations leading to seven franchises joining the ECHL. The Idaho Steelheads and Norfolk Admirals are the only two surviving WCHL teams to this day, though Norfolk played in Bakersfield until 2015. Due to the placement of teams throughout the United States, the league officially changed its name from the East Coast Hockey League to the initialism ECHL on May 19, 2003. With this expansion, the league reached a total of 31 teams for the 2003-04 season, the largest it has ever been to present. Over the next two seasons, seven teams ceased operations. After the Utah Grizzlies AHL franchise disbanded in 2005, a new ECHL Grizzlies franchise began play during 2005-06 season. The Kalamazoo Wings closed out ECHL expansion that decade, joining for the 2009-10 season when the league they had been a part of, the United Hockey League (UHL), ceased operations. This season was the first in which every ECHL team was directly affiliated with an NHL team. Another team from the UHL, the Fort Wayne Komets, joined the ECHL in 2012. Fort Wayne had spent the previous two seasons in the Central Hockey League (CHL), the failure of which, would shape the current iteration of the ECHL. The modern-day Jacksonville IceMen came into the league as the Evansville IceMen from the CHL in tandem with the Komets. A third team, the Orlando Solar Bears, joined that same season as an expansion franchise,

When the CHL folded in 2014, the ECHL absorbed the seven remaining franchises; The Allen Americans, the Brampton Beast, The Kansas City Mavericks, the Quad City (Illinois) Mallards, the Rapid City (South Dakota) Rush, the Tulsa Oilers, and Wichita Thunder. Except for Brampton and Quad City, all of these teams are still in the league. An expansion team, the Indy Fuel, brought the total number of new teams for the 2014-15 season to eight. The season was also the first to include a Canadian team since the Victoria Salmon Kings ceased operations after the 2010-11 season. Four subsequent expansion teams, The Worcester Railers in 2017, the Newfoundland Growlers in 2018, and the Iowa Heartlanders and Trois-Rivières Lions in 2021, brought the ECHL to its current 27 team state. The addition of the Lions doubled the number of Canadian teams, although there are still far fewer in the ECHL than in the NHL or AHL.

As there are currently only 27 ECHL teams, there is not a direct affiliate AHL and NHL team for each. Los Angeles, St. Louis, San Jose, Vancouver, and Winnipeg do not have ECHL affiliates. Due to this, NHL teams will often lend players to unaffiliated ECHL teams when players are sent down from their affiliated AHL team. Throughout the interview process, the Greenville Swamp Rabbits were unaffiliated with an NHL team. Swamp Rabbit players not on NHL or AHL contracts would have been eligible to be loaned to any AHL team or NHL team. The South Carolina Stingrays were affiliated with the Washington Capitals. Stingrays' players on NHL or AHL contracts were loaned, reassigned, or recalled by the Hershey Bears or Washington Capitals. Throughout the 2918-19 season, only one Swamp Rabbit player was loaned to an AHL team, while nine Stingrays players were loaned, reassigned, or recalled from the Stingrays to AHL teams. This imbalance is likely due to the lack of affiliation for the Swamp Rabbits, which typically means more players are on ECHL contracts. The Stingrays also had two players reassigned to them by the San Diego Gulls, the AHL affiliate of the Anaheim Ducks in the NHL. During that season, the Ducks and Gulls did not have an ECHL affiliate.

Due to the relative youth of the ECHL compared to the NHL and AHL, the league has always had a larger percentage of American players. However, as the league became more established at the turn of the millennium, Canadians still outnumbered their American teammates more than two to one. Nonetheless, the ECHL might hold some insight into what the future of the NHL and AHL look like. In recent seasons, the percentage of American and Canadian players in the league have evened out, a feat yet to occur in either of the other two leagues. While the NHL and AHL gaps have been shrinking at a steady rate, the ECHL has seen the gap between the two nationalities entirely erased. During the 2019-20 season, Americans and Canadians each made up 47.3% of the league.

Looking at all three leagues together, it is apparent that hockey would have been considered almost entirely a Canadian sport at the professional level from its NHL inception in 1917. Even with the expansion of the sport, American players found themselves outnumbered, reaching a peak of over 97% of players being Canadian in both the NHL and AHL during the 1950s and 1960s. It is impossible to downplay the impact of this massive historical Canadian presence at the professional level. American players in either league during these early years were so vastly outnumbered that it is easy to see why they potentially would have been heavily influenced by their Canadian teammates. However, the current trend in each league demonstrates that the percentage of American players is rising, rapidly in the ECHL and at a steadier rate in the NHL and AHL. Figure 2.4 shows the percentage of Americans and Canadians in each of these three leagues beginning in 1920, just after the NHL was established, throughout 2020, the last complete season of all three leagues. European players are not included; however, many players from the Czech Republic, Finland, Sweden, and Russia have played in each league. Overall, Europeans have been vastly outnumbered by American and Canadian players, as they did not surpass 10% of the league until 1990 in the NHL, 1995 in the AHL, and 2000 in the ECHL. The lines representing the AHL and ECHL begin roughly when each league was established, 1940 and 1990 respectively. The NHL is represented by the solid line, the AHL the dashed line, and the ECHL by the dot dashed line.

Both the NHL and AHL appear to follow very similar trajectories. From 1920 to nearly 1990, more than three out of every four players in the NHL or AHL was Canadian. This more than 70-year dominance would no doubt leave a lasting legacy on the sport. The few Americans skilled enough to make either league would have found themselves in locker rooms almost completely full of Canadian players. Even though the obvious trend is rising American representation paired with falling Canadian representation, those early years

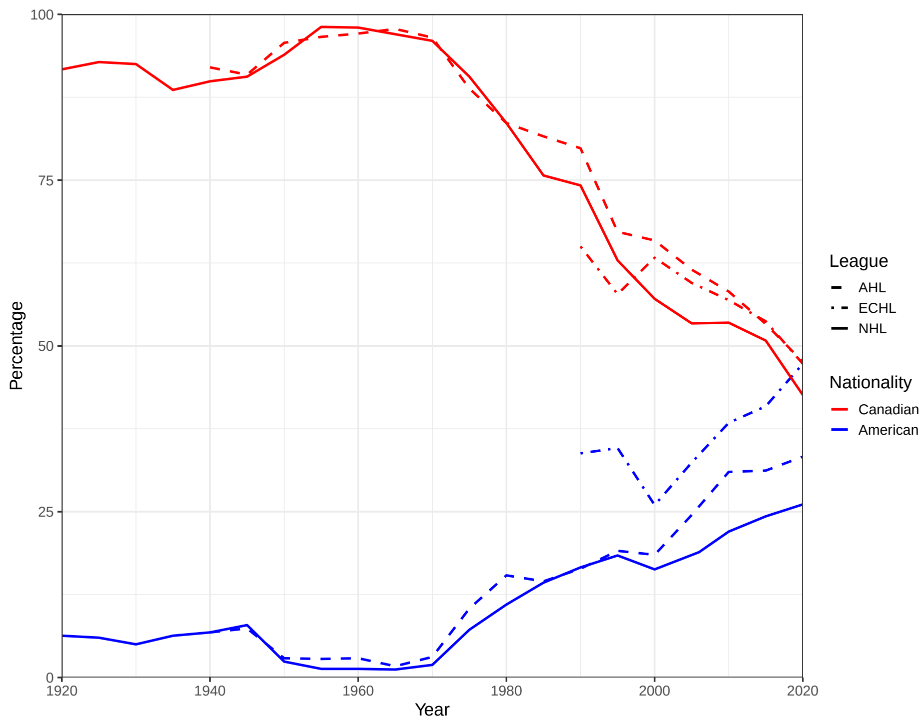

Figure 2.4: NHL, AHL, and ECHL players by nationality 1920-2020

cannot be overlooked. While it is apparent that there has been a nationality demographic shift, the notion of hockey being Canada's game offers an explanation as to why the SCE variables being study here are still prevalent in the speech of American-born players. It is this heightened importance of Canada due to the initial massive imbalance in American and Canadian players that offers insight into the potential motivation for players to borrow from SCE. As hockey and Canada are historically intertwined, any identity tied to the sport would likely be influenced by Canada as well even if the current demographic landscape would suggest the influence should be dwindling.

2.3 Amateur Hockey in North America

While the percentage of Americans and Canadians in the professional leagues tells a tale of historical Canadian dominance, it is important to also consider the number of amateur players in each country to better understand the culture of the sport. Amateur hockey in the United States is governed by USA Hockey. USA Hockey was founded in 1937, though before 1991 it was known as the

Amateur Hockey Association of the United States (AHAUS). The league is comprised of different playing levels ranging from youth to adult. At the youth level, players are split into boys level–8 and under (Mite), 10 and under (Squirt), 12 and under (Peewee), 14 and under (Bantam), 16 and under (Midget Minor), 18 and under (Midget Major)–and girls levels; 8 or under, 10 or under, 12 or under, 14 or under, 16 or under, 19 or under. Additional levels include High School for players enrolled in and playing for their high school, Junior for players under the age of 20, Collegiate for players enrolled in and playing for their university, and Adult. Amateur hockey in Canada is governed by Hockey Canada. Hockey Canada was founded in 1968 and merged with the Canadian Amateur Hockey Association (CAHA) in 1994. CAHA was founded in 1914, predating AHAUS by 23 years. Hockey Canada is structured similarly to USA Hockey with respect to age breakdown; however, they offer a U7 "Timbit" level, with subsequent levels; U9, U11, U13, U15, U18, and U21. High school, junior, collegiate, and adult hockey are separate levels as well. The membership statics for both of these leagues offer insight into the number of amateur players involved in the sport in both countries.

2.3.1 USA Hockey

Turning to amateur hockey statistics, participation between the United States and Canada initially looks comparable. According to the USA Hockey 2018-19 season final registration report a total of 567,908 people participated in organized hockey through USA Hockey, the governing body for amateur hockey in the United States, during the 2018-19 hockey season. This number includes both male and female players ranging from under six-year-old to adult distinctions. Table 2.6 offers a breakdown of this participation into the 12 districts. Four of these districts are individual states, Massachusetts, Michigan, Minnesota, and New York, but the reaming eight are made up of numerous states and are more so representative of entire American regions. The breakdown each of district containing multiple states can be seen below:

- Atlantic: Delaware, New Jersey, and Eastern Pennsylvania
- Central: Illinois, Iowa, Kansas, Missouri, Nebraska, and Wisconsin
- Mid-American: Indiana, Kentucky, Ohio, West Virginia, and Western Pennsylvania
- New England: Connecticut, Maine, New Hampshire, Rhode Island, and Vermont

- Northern Plains: Montana, North Dakota, South Dakota, and Wyoming
- Pacific: Alaska, California, Hawaii, Nevada, Oregon, and Washington
- Rocky Mountains: Arizona, Colorado, Idaho, New Mexico, Oklahoma, Texas, and Utah
- Southeastern: Alabama, Arkansas, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia

Given with each district's player count, is the population of all people in that district, using population estimates as of July 1, 2019 from the United States Census Bureau, and also the percentage of the population that was registered with USA hockey from that district.

Table 2.6: 2018-19 USA Hockey membership statistics by district

District	*Players*	*Population*	*Percentage*
Atlantic	38,611	16,256,949	0.24%
Central	66,050	32,634,475	0.2%
Massachusetts	48,729	6,892,503	0.71%
Michigan	48,664	9,986,857	0.49%
Mid-American	41,147	31,082,133	0.13%
Minnesota	57,923	5,639,632	1.03%
New England	33,639	7,952,560	0.42%
New York	50,587	19,453,561	0.26%
Northern Plains	16,721	3,294,258	0.51%
Pacific	57,089	56,572,426	0.1%
Rocky Mountain	51,064	53,080,157	0.1%
Southeastern	57,684	84,688,263	0.07%
Total	**567,908**	**328,239,523**	**0.17%**

The four districts with the most players in 2018-19 were the Central, Pacific, Southeastern, and Minnesota districts. However, three of these districts, were among the top four in total population; the Central Southeastern district had a total population of over 84 million, the Pacific had over 56 million, and the Central had over 32 million. Due to this, all three districts had very low percentage of participation. However, Minnesota was directly in opposition to this. Although the state district had the second lowest population of all 12 districts, it was second to only the Central district in total players produced. In turn, it had the highest participation percentage of 1.3%, admittedly still a very small percentage. Three state districts, Massachusetts, Michigan, and New York produced comparable numbers to those seen in Minnesota, but due to larger population sizes, had lesser participation percentage, with New York being the most extreme example, although second in players produced by an individual state. Minnesota was the only district where participation exceeded 1%, the percentage in Massachusetts was 0.71%, the Northern Plains 0.51% Michigan 0.49%, and New England 0.42%. There was a large drop off in participation after New England, as the New York district only had 0.26% participation and the Atlantic 0.24The Central, the Mid-American, the Pacific, the Rocky Mountains, and Southeastern all were at or under 0.2% participation. Perhaps unsurprisingly, the Southeastern district has the least participation with only 0.07%; however, this could be partly due to the massive population of this region, over one quarter of the entire population. Overall, the 567,908 hockey players in the United States represent only 0.17% of the population of 328,239,523. While this number of over half a million players seems high at first glance, when compared to Canada it starts to become clear that hockey is not nearly as popular a sport in the United States.

2.3.2 Hockey Canada

Table 2.7 presents the membership statistics for Hockey Canada during the 2018-19 season taken from the governing body's 2018-19 Annual Report. Hockey Canada is made up of 13 members, which correspond closely to the Canadian provinces. The province of Ontario actually contains three different members: Hockey Eastern Ontario, Hockey Northwestern Ontario, and the Ontario hockey federation. The only province not included in Hockey Canada is the Yukon, which has its own governing body Hockey Yukon, though membership statistics fro the 2018-19 season were not readily available and have not been included. Additionally, the Adult Safe Hockey League and the Canadian Hockey League are not confined to a single province. Player totals for each member are given paired with population estimates as of July 1st, 2019, from Statistics Canada for each Province. The population of Northwest Territories and Nunavut were combined, as they are represented by a single member in Hockey Canada, Hockey North. Furthermore, the population of the Yukon has been removed from the total population since their hockey participation was not captured in the Hockey Canada membership statistics. Due to this, the total population number is marked with an asterisk to denote that this is not the total population of Canada, but the population of the provinces that have member organizations within Hockey Canada. Once again, the participation percentage for each member is given. As the Adult Safe Hockey League and the Canadian Hockey League are not confined to a single province, population and participation percentages are not given for these leagues.

Table 2.7: 2018-19 Hockey Canada membership statistics by member organization

Member Organization	*Players*	*Population*	*Percentage*
BC Hockey	60,837	5,090,955	1.2%
HEO, HNO, and OHF	263,644	14,544,718	1.81%
HNB	15,556	776,868	2%
HNL	11,608	523,476	2.22%
Hockey Alberta	83,325	4,361,694	1.91%
Hockey Manitoba	30,899	1,369,540	2.26%
Hockey North	4,050	83,642	4.84%
Hockey Nova Scotia	17,649	969,747	1.82%
Hockey PEI	5,497	157,262	3.5%
Hockey Quebec	92,908	8,501,703	1.09%
SHA	38,461	38,461	3.28%
Adult Safe Hockey League	18,112		
Canadian Hockey League	1,412		
Total	**643,958**	**37,551,907***	**1.71%**

Alberta, Ontario, and Quebec all produced more hockey players in 2018-19 than any single district in the United States. Perhaps most surprising was Ontario. Between the three member organizations, over a quarter of a million players participated in the 2018-19 season. The 263,644 players in Ontario were nearly four times the number of players in the American Central district and accounted for over 40% of all Canadian players. British Columbian players were only surpassed by the Central district of the United States, a district that had a population six times greater than the population of the province. Manitoba, Nova Scotia, and Saskatchewan were comparable to different American districts in total number of players produced. Four provinces, New Brunswick, Newfoundland and Labrador, Nunavut (analyzed in conjunction with the Northwest Territories), and Prince Edward Island, all produced fewer players than the smallest American district, the Northern Plains; however, due to population size. the percentage of players for these provinces were far greater than those seen in American districts.

2.3.3 USA vs. Canada

When comparing the percentage of players per Canadian province with percentage of players per American district, the stark contrast in participation between nations becomes evident. Quebec had one of the lowest participation percentages in 2018-19, only 1.09%; however, this was still 0.06% greater than the highest percentage in the state district of Minnesota. Furthermore, the large population of Quebec likely skewed this participation percentage down, as the total population was over 8.5 million, while Minnesota only had a population just over 5.6 million. Every other province had an increase in participation from Montreal, with British Columbia being the second lowest at 1.2%. It should be noted that British Columbia did have the third greatest population of the Canadian provinces, which seems to pull this participation percentage down. Both Ontario and Nova Scotia had similar participation percentages of 1.81% and 1.82% respectively; however, due to the massive population of Ontario, the greatest of all Canadian provinces, this 1.81% participation rate lead to a massive number of hockey players. Alberta was just above both of these province with a participation rate of 1.91%. New Brunswick, Newfoundland and Labrador, and Manitoba all had rate above 2%. The Northwest Territories and Nunavut, Prince Edward Island, and Saskatchewan all had relatively high participation percentages over 3%. These percentages lead to Canada having a total percentage of 1.71% for the entirety of the country, a number 10 times greater than that seen in the United States.

When total numbers of players are compared, the United States produced 76,050 fewer players through USA Hockey than their Canadian counterparts in Hockey Canada during the 2018-19 season. These similar player totals suggests that American and Canadian players make up an equal percentage of hockey players in North America, but this ignores a major factor, the population size of each country. As of July 2019, the Canadian population was only just over 11% of the population of the United States; however, the average Canadian was 10 times more likely to play hockey than the average American. This led to the total population of Canadian players being greater than that of American. Therefore, although the total number of players produced was comparable, the involvement with the sport was not. Overall, Canadians were far more likely to play hockey than Americans, corresponding to the idea that the sport is more intertwined with Canadian culture. In the United States, hockey still occupies the place of a fringe sport, with very few players centralized in a few states, specifically, Massachusetts, Michigan, Minnesota, and New York. The opposite can be seen in Canada, where each province had a higher degree of participation than any American state. To put the fringe status of hockey in the United States in prospective, according to the Aspen Institute and the Sport and Fitness Industry, Basketball was the most popular youth team sport in 2020 with roughly 7,702,000 athletes in the 6-17 age range. Basketball was followed by baseball, 5,248,000 athletes, football (both flag and tackle) 3,672,000 athletes, and soccer, 2,934,000 athletes. Only 534,000 hockey players participated during the same season.

Understanding the status of hockey in the United States and Canada is key to establishing a rationale for players to adopt variables from SCE. The Canadian dominance of the sport at the professional level, paired with the disproportionate level of youth involvement in the sport, justify the Canadian value linked to hockey. Due to this, any linguistic persona that has developed for the players would likely borrow from SCE. In Chapter 3, I will summarize what constitutes SCE and how the usage of SCE variables differs from the expected regional dialects of the players included in this study.

Chapter 3

Canadian English

> "I learned the difference more here then, [pæstə] instead of [pɑstə] which is uh- about is like more like [əbut]. Sorry is like [sɔɹi]. Um those are the three ones we always give them shit for. Uh there's like another- like they say the *eh* at the- I do that too though so."
> — Hall

In this chapter, I discuss the three main variables which differentiate SCE from other regional Englishes spoken in North America, the Low-Back-Merger Shift (LBMS), Canadian raising (CR), and monophthongal FACE and GOAT by reviewing the relevant previous literature for each. While these variables are critical to establishing how Standard Canadian English (SCE) is distinct, they also have been attested in various other regional Englishes spoken in North American. Because of this, I also cover the status of each variable in Canada and the United States.

Before discussing each variable in greater depth, it is important to equate how vowel formant measurements relate to vowel height and advancement. The first formant, captured by F1 values, is inversely correlated with the height of the body of the tongue throughout the pronunciation of the vowel. Thus, smaller F1 values are indicative of a higher tongue position while greater values are indicative of a lower position. The second formant, captured by F2 values, then correlates with the advancement of the body of the tongue. Greater F2 values are indicative of a more forward tongue position while smaller values suggest a more backed position.

3.1 The Low-Back-Merger Shift

The first SCE variable being analyzed within this dissertation is the LBMS,[5]

[5] Becker (2019) compiles articles on the LBMS throughout Canada and the United States under the term "Low-Back-Merger Shift." It seems likely this will be the common term for the Shift moving forward, and it will be the terminology I use throughout this dissertation.

named for the Low-Back Merger of BOT and BOUGHT. First established in its entirety by Clarke, Elms, and Youssef (1995), the LBMS is characterized by the lowering and retraction of the front vowels, BIT, BET, and BAT made possible by the vacated low mid position in the vowel space after the merger (p. 212). Due to the Low-Back Merger (LBM) functioning as a potential catalyst for this shift, it is first important to review some of the literature on this specific merger in Canada.

3.1.1 The Low-Back Merger

The status of the LBM in Canada can be traced as far back as Joos (1942), where he notes its occurrence in Ontario. Regarding low back vowels in Ontario, he observes the following:

> Ontario not only has *balm* and *bomb* identical, as is the rule in General American, but also *pod* and *pawed*: [bɑm, pɑd], with only one phonological class where most General American has two: [bɑm, pɑd; pɔd], and certain other regions have three: bɑm; bɒm, pɒd; pɔd]. (p. 141)

The three divergent low back vowels Joos describes in other regions can be categorized as BALM, BOT, and BOUGHT, respectively. In Ontario, he notes that all three of these vowels are merged. This provides distinction from what he describes as General American where two of the three vowels, BOT and BOUGHT, are expected; however, the BALM category is merged with BOT in General American. Joos's early work in Ontario is not alone in examining the state of the merger in Canada. Evidence of the merger in Saskatchewan is captured by Lehn (1959). Although Lehn goes into great detail about potential allophony, he nevertheless suggests that there is only a single low back vowel being used in Saskatchewan. The merged vowel occurs in *father*, *bother*, *box*, *lock*, *long*, *lawn*, *shone*, *log*, *ball*, *odd*, *cot*, and *caught* (p. 93). While both Joos and Lehn attest a complete merger in each province, there is divergence on how this vowel should be transcribed as either [ɑ] or [ɒ]; however, both can be categorized as BOT. Joos and Lehn's data demonstrate that there are regional dialects across Canada which merge BALM, BOT, and BOUGHT.

However, the early state of the merger is not uniform throughout all Canadian regional dialects. Gregg (1957) presents evidence from Vancouver which suggests two distinct low back vowels in Vancouver. He does notes there are similarities shared by BOT and BOUGHT. Gregg establishes two distinct vowel classes, [ɑ] which most closely corresponds to BALM, occurring in *part*, *balm*, *father*, *amen*, *almond*, and *salmon*, and [ɒ] corresponding to a merged BOT-BOUGHT occurring in *pot*, *block*, *lost*, *bomb*, *bother*, *solder*, *coffee*, *office*, *logger*, *cot/caught*, and *collar/caller* (p. 22). Although he asserts two vowel classes, he still provides evidence for a merger with examples like *cot/caught* and *sod/sawed*, showing that at least two of the three low back vowels are merged.

Drysdale (1959) also suggests distinct low back vowels in Newfoundland; however, the distinctions between vowels is different than that documented by Gregg in Vancouver. Drysdale creates two distinct vowel classes, [ɒ] which corresponds to BOT, occurring in *body*, and *cot*, and [ɔ] corresponding to BOUGHT, occurring in *bawdy*, *bought*, *caught*, *law*, and *water*. While Drysdale makes a case for two distinct low back vowels compellingly, he does call into question the perception of the Low-Back Merger in Newfoundland, mentioning that some speakers were unaware that they produced distinct vowels (p. 32). This early era of literature on the merger in Canada suggests that much of the country had undergone the merger or were in the process of merging the low back vowels with the possible exception of Newfoundland.

Avis (1973) captured the uniform state of the merger throughout most of Canada stating, "[m]ost Canadians, for example, no longer make a distinction between /ɔ/ and /ɑ/ in such pairs as *caught* and *cot*, *naughty* and *knotty*, which have contrasting vowels in most varieties of American and British English."(p. 64). Avis's assertion that BOUGHT and BOT are merged throughout Canada has subsequently been extensively studied and corroborated in different regional Canadian Englishes. In Ottawa, Ontario, Woods (1993, p. 170) examines the state of the merger finding that there is no distinction between the low back vowels, but most speakers produce a rounded vowel, [ɒ]. In St. John's Newfoundland, Kirwin (1993, pp.74-6) shows a "collapse of *cot* and *caught*"; however, the vowel is produced as a low-mid vowel, more centralized than the back vowel expected in other Canadian dialects. Boberg (2005, p. 140) and Hagiwara (2006, p. 133) observe the merger in Montreal, Quebec and Winnipeg, Manitoba, respectively. In *ANAE*, Labov et al. included all of Canada, apart from Newfoundland within the isogloss for the LBM (Labov et al., 2006, pp. 60–1). Their data comes from 41 participants from every Canadian Provinces except Prince Edward Island.[6] Furthermore, *ANAE* establishes a benchmark for where the potentially merged low back vowel should be occurring within the vowel space throughout Inland Canada. An F2 value of less than 1,275 Hz is established as the benchmark for BOT, and due to the expected merged position, BOUGHT as well. This benchmark captures the back position of the merged vowels mentioned in many of the studies outlined above.

[6] They do no include speakers from any of the territories (Northwest Territories, Nunavut, or Yukon).

Boberg (2008) presents data from the Phonetics of Canadian English (PCE) study in which 86 participants from British Columbia, the Prairies (Alberta, Saskatchewan, Manitoba, and Northwest Ontario), Southern Ontario, Greater Toronto, Eastern Ontario, Quebec (Montreal), Maritimes (New Brunswick and Nova Scotia), and Newfoundland establishes a regionally balanced mean F1 and F2 values for SCE vowels. Boberg's PCE participants aligned with the *ANAE* BOT benchmark with a mean F2 value of 1,224 Hz. Even with the assumption of the merger for SCE, Boberg accounts for the possibility of distinct BALM andBOUGHT vowels; however, the mean F2 values of 1,211 Hz for both vowels are remarkably similar to that seen in BOT. Additionally, the mean F1 values are all within 11 Hz, with a mean BALM F1 value of 777 Hz, a mean BOT value of 774 Hz, and a mean BOUGHT F1 value of 768 Hz. In *ELC*, Boberg categorizes the three vowels as a single merged vowel and provides a mean F1 value of 771 Hz and a mean F2 value of 1,214 Hz, which aligns with the *ANAE* benchmark as well. Overall, Boberg's PCE data provide a convincing argument for the Low-Back Merger occurring throughout all of Canada, including Newfoundland, demonstrating its prevalence as a defining variable of SCE.

3.1.2 Lowering and Retraction of BIT, BET, and BAT

Esling & Warkentyne (1993) first note the potential retraction of BAT in Vancouver. Data from the Survey of Vancouver English shows that BAT retracts in the vowel space but keeps a low quality. Esling & Warkentyne explain that this change is led by women and those in the highest socioeconomic status (p. 242). Two years later, Clarke et al. (1995) establish a shift which encompasses not only the retraction of BAT, but also the other front vowel, BET and BIT. Clarke et al. name this shift the "Canadian Shift;" however, for clarity, I will continue to call the shift the LBMS. Furthermore, their data represents a slightly more transcontinental Canadian English, as they include speakers from Alberta, British Columbia, and Southern Ontario. However, the vast majority of their 16 speakers–all but two–are from Ontario, so it is possible that the degree to which the LBMS represents a variable SCE is overstated. According to Clarke et al., the LBMS is,

> [C]haracterized by the lowering of the front mid and high lax vowels. Thus, /ɪ/ lowers to /ɛ/, and /ɛ/ lowers to the slot occupied by /æ/ in more conservative dialects. [...] Instead of tensing and raising, [Standard Canadian English (SCE)] /æ/ retracts and lowers still further in the direction of central open /a/. Such retraction is made possible by the fact that the vowel of such lexical sets as *cot*

and *caught* – which for most Canadian speakers have undergone merger – has remained in the low back [ɑ] area in SCE, where it is variably rounded. (p. 212)

Clarke et al. note that the low mid position, which is left vacant due to the merger of BOT and BOUGHT is pivotal in creating an opening for BAT lowering and retraction which subsequently allows BET, and BIT to shift down as well. Similar to the findings of Esling & Warkentyne, Clarke et al. extrapolate that the LBMS is most advanced for female speakers and also assert that the degree of shifting seemed greater for younger speakers, but they had insufficient evidence to make this claim as all but one speaker was under the age of 30 (pp. 216-7). Clarke et al. additionally points out the contrast in directionality of movement for BAT throughout Canada and the neighboring Inland North (IN) region, which has undergone a competing shift, the Northern Cities Vowel Shift (NCVS). While BAT is lowering and retracting in SCE, when not occurring before nasal consonants, the NCVS shows raising of BAT in the IN region distinguishing the dialects (p. 212).[7] Figure 3.1 presents a recreation of the LBMS in Ontario as described by Clarke et al.[8]

[7] Since these vowels are not merged in the IN, the space for BAT to lower and retract is occupied, which could explain the prevalence for raising instead of lowering and or retraction.

[8] Clarke et al. additionally analyze the lowering and centralization of BUT as part of the LBMS; however, the position of this vowel will not be included in the analysis of this dissertation.

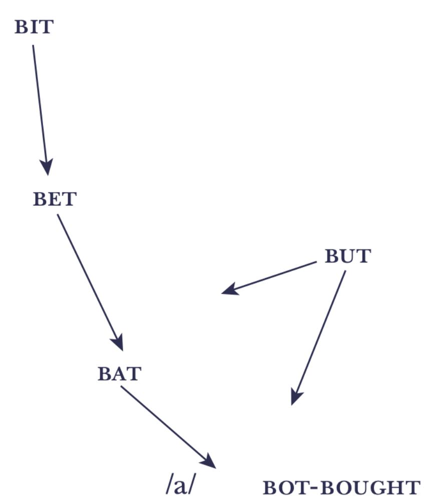

Figure 3.1: Low-Back-Merger Shift in Ontario according to Clarke et al. (1995)

Another key finding of Clarke et al. involves the conditioning environment in which the front vowels occur, specifically the manner of the following segment. The presence of a nasal following a front vowel appears to inhibit lowering. This is most apparent for BAT, where Clarke et al, note a prevalence for raising and tensing similar to that seen in the IN as part of the NCVS. However, this blocking of lowering is not uniform across the front vowels, as BET seems to exhibit greater lowering when pre-nasal (p. 216). De Decker's (2002) analysis of Rural Ontario also analyzes the impact of conditioning environment on the lowering of BAT. His results concur with Clarke et al. in that this retraction seems to be blocked when the following segment is a nasal. However, De Decker expands which type of segments inhibit lowering, adding that when BAT occurs before /g/ there is a tendency towards raising and tensing.[9]

D'Arcy's (2005) study of St. Johns, Newfoundland shows local variation with respect to the reaction of BAT. In analyzing St. Johns, she establishes three BAT variants in usage, a more traditional raised BAT which Clarke (1991) establishes as a regional variant of St. Johns, a SCE BAT which is neither raised or retracted, and the novel retracted BAT described by Clarke et al. She finds that the most common variant is the non-raised and non-retracted BAT used by 51% of her speakers. Only 35% of speakers produce the raised variant which is historically attested as a local variant. 13% of her speakers utilize the retracted BAT, demonstrating at least the presence of the shift in St. Johns. D'Arcy does not examine the state of the BIT or BET vowels.

Boberg's (2005) analysis of the LBMS in Montreal, Quebec presents findings which call into question some aspects of the the initial assessment of the shift by Clarke et al. He examines the state of the LBMS with respect to apparent time changes, analyzes the state of the shift in other regions, specifically in the city of Montreal and performs an acoustic analysis of the shift.[10] Boberg's Montreal speakers demonstrate that age is statistically significant in the shift; however, the apparent directionality of the shift differs from that established by Clarke et al. Boberg notes "generational group has a significant independent effect on four measures: the F1 of /æ/; and the F2 of /ɪ, ɛ, æ/" (p. 141). Most importantly, this suggests that the F1 values of BIT and BET are not significantly altered based on generational gaps indicative of apparent time retraction, but not lowering, in Montreal. Between the oldest and middle generations, Boberg only finds a statically significant difference of BAT F1 values indicating that lowering in Montreal is possibly complete. Between the middle and youngest generations, he finds significant differences between BET and BAT F2 values, and between the oldest and youngest generations, he notes significant differences between BIT, BET, and BAT F2 values. The retraction of BET and BAT appears to be a change in progress occurring more recently than BAT lowering, as it is significant in the youngest generation. Boberg also notes that BIT retraction is occurring but to a lesser degree than the retraction of the other two vowels, and it is only significant in the speech of the youngest generation when compared against the oldest, possibly demonstrating this change is still in progress in Montreal (pp. 143-5). Figure 3.2 depicts the LBMS in Montreal according to Boberg.

[9] Due to the expectation of raising and fronting of BAT before nasals and voiced velars, tokens in these environments will not be included in this analysis. This will be further explained in Chapter 5.

[10] Clarke et al. and D'Arcy relied on this impressionistic transcription for the initial explanation of the LBMS.

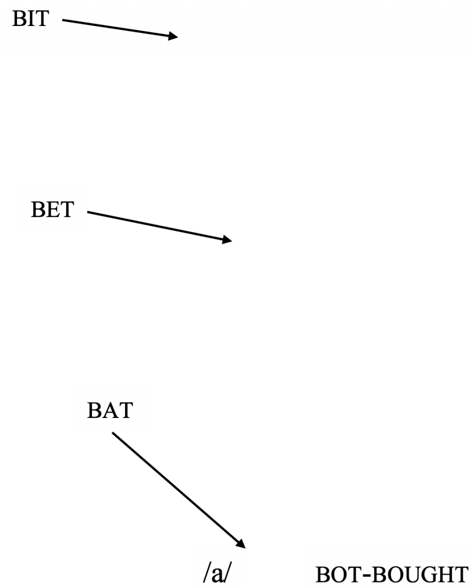

Figure 3.2: Low-Back-Merger Shift in Montreal according to Boberg (2005)

Hagiwara's (2006) Winnipeg vowel project examines the state of the shift in yet another region, Winnipeg, Manitoba. His findings present further challenges to both Clarke et al. and Boberg. While BAT appears to be lowered in Winnipeg, Hagiwara notes that all front vowels, including the supposed stable high front BEET, are in a lower position. This is counter to the findings of Clarke et al. as they suggest BIT, BET, and BAT are supposed to be lowering with respect to cannonical high front positioning of BEET. Furthermore, Hagiwara explains that while there is some retracting of BIT and BET, which could be indicative of incipient adoption of the Canadian Shift, BIT retraction is greater than BET, which is the opposite of what Boberg finds in Montreal. The only aspect of the shift that Hagiwara finds to be consistent with previous studies is the lowering and retraction of BAT (pp. 134-6).

ANAE also examines the state of the LBMS in Canada, but their definition of the shift does not include BIT at all. Furthermore, their data shows that the LBMS is not present outside of Inland Canada, which excludes the Atlantic provinces of New Brunswick, Newfoundland and Labrador, Nova Scotia, and Prince Edward Island. *ANAE* provides benchmarks for the expected positioning of BET, BAT, and BOT-BOUGHT for speakers whio exhibit the LBMS. According to *ANAE,* BAT is expected to have an F2 of less than 1,825 Hz for speakers exhibiting the LBMS. Their SCE speakers have a mean F2 of BAT of 1,725 Hz, which Labov et al. note is lower than all other North American English dialects except for speakers from Providence, Rhode Island. Additionally, BET is expected to have an F1 of greater than 650 Hz for speakers with the LBMS. Again, Labov et al. note that SCE speakers have one of the two lowest mean F2 of BET seen in North American English dialects. Finally, BOT-BOUGHT is expected to have an F2 greater than 1,275 Hz for speakers with the LBMS. *ANAE* finds no shift in the position of BIT, which is expected to be occurring in the LBMS according to Clarke et al. (1995) and Boberg (2005), and therefore does not provide a benchmark for expected formant values (Labov et al., 2006, pp. 219–20). Figure 3.3, recreated from Labov et al.'s Figure 15.1, depicts the LBMS for Inland Canada.

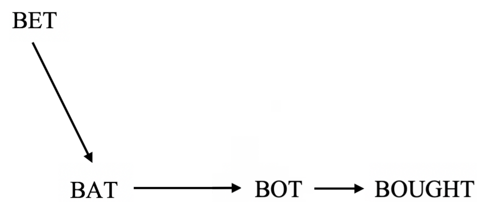

Figure 3.3: Low-Back-Merger Shift in Inland Canada according to Labov et al. (2006)

Boberg's PCE data (2008, 2010) provides interregional means for all of Canada, establishing the presence of the shift throughout the entirety of the country. Boberg finds that the Atlantic provinces do participate in the LBMS in opposition to the depiction of the shift in *ANAE*. Furthermore, *ELC* data aligns with all benchmarks for the LBMS established by *ANAE*. LBMS *ANAE* benchmarks and Boberg's mean formant values can be seen in Table 3.1. Bold values indicate alignment between Boberg's data and *ANAE* benchmarks.

Table 3.1: LBMS vowel *ANAE* benchmarks paired with *ELC* mean formant values

	ANAE Benchmarks		*ELC Data*	
Vowel	*F1*	*F2*	*F1*	*F2*
BIT			563	2,051
BET	> 650		**732**	1,891
BAT		< 1,825	885	**1,727**
BOT-BOUGHT		< 1,275	771	**1,214**

Boberg's SCE mean BET F1 value demonstrates the lowering expected in the LBMS. Additionally, the mean BAT F2 values captures the expected retraction due to the shift. By providing mean F1 and F2 values for all the vowels involved in the LBMS, Boberg presents a more complete picture of the vowel space for SCE which will be vital in the comparison of the results of this study to SCE. In his (2008) analysis, Boberg does note regional variation with respect to the LBMS. He finds that the Prairies (Alberta, Saskatchewan, Manitoba, and northwest Ontario) and Quebec exhibit larger F2 values, suggesting less retraction than those in Eastern Ontario, Southern Ontario, and Toronto.

While *ANAE* and *ELC* provide a strong argument for the LBMS being a key variable of a transcontinental SCE, they are by no means the most recent study involving the shift. Sadlier-Brown & Tamminga (2008) present an argument for the occurrence of the LBMS in Halifax, Nova Scotia, and Vancouver. They demonstrate the presence of the shift in both cities. Although Vancouver shows greater BET lowering and BAT retraction with little lowering; while in Halifax, BAT is lowering and retracting, potentially indicative of regional variation. Additionally, they note a potential change in progress of BIT retraction occurring diagonally in a similar manner to BET though to a lesser degree (pp. 9-11). Roeder & Jarmasz's (2010) analysis of speakers from the Toronto English Project show lowering and retraction of both BET and BAT present in Toronto. They find that BAT lowering and retraction still appears to be a change in progress and is more advanced in the speech of women, and the main directionality of BET is retraction. They do note a lack of lowering and retraction of BIT in Toronto (pp. 400-1). Hoffman (2010) presents a very similar analysis, finding that the LBMS is more advanced in Toronto, specifically highlighting the retraction of BET and BAT with younger speakers leading the change, with the LBMS being more advanced in Toronto than elsewhere in Canada (p. 134). Roeder (2012) suggests that Thunder Bay, in northwest Ontario, also exhibits the LBMS, though not to the degree of Toronto, suggesting that the change is spreading outward from the city. Roeder & Gardner (2013) highlight shifted BIT, BET, and BAT in just over half of their speakers in Cape Breton, Nova Scotia. However, they note that apparent change over time is not present in their data (pp. 167-8). Kettig & Winter (2017) re-examine Montreal and find that younger speakers exhibit both retraction, and to a lesser extent lowering, of BET, and retraction of BAT without lowering in apparent time. Additionally, they note that women retract both BET and BAT more than men (pp. 84-5). Roeder, Onosson, and D'Arcy's (2018) analysis of the Synchronic Corpus of Victoria English shows that apparent time impact of the LBMS on Victoria, British Columbia. They demonstrate that BIT, BET, and BAT retraction occur with the largest difference between the middle and youngest generations. They also note that lowering of BET, BAT occurs between the oldest and middle generations. The only movement that was influenced by gender was that of BAT retraction, where again, the youngest women were the most retracted (pp. 97-8).

Boberg's (2019a) pan-Canadian results of undergraduates at McGill University demonstrate strong correlation in F1 and F2 values of BIT, BET, and BAT. He notes, as F1 values of BAT increase, indicative of lowering, F1 values of BET increase as well. The same is true of F2 values of both vowels, although the values decrease indicating retraction. F1 values of BAT and BIT did not correlate. However, F2 values did (p. 98). In this same article, Boberg proposed the term Short Front Vowel Shift as the Canadian Shift implied that the border acts as an isogloss which numerous other studies would suggest is false. Furthermore, he proposes the Short Front Vowel Shift Index as a quantifiable methodology to measure the LBMS. This index has recently been adopted by the analyses presented in the volume titled *The Low-Back-Merger Shift: Uniting the Canadian Vowel Shift, the California Vowel Shift, and the Short Front Vowel Shift across North America* (Becker, 2019) in which Boberg (2019b) renames the Short Front Vowel Shift Index as the Low-Back-Merger Shift Index.[11] The findings he presents in both articles (Boberg, 2019a, 2019b) compare the advancement of the LBMS in Canada to the United States, specifically those in the United States who exhibit the Low-Back Merger. In the latter study, Boberg (2019b) tests the apparent time changes captured by many of the studies mentioned above by comparing his McGill University students with Canadian Broadcasting Company recordings of three Canadian World War I veterans. His data suggests that the Low-Back Merger, present in all the younger McGill students, but absent in two of the three veterans, is the catalyst for the lowered and retracted BAT position in the McGill students' speech. In addition, he notes that BET has shifted down to a position parallel to the merged BOT-BOUGHT and BIT has shifted down to a position parallel to GOAT. In calculating the LBMS Index for each group, he demonstrates that the McGill students' Index is more than 50% greater than the veterans, 873 Hz and 55 Hz, respectively, indicating far greater shifting for the younger speakers (pp. 62-4). When comparing LBMS Index scores of his Canadian and American McGill students, Boberg finds that the LBMS is occurring in the speech of both Canadians and Americans. In comparing the shift across the Canadian-US border, he finds a slightly smaller Index scores for Canada, 837 Hz, than that of the Americans, 939 Hz.[12] When gender is accounted for, Canadian men lag behind women in LBMS Index scores, with the men having a LBMS Index of 721 Hz and the women a value of 878 Hz. While both are trumped by the American women, who have an Index score of 958 Hz, the difference between Canadian and American women is not statically significant (p. 65-6). Swan (2019) also utilizes the LBMS Index

[11] The precise methodology to calculate the Low-Back-Merger Shift Index will be provided in Chapter 5 of this dissertation.

[12] Boberg notes that eight American speakers were removed from this analysis due to the absence of the Low-Back Merger in their speech marked by distinct F1 values.

to compare speakers in Vancouver and Seattle and presents similar findings. As Swan's data is normalized following Lobanov's (1971) methodology, her results are not directly comparable to Boberg's (2019a, 2019b), but she finds that both male and female speakers lag behind their counterparts from Seattle. Differences across the genders within each city are not significant, nor are difference across cities, showing the similarities between the shift in both Vancouver and Seattle. When individual vowels are accounted for, Swan shows that females produce BAT and BET in a lower more retracted position and BIT in a lower position than their male counterparts (pp. 83-5). Both Boberg and Swan address a critical question of the LBMS of just how Canadian the variable really is, as it has been attested in the United States. Their research proposes a large degree of similarity in the shifting occurring on both sides of the border, and because of this, it is important to briefly address the history of scholarship on the merger and shift in regional dialects of the United States.

3.1.3 The Low-Back-Merger Shift in the United States

Both the LBM and the LBMS have been extensively studied throughout the various regional dialects of the United States. However, as this dissertation is focusing on potential influence of SCE on hockey players, instead of providing a complete history of the phenomenon throughout all American regional dialects, I will focus on research pertaining to dialects which the players in this study likely utilize. I will provide the regional demographics for each player in Chapter 5, but it is important to note here that players were from the following regions taken from *ANAE* (Map 11.15, p. 148): Eastern New England (ENE), the IN, the Mid-Atlantic (MA), the West, Western Pennsylvania (WPA), and the Upper Midwest (UM).[13]

[13] *ANAE* does not establish an Upper Midwest that is distinct from the North. Instead, the Inland North is a subdivision within the North. The Upper Midwest would likely be the remaining portions of the North and the North Central.

Similar to the research on SCE, the LBM has been attested in regional dialects of the United States for decades. Wetmore (1959) notes the merger in WPA citing the production of identical phonemes in the word pairs *caught* and *cottage*, *pot* and *brought*, *John gone*, and *oxen* and *talking* (p. 107). Kurath & McDavid (1961) describe a similar merger in ENE where *crop*, *rod*, and *John* contain the same phoneme as *law*, *dog*, and *frost*. However, ENE does differ from WPA in the state of the merger, as there is a distinct ɑ phoneme which occurs in *father* and *palm* (p. 13). Allen's (1973) UM speakers produced distinct low back vowels; however, he provides an impressionistic analysis of his students at the University of Minnesota noting an increase in the percentage of those without a low-mid back rounded vowel, except for when it occurs pre-rhotically. He notes a lack of distinction in production in pairs of words such as *caller* and *collar*, *tot* and *taught*, and *don* and *dawn* which would be indicative of the Low-Back

Merger being incipient in the region at the time of his study (pp. 23-4). Due to the age of his students, and the time of his study, it is possible that the Low-Back Merger is more established and attested in the UM in present day speech. The Dictionary of American Region English (Cassidy, 1985) summarizes the state of the merger throughout the United States,

> In much of the West and in parts of the Southwest and Midwest, however, /ɑ/ occurs in *caught*, with the result that *caught* and *cot* sound alike. This is especially prevalent among younger speakers. In Eastern New England and WPA the vowel of *caught* is articulated [ɒ], but since the vowel of "short *o*" words is also [ɒ], the words sound alike in these regions too. (p. lx)

Cassidy et al. provide a map indicating where the merger is occurring, including most of what would be considered the West and the Midlands by *ANAE*.

More recently, Labov's (1991) classification of North American dialects stipulates the importance of the state of the Low-Back Merger, arguing that it is one of two pivot points for American Dialects. The first of his three-way differentiation of dialects is situated around the geographic North, which includes Western New England, New York State, the northern portions of Illinois, Indiana, Ohio, and Pennsylvania, and also Michigan and Wisconsin, is highlighted by the NCVS. The NCVS, first described by Labov et al. (1972), involves the fronting of BOT, becoming more like a, and lowering of BOUGHT towards the space originally occupied by BOT. Due to these movements, the North does not exhibit the Low-Back Merger (pp. 14-6). Furthermore, he notes that the Low-Back Merger is occurring throughout the geographic West, beginning with a transitional zone in Iowa, Minnesota, and Wisconsin. In this zone, there is a mixture of people with and without the merger. After the transitional zone, the merger is dominant throughout the West (pp. 31-3).[14] In *ANAE*, Labov et al. provide further classification of the state of the Merger in the United States. They note that the resistance to the merger in the IN and the MA is due to different chain shifts. As described by Labov (1991), the IN participates in the NCVS, now quantifying the fronting of BOT, with an F2 benchmark fave of greater than 1450 Hz. The MA, ranging from Providence, RI to Baltimore, MD, exhibits BOUGHT raising which results in two distinct vowels, as BOUGHT is no longer low, but potentially mid to high. Once again, they provide a quantifiable measure of this raising, with BOUGHT having an F1 benchmark of less than 700 Hz (p. 59). Based on this previous research, the Low-Back Merger would not be surprising for many of the players in this study and in some cases would be entirely explainable due to their regional dialect. Five players are from regions where the merger is expected: ENE, the West, and WPA.

[14] The Southern Shift is not described here due to the fact that none of the players in this study are from the South. However, the shift also blocks the Low-Back Merger.

The results for the other 15 players would be less easily explained by their own regional dialect alone. Allen and Labov both list Minnesota as an area that is transitional with respect to the merger, so it would not be surprising to find the merger for players from that state. The remaining players are all from the IN, a region which traditionally has exhibited stronger resistance to the merger. However, recent research has suggested a potential reversal of the NCVS with respect to BOT fronting. Dinkin (2011) finds that Cartesian distance between BOT and BOUGHT is diminishing in upstate New York by nearly 50 Hz every 20 years of apparent time. It should be noted that while this is progress towards a merger, these speakers still produce distinct low back vowels (pp. 237-8). Driscoll and Lape (2015) finds that younger speakers in Syracuse are backing BOT by just under 2 Hz for every one-year increase in birth while maintaining roughly the same position for BOUGHT, further evidence of movement towards potential merger (pp. 43-4). Wagner et al. (2016) find that while many of their speakers from Lansing, Michigan have BOT F2 values between 1,350 Hz and 1,500 Hz, there is a cluster of speakers with F2 values around 1,300 Hz (p. 174). Nesbitt et al. (2019) compares the Pillai score measuring the overlap of BOT and BOUGHT for speakers from Lansing born before the middle of the twentieth century and Millennial speakers which show further movement towards the merger in apparent time. Older speakers produce larger Pillai scores between 0.40 and 0.75, suggesting little to no overlap, while their Millennial counterparts produce lower Pillai scores from 0.10 to 0.55, trending more towards a merger (p. 151). These studies show that it is still possible for players from the IN to exhibit the Low-Back Merger with their own regional dialect as the driving force, though less likely than for players from the regions where it is more historically attested.

Turning to the front vowels, Hinton et al. (1987) describes a shift very similar to that presented by Clarke et al. (1995), predating all of the literature on the LBMS in Canada. Their pilot study of predominantly younger middle-class Californians conducted during a graduate seminar in 1986, shows fronting of the back vowels BOOT ([u]), BUT ([ʌ]), and GOAT.[15] Additionally, BUT is said to be fronted as well, but this is based on informal observation. The positioning of the front vowels in their study is more complex, as the phonological environment impacted the direction of movement. BIT, BET, and BAT lowering and retraction is seen when the vowels are not proceeding nasals or following /g/. However, when preceding nasals or after /g/, BIT, BET, and BAT undergo raising. They note that raising is impacted by location, with urban speakers raising less than rural, but lowering is not impacted at all. Additionally, while BOUGHT moves towards BOT, they question if it is truly merged,

[15] Only the fronting of GOAT will be further analyzed within this dissertation as a SCE variable in a peripheral backed position.

and they mention this is shift is gradually occurring, and does not have much significance in distinguishing younger speakers (pp. 119-24).

California remained the primary area of study for the LBMS in the United States after its initial description in the late 80s. Eckert (2008b) provides a name for the shift, the "Northern California Vowel Shift," although she describes a different direction of movement with respect to the merged low back vowel. She notes that BOT-BOUGHT is moving towards the tradition spot of the unmerged BOUGHT (p. 34). Subsequent studies of California further examine the state of the shift in California (Cardoso et al., 2016; D'Onofrio, 2015; D'Onofrio et al., 2016; Kennedy & Grama, 2012; Podesva, 2011; Villarreal, 2016). More recently, numerous studies of the LBMS have occurred throughout the West outside of California, in Arizona (Hall-Lew et al., 2017), Montana (Bar-El et al., 2017), Nevada (Fridland & Kendall, 2017), New Mexico (Brumbaugh & Koops, 2017), Oregon (Becker et al., 2016; McLarty et al., 2016), Washington (Stanley, 2020; Swan, 2016, 2019), and Utah (Bowie, 2017).

While the bulk of the research on the shift has occurred in the West, only two players in this study are from that region, and both are from Colorado. In their examination of Colorado, Holland & Brandenburg (2017) find evidence of elements of the LBMS but not a uniform Low-Back Merger. They describe how BIT and BET are lowering, but note that this is primarily in women's speech, and retracting, but only for more rural speakers (pp. 19-20). Furthermore, they describe that BAT is retracting, with female speakers surpassing male speakers in degree of retraction. BAT lowering was not present in male or female speakers in Colorado based on apparent time data (pp. 21-2).

Research on the LBMS has also occurred outside of the West. Studies of the Midlands have shown aspects of the shift to be occurring in Illinois (Bigham, 2010) and Ohio (Durian, 2012; Thomas, 2019). While there are players in the study from these states, they are from the northern portions which are typically considered to be in the IN. Nesbit et al. (2019) utilizes Boberg's (2019a) LBMS Index in their analysis of Lansing, Michigan and finds that Millennials are shifting the front vowels to a greater degree than older speakers. Lansing Millennials produce average LBMS Index scores of 2.22, 2.24 for female speakers and 2.14 for male speakers, while older speakers lagg behind at 1.94, 2.01 for females and 1.75 for males. Comparing these LBMS Index scores to Swan's (2019) analysis of Vancouver and Seattle, it does appear that Millennial speakers in Lansing are trending towards the LBMS. Swan's Seattle female and male speakers had values of 2.70 and 2.61, respectively, while her Vancouver females and males had values of 2.59 and 2.44 respectively.

Due to the relative age of these players, paired with the resent research showing a preference for Millennial speakers to participate in the LBMS, it would not be surprising for the shift to be present in the players data. However, it is most likely to be occurring in the players from the West, where this shift has been well documented. While there is research to suggest the shift is beginning in Michigan, I do not know how prevalent it will be for players from this state and also from the IN as a whole. Additionally, the status of the shift in ENE, the MA, the UM, and WPA has thus far been understudied. Therefore, the presence or absence of the LBMS cannot be explained by regional dialect alone. What is apparent, however, is that, if most of the players are participating in this shift, regional dialect alone is not sufficient to explain it.

3.2 Canadian Raising

The second SCE variable being analyzed in this dissertation is Canadian raising (CR). CR is a process in which the onsets and nuclei of the diphthongs TIE and COW raise to TIGHT and HOUSE, respectively, before voiceless consonants. The vowel in words such as *type*, *tight*, *tyke*, *rife*, and *rice* would all undergo this raising of the nucleus from the [a] towards a more centralized [ʌ] or [ɐ]. The same raising would occur in words such as *tout*, *south*, *mouse*, and *couch*.

3.2.1 Early Analyses of Raising in Canada

Very early research mentions the potential variation of both TIGHT and HOUSE in SCE. Ahrend (1934) notes that speakers from the Toronto and Kingston areas of Ontario have a tendency to raise in words like *nice*, *night*, *quite*, *like*, *white*, *out*, *about*, *south*, and *house* (pp. 136-8). The following year, Emeneau's (1935) study of Lunenburg, Nova Scotia highlights a shared aspect of the local and standard Canadian dialects with respect to these diphthongs. He is the first to provide a potential rule for this raising, noting that [ɑi̯] and [ɑu̯] are pronounced as [ʌi̯] and [ou̯] before voiceless consonants. This occurs in the words *wipe*, *bite*, *strike*, *ice*, *wife*, *height*, *height*, *out*, *mouse*, *crouch*, and *mouth* (pp. 142-3). The classification of the nucleus in the latter as rounded has been contested by other scholars in subsequent studies. While these early accounts of CR are not sufficient to capture the complexity of raising in its entity, they do establish an early awareness of this variable and its prevalence in SCE. Four years later, Ayearst (1939) describes that the raising of HOUSE differentiated the speech of Canadians and Americans. She notes that Americans seemed to be adding an extra vowel in *out* and *down*, whereas Canadians produce a clipped version of [a^{u}t] (pp. 231-2). Ayearst's assertion about the variation of the vowel is related to shortening, but most scholars agree the nucleus of the vowel does not remain low.

Joos (1942) was the first to offer a phonological rule which would be able to explain the variation seen in the lexical examples of previous research. In his analysis of Ontario English, he describes "high" and 'low" diphthong variants for the vowels involved in CR. His rule stipulates that high diphthongs, TIGHT and HOUSE,[16] occur before fortis consonants with zero juncture. Therefore, *white*, *knife*, *shout*, and *house* would be categorized as having high diphthongs, TIGHT and HOUSE, respectively. Joos notes that all other contexts utilize the low diphthongs, TIE and COW (p. 141).[17] Joos provides a rationale for the raising as tied with shortening of the vowel before fortis consonants. A shorter vowel would allow for lesser degree of movement within the diphthong, whereas raising would allow for the offglide to remain comparable to the longer vowel occurring elsewhere. Joos mentions colloquial evidence that shortening alone is insufficient in capture the vowel variation, as shorter non-raised variants before fortis consonants were heard by Canadians as "drawling" (p. 142).

In addition to providing a phonological rationale for CR, Joos addresses the potential for variation within CR by outlining two varieties based on the ordering of rules within SCE. Joos describes an apparent change in time occurring in Ontario where /t/ is becoming voiced [d] when between voiced sounds which is most common in the speech of public school aged children. For speakers with this voiced segment, *latter* and *ladder* and *betting* and *bedding* are homophonous. The introduction of a second rule led Joos to categorize speakers into Group A and Group B based on the ordering of rules. Group A speakers undergo raising before voicing, therefore, *typewriter* would have two raised vowels although the underlying /t/ has become a voiced [d], transcribed by Joos as [tɐɪprɐɪdɚ]. Group B speakers undergo the rules in the opposite order. Due to this, the voicing rule, where /t/ becomes [d] blocks the required environment to induce raising for the second vowel. Joos transcribes *typewriter* for a Group B speaker as [tɐɪpraɪdɚ] (p. 143). Joos does not attempt to predict which variation would eventually become standard for SCE, citing that future work will need to be done. Avis (1956) provides some framework for the raising of HOUSE which Joos describes.[18] He notes that a fast, short, and raised HOUSE occurs before voiceless consonants in Ontario. Furthermore, this raised variant differentiates the province from American dialects across the border (p. 42).

Further research shows this raising to be occurring elsewhere throughout Canada. Gregg (1957) provides four distinct phonemes corresponding to TIE,

[16] Joos transcribes these as [ɐɪ] and [ʌʊ].

[17] Transcribed by Joos as [aɪ] and [aʊ].

[18] Avis transcribes HOUSE differently than Joos using [əʊ].

TIGHT, COW, and HOUSE.[19] Gregg does not provide further rationale for why these are distinct phonemes and not allophones of two phonemes (pp. 23-4). Similarly, Lehn (1959) distinguishes four phonemes in Saskatchewan; however, he does provide examples of apparent contrast between both TIE/TIGHT and also COW/HOUSE. He cites pairs such as *rider/writer* and *powder/pouter* as rationale for this categorization. However, this appears to be the same voicing phenomenon noted by Joos, and therefore explainable by another rule. Lehn does present data which complicates the state of raising in examples such as *Eiffel* and *Faust* which should raise, but do not in his data (pp. 95-6).

Chambers (1973) proposes a series of phonological rules that captures the raising of TIGHT and HOUSE which expands upon the initial description provided by Joos. Chambers' rules are said to explain the state of raising in the "heartland Canada," an area which encompasses the majority of inland Canada, including northern-most points in Kingston, Ontario in the east to Edmonton, Alberta in the west with the Rocky Mountains and the southern border with the United States acting as boundaries. Chambers notes that the origin of this heartland Canada term has potentially been lost, but this region is supposed to represent a homogeneous and contiguous dialect in Canada. Chambers suggest that with respect to CR, the boundaries might potentially expand to include British Columbia in the west and the Ottawa Valley in the east (p. 114).[20] After outlining examples comparable to those given by Joos, Chambers proposes the following formalization of the CR rule, which he presents as Example 3 (p. 116):

Canadian Raising

$$\text{a. } \begin{bmatrix} \text{V} \\ \text{+tense} \end{bmatrix} \rightarrow \text{[-low]/\_\_\_\_\_GLIDE} \begin{bmatrix} \text{C} \\ \text{-voice} \end{bmatrix}$$

In addition to proposing this formal notation of the rule, Chambers notes that this raising operates strictly within word boundaries for all speakers but he does note some "inexplicable" distinctions. One of Chambers' speakers raised *high school* consistently, but many others produced multiple variants.[21] Additionally, four speakers did not raise *cyclops*, which should trigger raising biased on this proposed rule.

Chambers then turns his attention to the rule order issue which Joos categorized as Group A and B. Building off these divisions, Chambers provides the three rules potentially impacting the state of raising in Canada: voicing, shortening, and CR. His rule on voicing can be simplified to /t/ becomes voiced [d] in between a stressed and unstressed vowel in SCE.[22] The second rule, shortening, occurs when a vowel precedes a voiceless consonant, even if there is a glide between the two sounds. The ordering of these three rules is crucial in defining Group A and Group B, which Chambers renames Dialect A and Dialect B.

[19] Gregg's transcription of TIE and TIGHT as [ae] and [əi], respectively, differs greatly from other scholars.

[20] Chambers (1979) cites evidence from Gregg (1957) as a rationale for including Vancouver within the heartland Canada dialect.

[21] How *high school* is categorized in this dissertation will be established in Chapter 5.

[22] Chambers notes that in this environment, many American English dialects produce a flap which does not occur in SCE. He does provide examples of flapping in SCE, but those pertain to a nasal flap occurring when the consonant cluster [ɲt] occurs (p. 118).

Similar to Joos, Chambers explains that Dialect B has rule ordering which places CR after the voicing rule, noting that this order functionally ties CR to shortening, which is virtually identical in form, and noting that the order of these two rules is largely irrelevant. However, speakers of Dialect A have separated CR from shortening and the rules have undergone a re-ordering. The rationale Chambers provides for this re-ordering is one which begins exactly where Joos left off, apparent change over time. The public school age children in Joos' study where the most likely to utilize Dialect A. Three decades later, Chambers explains that Dialect A has become the predominant dialects and has spread throughout heartland Canada. The re-ordering of CR to a place before voicing is now the predominant ordering (pp. 117-24).

In addition to outlining rule ordering, Chambers explains that a single rule is insufficient to explain the state of CR in Canada. In his examples *bisexual/bicycle*, *citation/cite*, *psychology/psyche*, and *titanic/titan*, Chambers captures variation in vowel production, TIE in the former and TIGHT in the latter for each pair, which would not be explainable by a single rule alone. Considering these examples, Chambers proposes the following blocking condition: "[r]aising is blocked if and only if the low tense segment has non-primary stress AND is followed by a stressed syllable" (p. 127). Chambers revises his original rule for CR by adding this new blocking condition as part (b) in his Example 13, given below.

Canadian Raising (revised)

a. $\begin{bmatrix} \text{V} \\ \text{+tense} \end{bmatrix} \rightarrow \text{[-low]/\_\_\_\_\_GLIDE} \begin{bmatrix} \text{C} \\ \text{-voice} \end{bmatrix}$

b. CONDITIONING: (a) cannot apply if V < [1 stress] AND V' = [+stress], where V' is the following nucleus.

Chambers (1989) further elaborates on the blocking condition with respect to syllabification; however, as none of the tokens in this study trigger the blocking condition, further explanation is not necessary.

Avis (1973) mentions the allophonic distribution of TIGHT and HOUSE, following Chambers' initial description of raising without the blocking condition, but presents another interesting complication to the overall rule. He notes that raising seems to occur also in closed syllables where the following segment is a nasal sound, if and only if, the sound that follows is unvoiced. He mentions that it is possible that this style of raising also occurs if the segment after the vowel is a liquid. He provides the example *pint*, transcribed with TIGHT counter to *mound* transcribed with COW as an example of this (p. 64).[23] Chambers (1975) mentions raised pronunciation of *night* in the speech of a 90-year-old

[23] This environment was not specifically coded for in this analysis and is still categorized as TIE.

man from the Ottawa valley. Walker (1975) notes this same phenomenon occurring in his own speech. He presents another potential area of variation in raising, citing raised variants before rhotics in *pirate* and *Pyrex*; however, he notes this occurs to a lesser extent than raising before nasals and liquids which occur before voiceless sounds (p. 130).[24]

[24] This environment was not coded for in this analysis due to the removal of all tokens which were pre-rhotic.

Chambers (1980) re-examines the state of raising in Toronto due to the influence of an apparent change in progress occurring in the speech of younger speakers in each city, mainly the fronting of COW and HOUSE. He establishes a fronting index which measures impressionistic categorization of tokens as either back, central, or front. Furthermore, he establishes a similar raising index, which categorizes tokens as either raised or upraised. In Northern Toronto he finds that fronting is age-graded and sex-graded, with the youngest speakers (12-year-olds) fronting to the greatest degree and females surpassing males in value. This fronting is not entirely distinct from raising, as there is seemingly direct interaction between the two rules, as fronting is favored in the elsewhere environment. Chambers and Hardiwck (1986) utilize the fronting index to compare Chamber's Toronto results with Vancouver. They find the main difference between cities pertains to the degree of non-raising, where the youngest speakers from Vancouver did not raise HOUSE, with females far surpassing males in this change.[25] The rationale provided for this change in progress of non-raising is a potential Americanization of the vowels of the youngest speakers. This is supported by increased usage of American lexical items and exposure to American media (pp. 42-3). Davison (1987) presents similar results when comparing both cities with Victoria with respect to age and sex, but notes that Victoria shows little to no change in fronting when environment is considered in the speech of the youngest female group, where fronting is prevalent (pp. 117-8). Hung (1987) carried out a similar analysis on the state of raising in Montreal, Quebec finding a lack of uniformity similar to that seen in Toronto, Vancouver, and Victoria. Hung's Montreal speakers seem to produce a more centralized nucleus in COW and HOUSE; however, Hung finds no age or sex-grading, nor does style seem to impact fronting index values. The results of each of these individual studies are compiled in Hung et al. (1993).

[25] Chambers and Hardiwck describe a competing change where the vowel is rounded, transcribed as [ow] which is most prevalent for the younger male speakers in Vancouver, possibly explaining the sex-grading seen there (p. 38).

While these studies suggest that HOUSE raising might potentially be replaced with the usage of a low fronted variant, at least in Vancouver, Gregg's (1992) Survey of Vancouver English (SVEN) seems to dispel that notion immediately. In analyzing TIGHT and HOUSE he finds extreme uniformity towards a preference for raising in Vancouver. 94% of his SVEN speakers produced TIGHT tokens when the vowel preceding a voiceless consonant, with 90% doing so before voiced /t/ followed by a vowel. The percentages were very comparable for HOUSE, with 93% and 94%, respectively. Furthermore, the percentage of raising never dropped below 80% in any metric, leading Gregg to assert, "[t]hese Canadian markers are NOT on their way out. It is also obvious that they are evenly distributed throughout the population: there is no particular correlation with age, sex, or socioeconomic status of the speaker, or for that matter with the various speech styles" (pp. 259-60).

Kinloch and Ismail (1993) expanded the eastern border for raising into Fredericton, New Brunswick showing that 76% of speakers raised HOUSE to a mid level before voiceless consonants, with the remaing 24% raising above the traditional low vowel to what they describe as "Upper Low."[26] Age and level of education are both significant for HOUSE raising in Fredericton with teenagers raising to the mid level more than adults, and those without university education raising more than those with it (pp. 109-10). Overall, Kinloch and Ismail show that raising occurs outside of heartland Canada as well. This early research of CR throughout Canada seems to show a great deal of uniformity throughout the majority of Canada. While there are instances of regional variation, and some disagreement upon the future of raising, it is clear throughout this era of work that raising is a commonly contested aspect of the notion of SCE.

[26] According to Kinloch and Ismail, the upper low vowels include [æ] and [ɐ] which are distinct from the lower low vowels, [a], [ɑ], and [ɒ].

3.2.2 The Modern State of Raising in Canada

More recent research on CR has dropped impressionistic categorization in favor of acoustic analysis. This shift has been crucial in better understanding the degree of difference between allophones involved in raising and allowed deeper insight into potential variation occurring. *ANAE* establishes a quantifiable phonetic difference between raised and unraised variants of greater than 60 Hz between F1 values, with the measurement being taken at the established nucleus, or largest F1 value before any upglide begins. Labov et al. (2006) do note that CR is not entirely consistent throughout Canada, and regional variation does divide the map. They include Alberta, Manitoba, Ontario, and Saskatchewan within a single isogloss where speakers raised both TIGHT and HOUSE surpassing the 60 Hz F1 benchmark. There are individual speakers outside of these provinces who also align with this benchmark, specifically in Quebec and Nova Scotia, but they were not included within the isogloss. Additionally, speakers from Montreal and Vancouver raised HOUSE but not TIGHT. Due to this, Labov et al. classify CR as "a widespread feature of Canadian English [...] but not uniform enough to serve as a defining feature of the dialect of Canada" (p. 221). Furthermore, *ANAE* provides an additional benchmark pertaining to the fronting of COW where F2 values are expected to be less than 1,550 Hz. However, this benchmark appears to only be consistently met within "Inland

Canada," a smaller region than the heartland Canada described by Chambers, which only includes, Alberta, Manitoba, Saskatchewan, and Western Ontario. It is also within this Inland Canada region where COW F2 values are lower than TIE values. Outside of Inland Canada, specifically the Atlantic provinces, British Columbia, Eastern Ontario, and Quebec, the opposite holds true, and TIE F2 values are expected to be lower.

Using an inter-regional mean of 86 participants from eight Canadian regions, Boberg (2008, 2010) shows that a 60 Hz difference benchmark between variants does not accurately capture the raising occurring throughout most of Canada for both variants. His SCE speakers produce differences of 110 Hz between TIE and TIGHT and 142 Hz between COW and HOUSE. Before moving on, it is worth noting that Boberg codes for an additional allophone that is not included within *ANAE*, namely DOWN which occurs when the diphthong is preceding a nasal. In this environment he finds that raising is less prevalent where the difference between DOWN and HOUSE is only 85 Hz; however, this is still greater than the 60 Hz benchmark. Furthermore, Boberg provides a description of how uniform CR is throughout the different regions of Canada adding that 88% of the PCE speakers produce COW/HOUSE differences of 50 Hz or greater, while 84% did so with TIE/TIGHT. 92% of speakers produce a difference of 50 Hz or more when comparing F2 values for TIE/TIGHT (p. 139). The *ANAE* benchmarks for raising and Boberg's mean formant values for all variants can be seen in Table 3.2.

Table 3.2: Canadian Raising *ANAE* benchmarks paired with *ELC* mean formant values

	ANAE Benchmarks		*ELC Data*	
Vowel	*F1*	*F2*	*F1*	*F2*
TIE			843	1,428
TIGHT	< TIE - 60		**733**	1,657
COW		< 1,550	874	1,604
DOWN			817	1,838
HOUSE	< COW - 60		**732**	1,692

In analyzing the regional variation of HOUSE, Boberg finds that only Newfoundland failed to reach the 60 Hz benchmark, with a mean difference of only 37 Hz; however, this is potentially skewed as three of the six speakers from Newfoundland produce differences above 50 Hz, while the other three do not. The Prairies (Alberta, Manitoba, and Saskatchewan, also referred to as Inland Canada by *ANAE*) and Southern Ontario produced the largest COW/HOUSE differences at 168 Hz and 176 Hz, respectively. The degree of fronting of HOUSE largely differentiates these regions though. In fact, all Ontario regions (Eastern Ontario, Southern Ontario, and Toronto) produce the largest HOUSE F2 values ranging from 1,747 Hz to 1,760 Hz. The only region outside of Ontario which is comparable is Newfoundland. Overall, Boberg's analysis of the regional effect on CR shows that, while there are points of divergence, specifically with fronting, raising is largely expected to occur throughout the country.

In *ELC*, Boberg compares his PCE data to the additional *ANE* benchmarks for COW fronting. Although the F1 values for all variants all align with and arguably far surpass the raising benchmark, F2 values present a very different story for fronting. The mean COW F2 value for PCE speakers is 1,604 Hz, which being greater than 1,550 Hz, fails to align with the conservative COW F2 benchmark for Inland Canada. Boberg adds that this result patterns Canada more closely with the American North and West (Boberg, 2010, p. 145). Boberg describes a second key finding which refutes *ANAE* classification for Inland Canada as only three of his 86 PCE speakers have COW F2 value which are greater than their corresponding TIE values. According to the *ANAE* speakers from the Prairies should do so, but only one of the three PCE speakers is from Manitoba while the other two are from Montreal and Toronto. This patterns SCE more with the American Midlands and South. Boberg presents these finding as indicative of a retracted TIE pronunciation (pp. 148-9). This TIE retraction, possibly paired with the fronting of COW and HOUSE results in all three variants having very similar F2 values ranging from 1,604 Hz to 1,692 Hz. He further notes that the fronting of COW in Toronto and Vancouver (Chambers & Hardwick, 1986), and also Montreal and Victoria (Hung et al., 1993) is most prevalent within his DOWN allophone when SCE is considered as a whole. The mean DOWN F2 values for PCE speakers is 1,838 Hz.

Sadlier-Brown's (2012) analysis of CR in Vancouver was one of the first to examine how it differed from Americans living in Washington. In the first portion of her study, she finds that raising is still prevalent in Vancouver. By using T-tests, she shows that 91% of Vancouver speakers produce TIE and TIGHT variants which differ to a statistically significant degree. Furthermore, 65% reach this distinction for COW and HOUSE variants, and this percentage increases to 78% when speakers with marginal difference are included. She notes that the non-raisers of HOUSE produce higher COW F1 values along with lower HOUSE F1 values prompting her to label these speakers as "weak raisers" (p. 537). Examining the studies of CR in the Unites States is vital to understanding where CR should be expected in regional dialects and additionally which of the four variants are expected in each of those dialects. Sadlier-Brown's results on fronting in Vancouver seem to confirm what Boberg observed throughout his PCE speakers. When comparing Vancouver to Washington State, Sadlier-Brown shows that the Americans met her criteria for raising, statically significant differences, but did not reach the same height in TIGHT and HOUSE. Swan (2017) also compares Vancouver to Washington state, focusing on Seattle, but with a larger sample size than Sadlier-Brown, for COW and HOUSE. She demonstrates that raising is not occurring in Seattle, at least with respect to HOUSE. While Swan's Vancouver speakers had a mean difference of 90 Hz between F1 values of COW and HOUSE, their Seattle counterparts have a mean difference of only 21 Hz. The degree of fronting of COW and HOUSE is comparable in both cities. Both Sadlier-Brown and Swan show that, although raising might be occurring in the United States, it does not seem to reach the same degree as what is seen in Canada, at least with respect to COW and HOUSE.

3.2.3 Canadian Raising in the United States

Similar to the LBMS, while CR is a key characteristic of SCE, the border does not act as a true isogloss. However, raising of TIGHT and HOUSE in the US does not seem to be as stable as it is in Canada. Numerous studies show that raising of TIGHT is occurring or has historically occurred throughout the US, while relatively few have included HOUSE raising. Kurath and McDavid (1961) is one of the first studies to examine raising in the United States. As part of a large-scale analysis of the Atlantic states, they provide vowel variants which likely correspond with four variants analyzed in this dissertation: TIE, TIGHT, COW, and HOUSE. They find usage of TIGHT and HOUSE occurring in three regions; however, the rules behind this usage differs. In Northern ENE and Upstate New York, the vowel nucleus is raised, similar to TIGHT in all environments, and therefore distinct from CR. Kurath and McDavid note that this raising appears to be changing in apparent time, with the unraised TIE becoming the predominant variant. The same is seen in Maine, Southern New Hampshire, Upstate New York, and the Chesapeake Bay for HOUSE, where the following segment does not dictate raising. However, these tokens of HOUSE are described as "relics." As one of the players in this study is from ENE, Kurath and McDavid's findings might become relevant to this analysis. However, it is important to note that this study predates the birth of any players in this dissertation by nearly 30 years, and subsequent studies have found new developments in ENE which will be discussed below. None of the players are from the southern regions that follow the typical rules for CR. The remaining two regions, Virginia and the surrounding areas of Maryland and South Carolina, and coastal Georgia, Florida, and South Carolina, are potentially more relevant to the history of raising in the United States as Kurath and McDavid establish that the rule at work is similar, if not identical, to that occurring in Canada. In these southern regions, raising to TIGHT and HOUSE is restricted to pre-voiceless conditions (pp. 109-11; Maps 26-29).

Any review of raising in the United States would be incomplete without including Labov's (1963) Martha's Vineyard study. While Labov documents Vineyardards who utilize centralized variants, TIGHT and HOUSE, largely in pre-voiceless environments; however, that is only one of three common categorizations of the island. It is his speakers who raise in all environments who complicate the picture of CR on the island, and suggest that it is possible that general raising is occurring instead of CR. Furthermore, as no players in this study come from Martha's Vineyard, the phonetics results of the study are not as important as the sociolinguistic results which will be discussed in further detail in Chapter 5.

Allen's (1973) *Atlas of the Upper Midwest* shows evidence of raising throughout Iowa, Minnesota, Nebraska, and North and South Dakota. While he does note a prevalence for TIE in most instances, he describes the distribution of TIGHT noting that it is "preponderantly Northern" and does not subscribe to the rules established for CR. Furthermore, he explains that the usage of TIGHT is on the rise in the region. Raising of HOUSE does occur, but largely in Minnesota and northern North Dakota. Similar to the usage of TIGHT, the tokens of HOUSE in Minnesota and North Dakota do not seem to be phonologically conditioned, differentiating the region from Canada (pp. 25-7). In a response to Vance (1987), which will be discussed below, Allen (1989) provides further insight into the lexical distribution of TIGHT and HOUSE for his Atlas data. Although Allen does not specify the degree of overlap between groups, 28[27] of his informants utilize TIGHT in *five* and *twice* tokens. If these groups are largely comprised of the same informants, then raising seems to be occurring regardless of phonological environment. Further rationale for this can be seen in the presence of TIGHT in *spider* and *wire* tokens in the speech of 12 and 26 informants, respectively, while 29 of informants raise *white* tokens. To a lesser extent, the same phenomenon can be seen for HOUSE raising. Eleven informants produce HOUSE in *mountain* tokens, while eight do so for *house* tokens and only three for *out* tokens. Overall, it seems likely that Allen's UM informants do not strictly align with CR in its entirety but do raise some tokens to TIGHT and HOUSE.

[27] As I am focusing on American informants, I have removed Allen's Canadian informants from this and all subsequent totals.

Vance (1987) cites raising, most notably TIGHT raising, in the speech of himself and his mother from Minnesota[28] and a high school friend from Rochester, New York. Vance notes that the distribution of TIGHT before voiceless consonants is "only approximate" in their speech, as there are numer-

[28] Vance notes that both he and his mother moved first to Bethesda, Maryland when he was 12 and two years later to Rochester, New York.

ous examples which are inexplicable by Chambers's CR rules. Similar to Chambers' (1973) curious cause of *high school*, all three speakers in Vance's analysis produce TIGHT in these tokens,[29] which violates the rules of CR, but seems to be somewhat common across the literature. Furthermore, all three speakers agreed that TIGHT occurs before /r/ in several tokens including *wire*, which Allen's data corroborates. However, Vance finds variation; as not all pre-rhotic tokens are raised, he provides examples where raising does not occur in tokens of *briar*, *friar*, *diary*, *gyrate*, and verbs which take the nominal *-er* suffix. Vance also notes instances of pre-voiced stop raising in *cider*, *idle*, and *spider*. When analyzed in tandem with Allen's *Linguistic Atlas of the Upper Midwest*, it appears that CR of *tight* is common within the UM and Rochester, New York, but it does not align closely with the rules established for SCE. Allen and Vance's results are key to this study, as three of the players are from the UM as defined by Allen and two are from cities close to Rochester.

[29] Vance adds that all three speakers also raise tokens of *high chair*. There were no *high chair* tokens in this analysis and therefore it was not necessary to code for this.

Expanding outward from Rochester to the larger IN region, the dialect region which encompasses Rochester and the rest of the Great Lakes area within *ANAE*, additional research has attested the presence of CR, or some form of raising, in numerous cities. Three studies, occurring within a couple years of each other, analyzed the state of CR in Southeastern Michigan, focusing on Detroit and Ann Arbor. Eckert's (1996) analysis of TIGHT raising in the speech of high school Jock and Burnouts in suburban Detroit shows an apparent effect of phonological environment. She finds that raising is most favored when the following is /r/ or a voiceless obstruent. The first of these environments aligns Detroit with the UM but the second more closely with Canada. Furthermore, she describes the effects of gender and social category on raising, with females raising more than males to a statically significant degree. Social category alone is not significant on raising. When what Eckert describes as "extreme raising" is isolated, the difference between female and male speakers is only exacerbated, and social category becomes significant. When gender and social category are both considered, the female burnout group is where the most extreme raising occurs (pp. 52-5).

Similarly, Niedzielski's (1996) article on Detroit attempts to judge the positioning of TIGHT and HOUSE tokens in reference to the low BOT and mid BUT. She categorizes those who predominantly have TIGHT and HOUSE closer to BUT as "pronounced" raisers. Those with less than half, but more than two, of these tokens were categorized as having some raising and those with less than two raised tokens were categorized as marginal raiser. Her results show that "pronounced" TIGHT and HOUSE raising is more common in female speech, with all but two of 14 female speakers being in this category, than male speech, where only six of 16 qualify. Niedzielski also captures the impact of education on TIGHT raising, where those who did not attend college all are pronounced raisers. Four speakers with some college and eight speakers with college degrees were marginal or had some raising. Her results suggest that raising is most common for those without college education; however, six speakers from both groups, some college and college degrees, also were pronounced raisers (pp. 75-9). Another key takeaway from her study impacts the degree of fronting present in Detroit. She finds a point of deviance with CR and fronting as described by Chambers (1989), as her Detroit speakers do not exhibit any fronting of either TIGHT or HOUSE and potentially are more similar to an older iteration of CR in Canada (p. 83).

Dailey-O'Cain (1997) includes an analysis of both TIGHT and HOUSE raising in Ann Arbor, a college town of over 100,000 people roughly 50 miles from Detroit. She finds that 95.5% of pre-voiceless and 91.4% of underlying pre-voiceless flap are TIGHT in Ann Arbor, showing strict adherence to CR. Dailey-O'Cain codes for the environment of pre-nasal voiceless consonant cluster, finding that raising occurs here as well in 50% of tokens which is not novel as it is documented by Avis (1973) as occurring in SCE. Additionally, Dailey-O'Cain's results suggest that Ann Arbor adheres to the blocking condition, further aligning Ann Arbor with SCE at least with respect to TIGHT raising. However, a difference between dialects occurs in the pre-rhotic environment. Dailey-O'Cain's findings corroborate those of Eckert as 56.6% of pre-rhotic tokens are also raised, which is not expected in SCE. Further separation between Ann Arbor and SCE can be seen in HOUSE raising. While it is not entirely absent from the data, only 9.5% of pre-voiceless tokens are raised in Dailey-O'Cain's data. This percentage drops further to 6.8% when tokens occur before the underlyingly voiceless flap. While TIGHT raising in Ann Arbor is somewhat uniform, HOUSE raising is impacted by age and gender. Female speakers are more likely to raise pre-voiceless HOUSE tokens than males; however, younger speakers, males included, are more likely to raise than older speakers. All the players in this study are younger than Dailey-O'Cain's informants. If this is a change in progress, then it is possible that the chances of HOUSE raising occur to be higher than what is documented by Dailey-O'Cain. The studies by Dailey-O'Cain, Eckert, and Niedzielski studies all demonstrate that it is likely that TIGHT raising will be present in the speech of any players from Michigan. Furthermore, the studies show that while it is not as likely that HOUSE raising will be observed, it has been attested in the state, and is therefore possible.

ANAE also touches on the state of CR in the United States and helps expand the areas where TIGHT raising is expected. Map 14.10 (p. 210) contains an isogloss for speakers who raise TIGHT resulting in a difference of at least 60 Hz between F1 values with TIE. Included within the isogloss are both regions described above; the IN (Michigan, New York State, and Wisconsin, along with Northern Illinois, Indiana, and Ohio) and the UM excluding Nebraska (the entirety of Minnesota and North Dakota as well as Northern Iowa and South Dakota). However, their isogloss includes Eastern and Western Pennsylvania and also Eastern and Western New England along with a small portion of the MA. This isogloss contains all the hometowns of the players in this study with the exception of two who are both from the West. If this analysis holds true, at least 18 of the 20 players should not only raise TIGHT, but also surpass the 60 Hz benchmark between corresponding F1 values. Labov et al. (2006) note that "the parallel Canadian raising of /aw/, a stereotype of Canadian English, does not extend across the border to the Northern area of the U.S." (p. 206). This would suggest that none of the players should raise HOUSE; however, other studies, like Dailey-O'Cain's show that it is still a possibility.

ANAE analyzes a second relevant aspect of CR in the United States based upon the relative advancement of TIE and COW. Labov et al. create an isogloss (Map 12.5, p.161) capturing the region where COW F2 values are lesser than TIE F2 values indicating a more fronted pronunciation of the latter. Their isogloss for this feature, which they call the AWY line, includes the ENE, IN, and the UM. Furthermore, a second isogloss which is bundled with the AWY line suggests speakers are expected to have COW F2 values which are less than 1,500 Hz. The regions outside of this isogloss include MA, WPA, and the West. Players from these regions are not only expected to have TIE F2 values which are greater than COW, but all of these values should also be greater than 1,500 Hz. The AWY line and the 1,500 Hz benchmark for COW could present as interesting dividing factors between players. While the majority are from within the AWY line isogloss, there are a handful who are not. Uniform F2 results throughout all the players would point towards non-regional influence on their speech.

In *ELC*, Boberg's PCE study incorporates some American students to compare aspects of SCE with different American regional dialects. Thirteen students are organized into three different regions taken from *ANAE* for the purpose of comparison with Canada, ENE, the IN (both of which correspond to the regions as described earlier in this chapter) and a combination region of the Midland-Midwest and West. Boberg's results show that raising to some degree is present in all three of these regions. In ENE, the average difference in TIE and TIGHT F1 values is 141 Hz, which far surpasses the 110 Hz difference seen in Canada. Furthermore, Boberg finds HOUSE raising here, which eclipses the

ANAE benchmark of 60 Hz, where the difference in F1 values is 110 Hz. The corresponding Canadian difference is 142 Hz, so ENE speakers exhibit HOUSE raising, but to a lesser extent than that attested in Canada and therefore might not sound Canadian even though raising is present. A single player in this study is from ENE. Thus, it is possible that he will raise all expected variants to the degree described by *ANAE*, and it is entirely explainable by regional dialect alone and not the influence of hockey.

The second largest raising differentials are seen in the IN, where the average TIE/TIGHT F1 difference is 126 Hz, also greater than Canada. However, the average COW/HOUSE difference is only 46 Hz. This lower difference could potentially point towards a lack of uniformity in raising for the region, where some raise while others do not, or it is possibly indicative of slight raising. Boberg's results suggest that it is possible to expand the Michigan and New York state findings on raise to the larger region. While there are many players from these two states in this study, it is important to establish that raising is occurring throughout the region, as there are players from the other states in the IN in this study as well. It is likely that they raise TIGHT and this is explicable by regional dialect. What cannot be entirely attributed to regional dialect would be large scale uniform raising of HOUSE. If this is present in the data, this would lead to questions of the strength of regional influence alone.

In Boberg's third group, the Midland-Midwest and West, raising is less extreme than all other regions. The Average TIE/TIGHT F1 difference still surpasses the *ANAE* benchmark at 86 Hz, but the COW/HOUSE F1 difference for the region is only 25 Hz (155). While there are only two players from the West, it is nevertheless important to establish that raising is occurring here. Boberg's results show that it is possible that TIGHT raising will be observed, likely to a lesser extent than in the other regions, but also that HOUSE raising is unlikely. If either player is raising HOUSE an alternate explanation will be required to explain the variation.

3.3 Monophthongal FACE and GOAT

The final variable analyzed in this paper involves the articulation of diphthongs FACE and GOAT, as peripheral and approaching monophthongal in form. Both vowels are said to be resisting any centralization in F2 values, retraction for FACE or fronting for GOAT, retaining positions towards the periphery of front and back of the vowel space. Furthermore, minimal upgliding is expected in F1 values leading to more monophthongal realizations. As many American regional dialects are experiencing these processes, this presents a point of divergence between SCE and other regional American Englishes.

3.3.1 Monophthongal FACE and GOAT in Canada

Unlike the previous two linguistic variables, monophthongal FACE and GOAT in SCE do not appear to be as extensively studied. However, a few of the previously cited studies do include a note on this variation. Gregg (1957) categorizes both FACE and GOAT in Vancouver as diphthongal; however, he adds that the upglide in both is "relatively faint" (p. 21). Drysdale (1959) notes that a similar situation occurs in Newfoundland, where the upglide is "occasionally not heard at all" (p. 34). Lehn's (1959) analysis of Saskatchewan mentions the existence of monophthongal GOAT but seems to restrict the usage within two tokens, "so long" and "gonna." He does not provide any instances of monophthongal FACE. Furthermore, diphthongal GOAT variant does not seem to be nearly as restricted (pp. 92-4). *ANAE* again provides a benchmark for FACE and GOAT, but only in the F2 dimension. According to Labov et al., F2 values for SCE FACE tokens should be greater than 2,200 Hz. Additionally, F2 values for GOAT are expected to be less than 1,100 Hz. However, excepted F1 values are not provided, and there is no further explanation other than "approaching monophthongal" (pp. 223-4). The isoglosses provided for both benchmarks are close but do not run identical to each other. Inside the isogloss for FACE F2 values greater than 2,200 Hz are the major cities of Alberta, Manitoba, and Saskatchewan. Ontario is divided by this isogloss, as Western Ontario towns such as Thunder Bay and Sault Ste. Marie are within, while London, Ottawa, Toronto, and Windsor are not. The isogloss for GOAT F2 values being less than 1,100 Hz is larger including the bulk of Ontario with the only exceptions being London and Windsor. Both isoglosses exclude portions of coastal Canada, suggesting more centralized vowels in those provinces, including British Columbia, Montreal, Newfoundland and Labrador, and Nova Scotia.

Boberg's (2008, 2010) PCE data offers more precise measurements with respect to these benchmarks and SCE while also providing some of the formant values which were not provided in *ANAE*. Specifically, Boberg's data in *ELC* helps establish the position of both FACE and GOAT for SCE within the vowel space. The *ANAE* benchmarks for the high-mid vowels and Boberg's mean formant values can be found in Table 3.3.

Looking first at how his data conforms to the benchmarks provided, the PCE speakers fall just short for FACE. The difference between Boberg's mean FACE F2 value and *ANAE* benchmark is negligible though as it is only 2 Hz. Regional influences seem to factor into why this benchmark has not been met

Table 3.3: High-mid vowel *ANAE* benchmarks paired with *ELC* mean formant values

	ANAE Benchmarks		*ELC Data*	
Vowel	*F1*	*F2*	*F1*	*F2*
FACE		> 2,200	571	2,198
GOAT		< 1,100	608	1,291

for by Boberg's SCE speakers. He suggests that the *ANAE* isogloss is potentially too expansive, as the mean F2 values for the Prairies (Alberta, Manitoba, northwestern Ontario and Saskatchewan) is 2,263 Hz, surpassing the benchmark. While Labov et al. did exclude a portion of Ontario from their isogloss, specifically London and Windsor, it seems the PCE data shows Ottawa and Toronto should be excluded as Eastern Ontario is exhibiting slight centralization when compared to the Prairies (Boberg, 2008, p. 141). However, even this centralization FACE is relatively minimal when compared to the American Midland and South, leading Boberg to still categorize FACE as peripheral for SCE (Boberg, 2010, p. 148).

The *ANAE* benchmark for expected GOAT F2 values proves to be more problematic for SCE as it is not satisfied, nor are the two values close. Boberg provides a rationale for this difference of nearly 200 Hz from the benchmark, noting that the *ANAE* data is mostly from spontaneous speech where speakers produce fewer post-coronal and syllable final tokens, which are more likely to undergo centralization of the nucleus (Boberg, 2010, p. 148). For GOAT, Boberg does not find a significant impact of region, but does single out two regions were F2 values surpass 1,300 Hz, Ontario and British Columbia. Toronto exhibits the greatest GOAT fronting with a mean F2 value of 1,352 Hz, with Eastern Ontario and British Columbia just behind at 1,350 Hz and 1,337 Hz, respectively. Again, the Prairies are the most peripheral; however, GOAT F2 values still fail to reach the benchmark with a mean value of 1,227 Hz (Boberg, 2010, pp. 204–9). Overall, Boberg's PCE data shows that the original *ANAE* benchmarks are potentially too restrictive to be applied to a SCE but are still applicable to certain regional dialects.

Boberg (2010) also provides mean F1 values for both vowels. The interregional mean FACE F1 value for the PCE speakers if 571 Hz and the mean GOAT F1 value is 608 Hz (p. 145) While this does not provide any more insight into the status as "approaching monophthongal," it does provide a point of reference for where these vowels should be in the vowel space. Additional measurements, which will be explained in Chapter 5 of this dissertation, will be used to capture the degree of monophthongization in players' speech. What the *ANAE* benchmarks and Boberg's PCE data provide are points of reference for impressionistic comparison which will be key in establishing if the players are producing Canadian like vowels with respect to height and advancement.

3.3.2 Monophthongal FACE and GOAT in the United States

Similar to the LBMS, and CR, monophthongal high-mid vowels are not entirely confined to SCE and have been attested historically in the United States. Kurath and McDavid (1961) are the first to mention that monophthongal variants of FACE and GOAT occur regularly in the low country of South Carolina, coastal Georgia and Florida, eastern Virginia and the southern tip of Maryland (p. 106). Furthermore, they noted that this monophthongization was a"Germanism" occurring in Eastern Pennsylvania. However, their early data is not entirely relevant to this study as none of the players are from these regions.

According to Allen (1973), this same process is occurring throughout the UM. Allen describes the variants being used in the region, noting that only two realizations of GOAT were observed; a "monophthongal [o] and an upgliding diphthongal [oʊ]" (pp. 22-3). Looking specifically at Minnesota speakers, his data shows a distinction between the vowel realization in open position, preceding a voiced consonant, and preceding a voiceless consonant. The full diphthong occurred 51% of the time in *ago*, while a monophthong occurred 47% of the time in *coat*. The similarity of these percentages suggests both variants are equally accepted in the UM. Additionally, Allen transcribes some realizations as [oo^] where a very slight tongue movement produces a reduced offglide. This variant occurred 66% of the time in road. For GOAT, Allen notes a monophthongal variant as being widespread in the region along with the more standard upgliding diphthong. Monophthongal FACE is favored in his data in short stressed initial syllables such as in the word *April* (p. 22); however, more specific statistics for its usage were not provided.

Thomas (2001) re-examines the UM, including western Wisconsin within the region, and argues that the monophthongization of the high-mid vowels is largely related to the German and Scandinavian influence from the regions' initial European settlers (p. 72). Prunell, Raimy, and Salmons (2017) present further data that monophthongization is occurring in a very similar manner in Wisconsin and offer further insight into the historical development. Due to the findings of these studies, the analysis presented in this dissertation includes Wisconsin as part of the UM region. In total, five players in this study are from the UM. Based off of this previous research, it is possible that these players utilize more monophthongal FACE and GOAT tokens due to influence from their own regional dialect. However, outside of the UM monophthongal high-mid vowels are not widely attested in the United States and are largely understudied. Considering that 15 players are from regions where little to no research on monophthongization has occurred, it is far less likely for any monophthongal FACE and GOAT tokens to be applicable to regional dialect alone.

Monophthongization is not the only aspect being studied with respect to FACE and goat as these vowels are peripheral in SCE, but experiencing centralization in many American regional dialects. However, there is an area of overlap between the United States and Canada highlighted in *ANAE* based on the peripheral back position of GOAT. Labov et al. note that "a mean F2 less than 1200 Hz is a defining variable of the North, the West, and Canada" (p. 143). Labov et al. include both the IN and the UM within the North in this categorization. More specifically, they establish the mean F2 in the North and Canada to be approaching 1,100 Hz, the same value given as the benchmark for SCE GOAT F2 values. Comparatively, ENE does not exhibit much more fronting, with F2 values ranging between 1,100 – 1,200 Hz. The West has mean F2 values around 1,200 Hz. These values suggest that ENE, the IN, the UM, and the West align somewhat closely with Canada when it comes to the backed position of GOAT, meaning it is plausible for the vast majority of the players in this study to produce peripheral GOAT tokens and have it be explicable by their regional dialect. The players from other regions which exhibit more fronting–the MA and WPA–are expected to have a mean F2 value between roughly 1,400 – 1,500 Hz.

While most of the players should exhibit peripheral GOAT tokens, only those from the UM are expected to approach monophthongal tokens. Furthermore, the status of a peripheral FACE is not linked to US regional dialects to the same degree as GOAT is and therefore even less likely to be explicable by regional dialect. F1 and F2 values that are trending more towards SCE values and away from the expected American regional values will need to be examined in greater detail. If regional dialect cannot explain the presence of SCE variables in the players' speech, I suggest that their involvement with the sport offers a viable alternative.

3.4 Summary

While the LBMS, CR, and monophthongal FACE and GOAT have been attested in certain regional American English dialects, the combinations of all three variables differentiates SCE from other dialects. Furthermore, the presence of each individual SCE variable is not consistent throughout different American regions. The LBMS has been attested in the West and seems to be advancing throughout the country in real time, but it is not uniform across regions. This lack of uniformity is even more extreme for Canadian raising, where multiple regions have demonstrated TIGHT raising, but HOUSE raising has been more restricted to ENE, the IN, and the UM. Monophthongal FACE and GOAT are perhaps the most restricted of the variables of study, as they have only been attested in the UM.

The UM is the only region where multiple SCE have been attested outside of Canada. As this dissertation hypothesizes that these variables will be present in the speech of all hockey players, including those not from the UM, then the presence of these variables cannot be linked to regional dialect alone. To test this hypothesis, it is important to establish quantifiable measurements of each of these variables to test for their presence in the players' speech. These measurements will then be used to analyze how players compare to SCE speakers, as well as each other.

Chapter 4

Indexicality

"You wanna sound like a hockey player. Canadians, they sound like hockey players." — Jackman

In this chapter I highlight the relevant literature on indexicality and indexical fields, before turning my focus to studies which capture both in various speech communities. Additionally, I establish how indexicality could serve as a viable rationale for the usage of the SCE variables by the players outlined in the previous chapter. If regional dialect cannot explain the presence of these variables, a secondary avenue must be explored. Accommodation would be another possible explanation, but this is unlikely as Canadian players no longer outnumber Americans to a large degree in the professional leagues and Americans comprised the vast majority of the rosters for the four teams included in this dissertation. This shift towards more American rosters makes accommodation a less likely explanation for the potential adoption of SCE variables. Instead, I argue indexicality more adequately explains the any presence of SCE variables. Using this framework, it is possible to explain how the SCE variables can be reanalyzed as indexing a hockey-based persona available for usage by the players in this study and subsequently all non-Canadian born hockey players.

I continue by presenting the previous research on indexicality, specifically highlighting the relationship between sociolinguistic variables and indexical values. I then cover the importance of the indexical field in establishing how multiple values can be indexed with a linguistic variable. I then shift focus to the indexical value already present and linked to SCE variables. I conclude the chapter by establishing how the variables being studied here have potentially been re-interpreted to index a hockey-based linguistic persona which players can to use to identify themselves as hockey players and members within the hockey community.

4.1 Establishing Indexicality

The framework for the indexicality is first established in its entirety by Silverstein (2003); however, he notes the presence of previous theories which align in some ways with his own analysis. Following his lead, it is important to begin with three previous studies which lay the groundwork for the current approach to indexicality.

Gumperz's (1968, pp. 383-4) distinction between *dialectal* and *superposed* variation predates Silverstein's notion of indexicality but aligns with core components of the theory. Gumperz describes his *dialectal* variation as similar to the contemporary regional or social dialect, noting that these are differences in the linguistic performance of groups who share a "broader culture."[30] The usage of one of these dialects would then be indicative of membership within the larger group which uses that dialect. *Superposed* variation, on the other hand, focuses on the speech used within an individual group, highlighting variation based on the context of speech usage. Due to this importance of context, speakers in a group are expected to command numerous *superposed* variants alternating based on appropriateness and position within the group. In summary, dialectal variation accounts for interspeaker variation while superposed variation accounts for intraspeaker variation.

[30] Gumperz adds that these dialects do not need to be within the same language, but rather can be based on the relationship between a majority and minority language or between various languages in a setting of language contact.

Labov (1971, pp. 192-206) argues for the existence of three categorizations of linguistic variation: *indicators, markers,* and *stereotypes*. According to Labov, sociolinguistic indicators are dialectal variants, regional or social, which are regularly distributed across social groups, used similarly by all speakers within the group in all speech contexts regardless of formality. Again, the usage of an indicator is indicative of membership within the group with which it is associated. The second categorization, markers, are linked to not only specific social distribution, but also show differences based on what Labov calls "style." Thus, markers are linked to social and stylistic differences. Labov (1971) provides an example of the linguistic marker of (th).[31] He describes the expected usage of the standard variant, the voiceless dental fricative [θ], and non-standard variants such as affricate [tθ] or stop [t] based on socio-economic class and "contextual style." Labov's analysis shows that those in the lower socioeconomic class (SEC) are most likely to use non-standard (th) variants, showing social difference. However, these speakers also adjust their usage of these variants across contextual style, decreasing in usage as the formality of style increases between casual and careful speech, reading style, and word lists, showing stylistic difference. It is the intersection of these differences which elevates (th) from indicator to marker. Labov notes a parallel marker of (dh) which corresponds to

[31] Labov (1972) provides another example of a sociolinguistic marker (ing).

the voiced dental fricative /ð/. The key distinction between linguistic markers and stereotypes involves the level of social consciousness. Markers are not the focus of metapragmatic discussion, while the value of stereotypes in marking a population is openly discussed. Labov notes that the transition from marker to stereotype seldom occurs. Labov argues that (dh) now functions as a stereotype, as people use phrases such as "one of 'dese, dem and dose guys"' (p. 200). This metapragmatic discussion of the marker is central to it becoming a stereotype.

Silverstein (2003) demonstrates how these previous frameworks of sociolinguistic variation correspond with his system of indexicality. Silverstein explains how Gumperz's *dialectal* roughly corresponds to his own *first order indexicality* as both index membership within a group based on linguistic performance. The existence of linguistic variation between dialects presents a potential instance for indexing membership of a speaker within a group. Based on the linguistic difference between dialects, speakers of a dialect differentiate themselves from those who do not use that dialect establishing a group. Any regional dialect represents a potential first-order index, where the speakers that use that regional dialect can be positioned together within that group. Silverstein highlights that this is equally similar to Labov's notion of indicator. In his definition of indicator, Labov introduces the idea that indicators can be used to index speaker membership within any group, expanding outside of the regional element addressed by Gumperz to include relevant sociological categories. Therefore, first-order indexicality does not need to be confined to just the regional dialect but is also applicable to social dialects. Silverstein highlights Labov's usage of socioeconomic class (SEC) to demonstrate how variation is present between the stratified classes. The expectation for the higher SEC to use more forms that belong to the standard variety captures the linguistic differences between classes and how this can index membership within or solidarity with a specific SEC. Due to the presence of linguistic variation, no matter the cause, variables can obtain indexical value, establishing *n-th order* value according to Silverstein. The notion of first-order value then captures the initial index with which the variable is linked.

After *n*-th order indexical value has been associated with linguistic variation, there is the possibility for the acquisition of additional indexical value. Silverstein refers to this as *n + 1st order indexicals* or *second-order indexicality*. This level of indexicality can correspond to Gumperz's superposed variability and Labov's markers. Silverstein explains that superposed variability is rooted in a "cultural expectation of alternation" (2003, p. 217) at the individual speaker level. As a dialectal, or first-order indexical, is already present for that speaker, then this expected alternation would create an *n* + 1st order value attributed to the context with which the speaker is trying to align. As the *n* is an established first-order in this scenario, superposed variation can be said to represent second-order indexicality. Labov's notion of marker differs slightly from superposed variation, but still aligns with the *n* + 1st order indexical. Labov's marker relies on the interaction of two dimensions of variation. The existence of variation based on SEC, which satisfies Silverstein's requirements for first-order indexicality, is only one of two dimensions of variation present for Labov's markers. In addition to this, speakers are expected to exhibit variation across different linguistic styles, although Silverstein uses the term "*register demands*" (2003, p. 218). As these register demands increase in level of formality – casual speech, careful speech, reading passage, word lists, minimal pairs – the level of conformity with a notion of standard variants in expect to rise. Due to this shift across register demands, a *n* + 1st order indexical can be outlined addressing the expectation for shift toward standard as formality increases. This again creates an instance where second-order indexicality can be used to explain the variation present within linguistic data, where *n* represents the variation attributed to SEC and the additional indexical value is accounting for register demand.

As Labov provides a third categorization for linguistic variation, Silverstein also addresses how indexicality handles the notion of stereotypes. The key difference between Labov's marker and stereotype involves the degree of social consciousness for the indexical value of variation. When metapragmatic discussion of the link between variation and indexed group occurs, that variation rises to the level of stereotype. For Silverstein, this shift from marker to stereotype is explainable as "consciously speaking 'like' some social type or personified image" (2003, p. 220). He adds that this is also a version of fully superposed variation following Gumperz's initial description. Using his own terminology, Silverstein assesses stereotypes as *n* + 1st order indexicals which have undergone a process of replacement of the initial *n*-th order-value. This process allows a new *n* + 1st order indexical value, now at the level of consciousness, where the indexical value is obvious and apparent. Usage of variants at this level of indexicality can explicitly link a speaker with a certain group. Indexicals at this level are occasionally referred to as *third-order indexicals*, building off of the notion of second- and first-order indexicality, but this obscures the fact that this process does not need to function in a linear order.

Throughout his work, Silverstein argues that it is always possible to reinterpret indexical value. If variation can acquire indexical value, this value can change as is evident with the notion of *n* + 1st order indexical value. While this can certainly take first-order indexicals and return second-order indexicals, it is also possible for this reinterpretation to involve the acquisition of differing indexical values entirely. Because of this, it is important to examine the status of variants that convey multiple indexical values. If players are utilizing SCE variants, it is likely that they have reinterpreted the indexical value and are not trying to represent themselves as members of a Canadian-based group, i.e., Canadians, but rather that these variants potentially have acquired additional indexical value indexing a hockey-based persona.

4.2 Indexicality and Sociolinguistic Variables

While the theory of indexicality as established by Silverstein was not fully established until the turn of the century, there were multiple studies which predate the theory but demonstrate the importance of indexicality to sociolinguitstics nonetheless. The first of these studies, and arguably the most influential in establishing the study of linguistic variation, is Labov's (1963) Martha's Vineyard study.

The presence of raised TIGHT and HOUSE[32] variants on the island could be viewed as a first-order index of the geographic location of Martha's Vineyard, but Labov's data suggests this does not fully capture the state of the variation. In analyzing raising, Labov captures variation across age, ethnicity, geography, and occupation. In most instances, raising is favored by those 31-45 years old, of English decent, living Up-Island, and Fishermen. Native Americans on the island raise HOUSE more than any other ethnic group, though. This internal variation suggests that an n + 1st order indexical value has been attributed to raising, one which spans numerous groups on the island. Labov is able to establish what this addition level of index is linked to by analyzing his speakers' desire to remain on Martha's Vineyard. Vineyarders who plan to stay on the island raise to a much higher degree than those who plan to leave. In other words, the degree to which a speaker associates with the island is indexed in their usage of raised variants. Labov notes that raising is highest in the Chilmark fishermen[33] who have come to be a reference group for others on the island, as they are a very close-knit group who represent an independent opposition to the mainland for the island. Those who plan on staying on the island and identify themselves as Vineyarders raise as they have associated the speech of the Fisherman with a sense of authority as Vineyarder and this speech is the most likely to include raised variants. In this sense, the n + 1st order indexical is linked to perceived value in the locality. Those who plan to stay do not raise to index membership as a fisherman but rather as a Vineyarder.

Trudgill (1972) presents another instance of indexicality, specifically involving levels of indexical value, in his analysis of Norwich, England. He shows

[32] I am using the keywords for the raised variants which are typically restricted to pre-voiceless environments in CR here although Labov's data does not conform to the rule for CR. While pre-voiceless tokens are favored for raising, this is not the only environment in which it occurs on Martha's Vineyard (1963, p. 290).

[33] Chilmark is a town on the up-island portion of Martha's Vineyard with a salt pond harbor for the island's fishermen which provides year-round access to Vineyard Sound and the Atlantic Ocean.

variable realization of (ing) is occurring in Norwich and can be tied to SEC. The standard variant, vowel and velar nasal /ɪŋ/, is socially stratified and more common in the middle class than the working class, with additional subdivisions in both classes of upper, middle, and lower. The working class produces more utterances of the non-standard variants /ən/ and /n̩/, with the most occurring in the lower working class. The variable production of (ing) represents a first-order index for social class, but Trudgill provides additional metrics capturing gender-based differences. Men, at almost every SEC and in each speech style, are more likely to use a non-standard variable than women. This then functions as an n + 1st order index capturing an element of masculinity.

Eckert's (1989, 2000) work at Belton High School in a suburb of Metro Detroit further establishes how regional variables can gain additional indexical value based on the social categorization and identity of students. In categorizing students at Belton High into two groups, *jocks* and *burnouts*, Eckert is able to evaluate how either group utilizes different variable aspects of the Northern Cities Vowel Shift (NCVS). In her analysis, Eckert separates the individual components of the shift into the older variables – BAT raising, and the fronting of BOT and BOUGHT – and newer variables – BUT backing or fronting and BET backing or lowering. Eckert includes TIE/TIGHT, not part of the NCVS, in her analysis as undergoing two different changes – monophthongization or raising and backing. Eckert finds that women lead men in usage of the older NCVS variables regardless of social category. This is most evident in BAT raising and BOT fronting. TIE/TIGHT monophthongization is more advanced in male speakers and represents the only variable in which men surpass women. The newer NCVS variables present a largely different scenario, where social category becomes the most important effect on usage. The burnouts present the greatest BET and BUT retraction, while the jocks exhibit contrary vowel movements, whereas BET is lowering and BUT is fronting towards a central position. BOUGHT fronting is at the intersection of gender and social category as both are relevant to usage but with gender having greater influence. TIE/TIGHT raising, but not monophthongization,[34] is similar with burnouts leading jocks and women surpassing men, but social category remains the primary effect.

[34] TIE/TIGHT monophthongization is comparable across social groups, but more common for the men.

Eckert notes that the older NCVS variables are largely stable across the region. Due to this, it is possible that these older variants index all of Metro Detroit, likely Michigan, and potentially the Inland North (IN) as a whole. The indexical value is largely limited to this regional aspect, and reinterpretation has not become prevalent. The newer NCVS variants are used increasingly in the more urban city center of Detroit and, therefore, have a different indexical value linked to the city. Eckert argues that the usage of these variable by the burnouts is not to index membership within the urban community of Detroit, but rather the burnouts identified more closely with the urban lifestyle. The newer NCVS variable present a first order index of urban Detroit, which allows for distinction and differentiation with suburban Metro Detroit. The Burnouts have likely reinterpreted the indexical value, creating an *n*th + 1st value indexing the urban values which they admire and wish to present. Within the Burnouts, Eckert describes a group of women that are extremely urban oriented which she calls the *burned-out* burnouts. These women surpass all other burnouts in use of NCVS variables, suggesting even greater indexing of urban values and persona creation. Their heightened use of the urban index variables complements their heightened orientation with urban Detroit. Eckert's work in Belton High demonstrates how locally indexed variables can be reinterpreted to construct distinct personae. The urban values which the burnouts admired manifest in their usage of urban indexing variables. Furthermore, this study shows how established regional variables can gain additional indexical value in their personae creation process.

Since Eckert's work in Belton High, many linguists have researched the role of indexicality in variation. Moore (2004) shows variation between two communities of practice, the "populars" and the ''townies," at Midland High in northwest England. The townies show increased use of nonstandard *were* and negative concord between 9th and 10th grade, while the populars show increased use in tag questions during the same period. Although the townies surpass the populars in use of the more-locally indexing variables, the populars still utilize them in their own speech. In doing so, they create a persona which does not index locality as closely as townies but does not entirely reject it as well. In his study of *dude*, Kiesling (2004) demonstrates the versatility of the word in indexing various stances explaining that *dude* can index a stance of effortlessness, while also indexing a specific form of masculinity which is close yet casual. White men can use *dude* to index this casual, effortlessness, masculine solidarity, which simultaneously indexing their heterosexuality. Podesva (2007) demonstrates that indexicality extends beyond both the phonetic and lexical levels, looking at the use of falsetto to create a "diva persona" within the larger gay identity of a speaker. Podesva's analysis shows heightened and less restricted usage of falsetto when his subject Heath is attending a barbeque with close friends. Furthermore, Heath utilizes creaky voice to expand his possible range of falsetto at the barbeque, which is not attested in his other speech styles. Falsetto can index expressiveness and additionally non-heterosexual behavior in the creation of a diva persona which Heath can use when he wants to do so. Johnstone and Keisling's (2008) analyzing of COW monophthongization in

"Pittsburghese" shows how a variable can function as a first- and third-order indexical without attening second-order status. Using a matched-guise test, they show that people from Pittsburgh who are aware of the monophthongal status of COW as a stereotype of Pittsburgh speech perceive the variable as indexing Pittsburgh speech, but often do not produce this variable in their own speech. Furthermore, those who do monophthongize, do not always perceive the variable in their own speech. This shows that COW monophthongization can function as a first-order index as it can define the speech of Pittsburgh and has also potentially rise to third-order status as its indexical value is part of the conscious knowledge of some speakers.

These studies demonstrate how different speech communities, larger regions, Martha's Vineyard and Pittsburgh, smaller communities of practice, jocks/burnouts and townies/populars, and even speaker internal categorization, heterosexual and homosexual, all incorporate indexical value in the process of displaying identity. While the level of indexical order may vary across these studies, they all show how the process of indexicality can introduce meaningful social distinction on linguistic variables which allows for the indexing of social groups based on linguistic performance. As any linguistic variable can gain indexical value, an *n*th order usage according to Silverstein, then it is possible that hockey players have attributed value to the SCE variables included in this dissertation. If this process has occurred, then these new values could index membership within the sport. However, for this to occur, it needs to be possible for a variable to carry multiple indexes, as players are likely not trying to show Canadian membership but rather hockey community membership.

4.3 Indexical Fields

In her analysis of variation and the indexical field, Eckert (2008a) provides examples of how Silverstein's framework explains the variation present in previous research, while also coining the term *indexical field* to account for the presence of multiple indexical values tied to single variants. This process creates an indexical field for the variables in question, where the association with a particular group, persona, meaning, etc. is no longer restricted, but rather a collection of possibilities.

Eckert uses Campbell-Kibler's (2007) analysis of (ing) to demonstrate the ability for a variable to carry differing indexical values creating an indexical field. Using a Matched Guise Technique to test listener reaction to differing speech, Campbell-Kibler's results show that there are multiple potential values associated with the use of a velar variant, [ŋ], versus the alveolar variant, [n], for (ing). By controlling the realization of the final segment as either alveolar or velar, Campbell-Kibler is able to elicit listener reaction to controlled but manipulated spontaneous speech. The speech comes from eight speakers, four from North Carolina and four from California with an equal distribution of men and women from each state. Three North Carolina speakers are commonly rated by Campbell-Kibler's informants as being Southern or less specifically from "the country." Her listeners assign the alveolar variant as being more likely to be used in this southern speech. Inversely, three of the Californians are judged as being from anywhere in the United States or "aregional." The velar variant is attributed to this group. Two speakers, one from each state did not pattern with the others from their region. Jason, from California, is largely perceived as from the city, followed by coastal United States, either East or West, and then anywhere. Unlike the other Californians, neither the velar or alveolar variant is seen as more appropriate for his speech. Ivan, from North Carolina, is perceived as from the West Coast or suburbs, but Campbell-Kibler suggest this is potentially due to him sounding "laid-back and like a stoner and a surfer" (p. 45). All of the Southerners are viewed as being less educated or from a lower income backgrounds.

Campbell-Kibler's listeners perceive the Southern speech as being more accented than all other speech. The alveolar variant increases the perceived degree of accent occurring for the Southerners and Southern speech. This regional aspect is relevant to perceived education level, as Southerners are rated as less educated than the other groups. Velar variant usage is associated with more educated speakers and alveolar variant with less educated. The same is seen for the value of articulateness, whereas the Southern accent and the alveolar variant are perceived as less articulate while other regions and the velar variants are more articulate. Additionally, the alveolar variant is associated with the "redneck" stereotype and is attributed to the southern accent and Southerners by the listeners in the study. Campbell-Kibler's data shows that listeners viewed the alveolar variant as indexing a Southern, country or rural, redneck identity, while the velar variant indexes a speaker from anywhere, potentially the East and West Coasts, or the city. However, the index regional value for each variant is not isolated as there appears to be additional value linked to articulateness as well.

Campbell-Kibler highlights another potential index for the velar variant, one which marks homosexuality, specifically in the speech of Jason. When Jason's speech contains velar variant tokens, he is perceived as gay by 63.5% of listeners, up from 36.5%[35] when alveolar variant tokens are used.[36] Because of this, it is not likely that the velar variant carries a larger indexical value as mark-

[35] No other speaker is perceived as gay by more than 8% of Campbell-Kibler's informants.

[36] She notes that this value is only attributed to Jason's velar variant tokens and not the tokens of other speakers.

ing homosexuality. Instead, it increases the perception of homosexuality in the speech of an individual who is already perceived as gay. Campbell-Kibler summarizes this data saying "Not only does Jason sound 'gay' to many listeners, but he is more likely to sound 'gay' when he uses *-ing*" (p. 50). These results show that indexical value is not entirely static, as there is a great degree of variation in perceived indexical value of both velar and alveolar (ing) variants. While the alveolar variant can index Southern speech and also enhance the degree of accent attributed to speakers who use it, there is also value linked to level of education as the alveolar variant is perceived as less educated. There is obviously overlap between these two notions, as Southern speech is also judged as less educated. Although the velar variant is perceived as aregional and more educated, when used in the speech of a perceived gay male, there is additional indexical value of homosexuality. At least in the speech of Jason according to her informants. Campbell-Kibler's research demonstrates that variables can and do hold differing indexical values. The indexical value perceived is often context dependent.

Eckert (2008a) uses Campbell-Kilber's work as a crucial example in explaining the notion of the indexical field. Campbell-Kilber's work demonstrates that (ing) simultaneously indexes multiple values that vary across speakers and contexts. In her article, Eckert introduces and defines the indexical cycle as follows:

> An indexical field is a constellation of meanings that are ideologically linked. As such, it is inseparable from the ideological field and can be seen as an embodiment of ideology in linguistic form. I emphasize here that this field is not a static structure, but at every moment a representation of a continuous process of reinterpretation [...] Variables have indexical fields rather than fixed meanings because speakers use variables not simply to reflect or reassert their particular pre-ordained place on the social map but to make ideological moves. The use of a variable is not simply an invocation of pre-exiting indexical value but an indexical claim which may either invoke pre-existing value or stake a claim to a new value. (p. 464)

The indexical field challenges the notion that values are fixed. As a result, the context of usage for a variable can be a relevant aspect in the value being indexed. In allowing the option for multiple meanings to co-exist, the pronunciation of (ing) is not simply used by a single group to denote a single value but usage can vary across populations indexing different values.

Building upon these values presented by Campbell-Kibler, Eckert further examines this indexical field for (ing), establishing four potential indexes, each in pairs where the use of the alveolar versus the velar variant carries the meaning. The velar variant indexes being educated, effortful, articulate or pretentious, and formal while the alveolar variant indexes uneducated, easygoing or lazy, inarticulate or unpretentious, and relaxed (p. 466). The values themselves are somewhat open to interpretation. While the alveolar variant is seen as being lazy, which carries negative connotation, it can also be perceived as being easygoing, a potentially desirable trait. Similarly, the velar variant might be perceived as articulate but also evokes pretentiousness. Both positive and negative value can be perceived for velar and alveolar variants. The meaning associated with the variants then is based on the context of the utterance. In establishing this indexical field, Eckert notes that the values being indexed will not be uniform as people, situations, and purposes differ. For (ing), the alveolar variant can be viewed as a first-order index for the South, although one which might vary according to context, but the usage of this variable to index other values in the field will differ across the South.

Eckert's indexical field allows for the presence of multiple values for a single variable which is crucial for the argument that SCE variables have been reinterpreted to now index a hockey-based persona. The research outlined in the previous chapter demonstrates that the Low-Back-Merger Shift (LBMS), Canadian raising (CR), and monophthongal high-mid vowels are attested in SCE. These variables differentiate SCE from other English dialects spoken in North America and have attained first-order indexical value linked with Canada. It is possible however that the larger indexical field has grown to include additional values such as that of being a hockey player.

4.4 The Perceived Indexical Value of "Oot" and "Aboot"

Before addressing how indexicality functions as a rationale for the presence of SCE variables in hockey players' speech, indexing an emerging hockey-based persona, it is important to evaluate the current indexical perception of said variables. Throughout the process of researching SCE variables and throughout my own personal experiences growing up in Metro Detroit, the metalinguistic awareness of CR and its function as a first-order indexical of Canadians in general must be addressed. Following the notions of indexicality, if CR has been reinterpreted as a third-order index, one which stereotypes Canadians specifically, then this could potentially be influencing the players' use of the variable.

Numerous studies suggest that CR has risen to the level of social consciousness, especially when it comes to American perception of this variable, equating a Labovian stereotype or Silversteins' third-order indexical. This assertion of raising as a stereotype can be traced back almost as far as the literature available on the variable itself. In Ayearst's (1939) analysis of CR, he includes a note about the American perception of raised variants, specifically when Canadians pronounce the word *out*. He states, "to the [American], the Canadian appears to say [uːt]" (pp. 231-2). Although Ayearst does not mention if HOUSE raising functions as a stereotype of Canadian speech, his example does provide evidence of conscious knowledge about the differences between SCE and American regional Englishes from an American perspective. Avis (1973, p. 64) describes a similar occurrence for tokens of *house*, which he explains non-Canadians incorrectly insist Canadians pronounce as [hus]. Avis's remarks suggest that it is not just Americans who are aware of CR, but rather all non-Canadian speakers of English. He does note that HOUSE raising is an "oft-remarked Canadian trait", even though it occurs in Northern England and Scottish English dialects.

Chambers (1973, p. 113) is the first to reference American perception of TIGHT raising in addition to HOUSE raising, providing example tokens of *wife* and *south* which he explains are often misheard by Americans as *weef* and *sooth*. While he does not provide a transcription for these mishearing, it is likely they are [wif] and [suθ], respectively. In a footnote, Chambers adds that this foreign misrepresentation of the raised variants undergoing raising has reached the conscious level, as a Canadian edition of *Time* magazine picked up a story from Long Island *Newsday* newspaper questioning the "strange" pronunciation of *out* as "oot" and *about* as "aboot" by a Canadian anchorman. This further builds upon both Ayearst's and Avis's examples in establishing the existence of non-Canadian metalinguistic awareness of Canadian speech. In a follow-up to this paper, Chamber and Hardwick (1986) address the status of raising as an index of Canadian English stating, "[t]he raised onset before voiceless consonants has been the most identifiable trait of [Canadian English], and the one that most readily distinguishes it from other varieties of [North American English]" (p. 28). This statement suggests that not only are non-Canadians aware of the presence of CR, but also that CR is a distinguishing variable of SCE. The fact that non-Canadian speakers have metalinguistic awareness of this variable constitutes raising as a stereotype of SCE.

The studies mentioned so far, all approach CR from a Canadian perspective, analyzing the state of the variable in Canada, while only mentioning the fact that it is largely viewed as indexing Canadian speech by Americans and other non-Canadians. Although Americans can understand the difference in Canadian and American speech which raising produces, they fail to capture the actual pronunciations of SCE speakers. However, it is this perceived extreme raising that is important when analyzing the indexical value of the stereotype for speakers from American regions in which raising has been historically attested as part of the dialect. Niedzielski (1996) presents an analysis of the production and perception of CR in Detroit. Her work is key in understanding not only the stereotypical value of raising, but also how it effects the speech of those who undergo CR themselves. Niedzielski shows that raising of both TIGHT and HOUSE is occurring in Detroit. Niedzielski quantifies raising as 'pronounced', more than half of potential tokens being raised, 'some', less than half but more than two tokens being raised, and 'marginal,' raising two or fewer tokens. The most pronounced raising is observed with women; 12 of 14 exhibit pronounced raising with the remaining two having some raising, although raising is still attested in the speech of the majority of men, six of whom have pronounced raising and seven some raising. When asked if there are differences between SCE and Detroit English, Niedzielski finds that all the women in her study believe that there are, while the men are evenly split down the middle. The men who claim to note differences often described the use of "eh" or lexical variants typically associated with British English as being Canadian. When asked specifically about pronunciation, only five men observe differences between the dialects, with the number dropping to two when asked about the pronunciation of *out* and *about*. Interestingly, Niedzielski notes that these two men are "avid hockey fans." While this is not a clear indication that all Detroit hockey fans, or all Detroit hockey players for that matter, perceive a difference between Detroit and Canadian *out* and *about*, it is fascinating that the only two men in her study who claim to perceive a distinction were associated with the sport. Furthermore, Niedzielski mentions that the vowel produced when imitating the Canadian pronunciation of *out* and *about* is most similar to [u], which corresponds with the previous examples of the Canadian stereotype.

Niedzielski (1999) further analyzes the influence of nationality on the perception of raising in Detroit. In her study, 41 Detroiters listened to the speech of a female speaker from Detroit, although half of the group was told that the speaker was from Windsor, Ontario, and were asked to categorize the vowel they heard. When the listeners were led to believe that the speakers was Canadian, 53% of HOUSE tokens are categorized as raised. However, if the speaker was labeled as a Detroiter, only 15% of tokens are categorized as raised, even though the actual tokens were identical. 85% of Detroiters categorize HOUSE tokens as being pronounced lower in the vowel space, closer to the position of the non-raised variant, when they believed they were listening to a fellow Detroiter. Niedzielski's Detroiters suggest that raising indexes SCE, as they are more likely to categorize tokens as non-raised if they believe the speaker is from Detroit no matter the actual pronunciation of the tokens.

Niedzielski summarizes these findings stating, "CR is a Canadian stereotype for Detroit residents, while remaining a virtually unnoticed feature of their own dialect" (p. 69). She revisits her earlier findings on gender with this perception task as well. In her earlier article she shows that men are likely to find no differences between the Canadian and Detroit dialects. However, her perception study shows that not significant difference in the performance of men and women in categorizing tokens. Both men and women are more likely to notice raising when they believe they are listening to a Canadian speaker. Again, the importance of being a hockey fan is addressed in this perception study, where Niedzielski adds that one hockey fan refused to believe that the speech he heard was Canadian although it was labeled as such. She suggests that the male hockey fans are potently more aware of the differences between Canadian and American dialects due to their heightened exposure to SCE speakers. As I established in Chapter 2, the NHL, the level of hockey for which I assume these men are fans, was disproportionately comprised of Canadians during the time Niedzielski was conducting her research. Although the percentage of Canadians began to decline throughout the 90's, at the beginning of the decade the league was still 73.9% Canadian. Avid hockey fans of this era would no doubt have been exposed to a great deal of Canadian speech from announcers and player interview included in the broadcast of games. I agree with Niedzielski's assessment that the metalinguistic awareness of these hockey fans can be directly traced to their involvement with the sport.

Niedzielski's work on the production and perception of HOUSE raising in Detroit presents a unique challenge for this current study. She clearly shows that HOUSE raising is present in Detroit, albeit it ranging from largely common for women to somewhat sparse for men. However, the usage of this variable by Detroiters seems to be entirely unnoticed by those in the city. This could be due to the indexical value of HOUSE raising as marking Canadians and SCE. By highlighting this as a defining variable of SCE, Detroit speakers can ignore the presence of the variable in their own speech. Due to this occurrence of HOUSE raising, they are forced to exaggerate the SCE variation to a point which surpasses the actual pronunciation in effect, retaining the perceived differences between dialects. This exaggerated raising could potentially allow for HOUSE raising to be prevalent in the results of this study, although with a lack of consciousness of the raising. If HOUSE raising does not reach the exaggerated pronunciation of *oot* associated with the Canadian stereotype, then it is possible for raised variants to occur that would not be perceived as Canadian by those using them. These variants could be perceived as comparable to SCE by those outside of the hockey community.

As CR involves multiple variants, two raised and two unraised, it is important to establish which of the variants function as stereotypes indexing SCE. Labov et al. (2006) note that, although CR is not confined by the Canadian border, it is "the basis of the most popular American stereotype of Canadian speech, at least as it applies to /aw/" (p. 221). There are a number of potential reasons why HOUSE raising might have reached the level of Canadian stereotype, while TIGHT raising has not. The simplest explanation is probably the prevalence TIGHT raising that occurs outside of Canada. In the previous chapter, I outlined studies showing that TIGHT raising is relatively common, at least throughout Eastern New England (ENE), the IN, and the Upper Midwest (UM). As HOUSE raising is largely uniform throughout Canada, possibly apart from the Atlantic provinces, this presents a variable which most Americans, especially those who regularly interact with Canadian speech, can pinpoint as divergent from their own speech and also from other American dialects. Furthermore, most of the previous research, with the exception of Chambers (1973), only addresses the stereotype status of HOUSE raising. Consequently, I argue that only HOUSE raising has third-order indexical value and stereotypes SCE and more largely Canadian speech. Although HOUSE raising has been attested in different regions in the US, it does not have this stereotyped status and has potentially gone unnoticed by Americans from these regions or any other regions for that matter.

4.5 Indexing a Hockey-Based Persona

The focus of the chapter so far has been a review of indexicality, more specifically, indexical values and indexical fields. I conclude this portion of the discussion by addressing how these processes are potentially at work in creating a hockey-based persona for players. To explain this process, I will begin by explaining how the SCE variables being studied here have indexical value denoting Canadian speech and also Canadians as a whole.

The LBMS, CR, and monophthongal high-mid vowels all constitute first-order indexes of SCE as they present areas of divergence from other regional dialects being used in the United States. Although I noted that these variables do occur in some American regional dialects, for instance, the LBMS is well documented in the West, CR has been attested in ENE, the IN, and the UM, and monophthongal high-mid vowels have also been documented in the UM, the presence of all three variables establishes SCE as uniquely distinct. As Silverstein argues that any linguistic variable can gain indexical value, these three variables, when used together, have indexical value linked to Canada, and speakers who exhibit all three index themselves as Canadian. As people become aware of the differences between SCE and other dialects, this indexed social value related to being Canadian is linked with these specific variables by those inside and outside of Canada. Simultaneously, Canadians and non-Canadians can affiliate or distance themselves from the group by adopting or discarding these variables. If speakers want to position themselves as Canadian, they can adopt the SCE variables to do that social work.[37]

[37] The ability for speakers to vary their usage of each variable based on their desired social projection elevates them to second-order indexes for SCE and Canada.

As these variables have gained indexical value, the requirement to reach Silverstein's *n*th order status, it is possible for them to be re-interpreted as emerging indexes linked with hockey. While still carrying the value of 'Canadian,' it is possible for speakers to use these variables in an attempt to index different values and make additional claims about their linguistic persona. In doing so, a new indexical value, an *n*th + 1st order index distinct from Canadian, can be established. It is within this reinterpretation that I argue that these variables transform from indexing only SCE to a larger indexical field that includes this emergent hockey-based persona.

While reinterpretation of SCE variables is one possible outcome, awareness of the Canadian value indexed by these variables can also lead to them becoming third-order indexicals. This is most evident for CR, specifically HOUSE raising. The metalinguistic awareness of the Canadian value of HOUSE raising could cause players to avoid any reinterpretation of this variable. The pre-existing indexed value is potentially too strong for a reinterpretation to take place. If this is the case, then the stereotype status of HOUSE raising as being Canadian might block the players from adopting the variable as they are not trying to take the stance of being a Canadian, but rather creating a hockey-based persona.

If American-born hockey players have uniformly adopted any or all of these variables, they have likely reinterpreted their usage, as they are not trying to present themselves as being a member of the regions where these variables are used, i.e., Canada. These players would be establishing second order indexical value that does not index membership as a Canadian but rather membership in a population associated with hockey. As with any type of social group, hockey players have the ability to distinguish themselves from outsiders by altering aspects of their language. It seems highly plausible, and in fact I argue, that SCE would be an ideal place to look for variables for adoption, as historically the majority of players have been Canadian. If players see an idealized hockey player as being from Canada due to the historically significance of the region, then it is likely that they would see the variables of that regional dialect as potentially indexing the hockey players themselves and not just their region. Players outside of Canada, then, would be able to adopt the SCE variables, creating a more uniform set of variables for these players which would be in contrast with their expected regional dialects. A reinterpretation of the social value placed upon these variables could then explain the shift in which group is being indexed. This process potentially creates new first-order indexes no longer linked to region but to the sport. As a second-order index, players have the ability to position themselves with or in opposition to the larger hockey community. If an individual player values these variables as second-order indexes of an emerging hockey-based persona, then they can utilize the variables to mark inclusion as hockey players and situate themselves within the hockey community.

One issue with the SCE variables being studied here pertains to their varied usage throughout neighboring US regions. While all three variables act in tandem as first-order indexes for SCE, each of the variables in isolation occurs in various US regions and potentially index these regions as well. For example, the dialect with the greatest degree of overlap with SCE is the UM, where the four variants of CR and monophthongal high-mid vowels have been historically attested. This is further complicated by the fact that many American-born players currently playing professionally are from Minnesota and Wisconsin, two states that are typically included in the UM region. Due to this overlap in the usage of these variables and the Canadian or Upper Midwestern values indexed by their usage, it is even more likely that players from other regions would target these variables for reinterpretation of indexical value. By re-interpreting the value as not Canadian or Upper Midwestern, but rather linked to hockey, players' usage of these variable can index being a hockey player and provide a basis for a hockey-based linguistic persona. Furthermore, the LBMS is commonly attributed to the West more generally, meaning that this variable could naturally be occurring in the speech of some of the players. It is important to test for all three variables to see what occurs regardless of each player's region. If all three variables are observed, then it would suggest that SCE is at the root of this potential hockey identity. However, if only CR and monophthongal high-mid vowels are observed throughout, this would suggest that the shared variables of Canada and the UM are the most likely indexes for the construction of a hockey identity. If this holds true, then this hockey identity would not be entirely Canadian based. It is also possible that players will only have the variables that just happen to be co-occurring in their own regional dialect, which would be counter to the hypotheses defended in this dissertation.

By establishing SCE elements as second-order indexes of membership within the hockey population, American-born players are potentially creating a hockey persona defined by linguistic choice. This analysis intends to demonstrate that American-born hockey players are currently using variables of SCE in an attempt to construct a hockey-based persona. If players from regions that have dialects with little or no shared elements with SCE are exhibiting variables of SCE, it provides evidence that the acquisition of these variables could be linked to this process of adding additional indexical values to the SCE variables.

Chapter 5

Methodology

In this chapter, I outline the methodology used in data collection, processing, and analysis for this study. I begin with an explanation of the recruitment selection for participants, mainly how each team was selected for inclusion within the study. After this, I outline the sociolinguistic interview (Labov, 1966, 1972, 1984), including the semi-structured script which was used, central to data collection for this study. The following section highlights the three different methods of analysis for the Low-Back-Merger Shift (LBMS), the degree of Canadian raising (CR), and the monophthongal quality of FACE and GOAT. Finally, I conclude the chapter by discussing the methodology for analysing the social variable to determine their influence on the acoustic variables being studied.

As outlined in Chapter 1, this dissertation attempts to answer two research questions. First, have hockey players adopted variables associated with SCE, and if so, which variables have been adopted and is their usage uniform across the community? Second, if SCE variables are present, what motivations are there for this adoption to have occurred? As there are two research questions at the heart of this dissertation, there are two sets of hypotheses as well. The first set attempt to answer if players have adopted SCE variables, and if so, which variables. I hypothesize that the players in this study have in fact adopted SCE variables, but to varying degrees for each variable. Monophthongal FACE and GOAT variants are predicted to be the most prevalent in the speech of the players. This variable is not uniquely Canadian, as it can be linked to the Upper Midwest (UM), a region which produces a great deal of hockey players, and does not have indexical value, potentially of the third-order or stereotypical variety, linked to Canada. CR is hypothesized to be attested in the speech of all players, but potentially not raising of both TIGHT and HOUSE. Raising of TIGHT is well documented in Eastern New England (ENE), the Inland North (IN), and the UM, so players from this region will likely raise. I do not believe TIGHT raising will be restricted to players from these regions though. In contrast, I hypothesize HOUSE raising to be less prevalent. This is further complicated by the stereotypical Canadian indexical value HOUSE raising has attained, specifically in words such as *out* and *about*. Finally, the LBMS is predicted to be the variable which is the least common across the players. As many players are from regions which do not exhibit the Low-Back Merger (LBM), it is possible that this would inhibit the LBMS. Furthermore, players from the IN and the UM might display the Northern Cities Vowel Shift, which would be counter to the LBMS. In this chapter, I will establish the methodology for how each variable will be analyzed. This methodology will provide metrics which demonstrate if each player exhibits each variable.

Having established if any variables are commonly occurring in the speech of the players, which I posit will be the case, the rationale for the presence of these variables must be analyzed. I hypothesize that regional dialect will not impact the presence of the variables, but potentially be a reason as to why they are not attested. Specifically, that region will not impact FACE and GOAT but might affect CR, more so the raising of HOUSE, and the LBMS. Other traditional social factors such as ethnicity and gender will not be analyzed, so I have no hypotheses on how these factors might impact SCE variable usage. This will be discussed briefly in Chapter 10. I will be analyzing hockey-specific factors to assess if the variables attested in the players' speech are uniform. These factors include age, developmental pathway, league of play, and status on the team as a rookie or veteran player.[38] I do not hypothesize any of these to significantly impact variable usage, but it is necessary to establish in order to claim that usage is uniform across players. If this hypothesis is incorrect, the youngest AHL level players who played junior hockey in Canada who are the most likely to utilize these variables. These players have the best chance of eventually making an NHL roster, and likely have their identity deeply intertwined with the sport. Playing junior instead of collegiate hockey would have also meant these players spent far more time in Canada. Later in this chapter, I will outline how these factors, social and hockey-specific, will be tested against the acoustic metrics for each variable to establish if they significant impact usage.

[38] This did not directly correspond to age. Younger players were often veterans if they played junior hockey instead of going to college.

5.1 Team Selection and Player Recruitment

Teams from the AHL and the ECHL, the two most skilled professional minor hockey leagues in the United States and Canada, were contacted to gauge their interest in participating in the study. This process consisted of emailing various members of each organization's front office, who would then evaluate players' interest in participating in the study. These emails were sent after each season had begun, so that the rosters would remain somewhat fixed, giving me an idea of how many potential participants each team had available. To maximize the number of potential participants, teams with more American-born players were placed at a higher priority than those that had more Canadian or European players. Eventually, the Charlotte Checkers and Rochester Americans of the AHL and the Greenville Swamp Rabbits and South Carolina Stingrays of the ECHL were selected, as they best fit the criteria outlined above.[39]

Interviews were conducted throughout the 2017-18 and 2018-19 seasons that involved multiple visits to Charleston and Charlotte. However, the data collected in Rochester and Greenville was collected during one session per city. Interviews were conducted with as many players as possible in a single day. Interview sessions ranged in total number of interviews from two in Greenville, to five in Rochester. The total number of interviews in a session was dependent upon the availability of players that day based on their individual schedules and also the total number of players wanting to participate in the study. After arriving at a team facility and identifying the best area to conduct interviews, my team contacts would go into the locker room to construct a schedule of interviews for that session. To recruit players for the study, I relied on a modified version of the network sampling (Hammersly & Atkinson, 1995, p. 135) and I relied on players and team personnel to recruit more participants for me to interview. The only requirement was that they were born in the United States. At the end of each interview, I would either ask the player directly if there was anyone else on the team who they thought would be good to include in my study, or my front office contact with the team would go and grab another player for me from the locker room who they knew fit the only requirement for participation in the study.

[39] The Atlanta Gladiators of the ECHL were going to be included in study as well, but after initially making contact, we were unable to schedule interview sessions.

5.2 The Sociolinguistic Interview

Given that the participants in this study were professional athletes and that the interviews were conducted during an active season, it was important to minimize the interference of the interview process on their schedules. To accomplish this, interviews typically occurred directly following a team practice, utilizing gyms, locker rooms, media rooms, and other secluded areas within each team's arena. Some players came directly off the ice and participated in the interview still in their gear from practice. On a few occasions, injured players were interviewed after they had received medical treatment while their teammates practiced, which helped mitigate the inconvenience. As these interviews took place at team facilities, the presence of background noise was sometimes unavoidable. This interference included media interviews, medical treatment, music, off-ice training, on-ice practicing, and the sound of refrigeration and air-conditioning units. The interviews in which the background noises directly impacted the integrity of the acoustic data were not included in this analysis. In total, 20 players were included in this analysis.[40] The selection of which players would be included in the study was done before any linguistic analysis had been done. Therefore, no player was removed from the study on any linguistic basis. While it is regrettable that every interviews could not be included in the analysis, the advantages of recording on location at team facilities far outweighed the cost of lost data. By recording directly after a practice, the context of hockey was able to remain consistent even as the players transferred into the role of an interview participant.

[40] A total of 24 interviews were conducted, but four of these interviews were unable to be included in this study due to music being played in the background during a team off-ice training session.

The data for this study comes from sociolinguistic interviews conducted following a semi-structured script[41] created to prompt speech as close to natural as possible. This script was developed following the traditional sociolinguistic interview protocol originated and outlined by Labov (1966) for his study of New York City. Due to the limited time available for interviewing, the focus of each interview was on Labov's "Context B" or "The Interview Situation," in which players were directly answering questions being asked of them.[42] Labov notes that Context B elicits careful speech from participants as the interview situation is more formal than most conversations (1966, pp. 58-9). Due to the perceived formality of the interview situation, the Observer's Paradox[43] had to be overcome to obtain speech approaching that used in casual conversation. Labov (1972, pp. 209) outlines how it is possible to overcome the Observer's Paradox by utilizing devices which "divert attention away from speech, and allow the vernacular to emerge." The use of the sociolinguistic interview as a means to elicit casual speech or the vernacular, is not without criticism (Wolfson, 1976); however, given the limitations of the participants in the study, the interview allowed me to collect the greatest amount of speech in the shortest time span, while also giving me some control over the topics of discussion.

[41] The entire interview script is given in Appendix A.

[42] Labov's Context C: Reading style, Context D: Word Lists, and Context D': Minimal Pairs were all considered for inclusion within the interview, but were not utilized to keep interviews as brief as possible for the players.

[43] Described by Labov (1972, pp. 209) as "the aim of linguistic research in the community must be to find out how people talk when they are not being systematically observed; yet we can only obtain these data by systematic observation."

Labov (1984, pp. 33) further elaborates on the methodology behind the sociolinguistic interview through the introduction of the module, or "a group of questions focusing on a particular topic." After each player had signed consent forms, interviews began by asking questions from the first module pertaining to demographic information. Specifically, players were asked their name, age, and what they considered their hometown to be. I also asked players if they had spent most of their childhood in their hometown, or if they had moved at all throughout their childhood. Players who had moved were asked where to and for how long they lived in each location. This allowed me to collect the metadata necessary of each player for the sociolinguistic analysis portion of the study. This metadata is provided in Section 5.3.

The second module of questions tasked players with focusing on their career up to and including their current status as a professional. Players were first asked to describe when and why they initially began playing the sport. This provided the insight needed to establish a connection with each player in an attempt to lessen the formality of the interview process and mitigate the Observer's Paradox. Following Wolfram's (1974, pp. 50-4) methodology, I designed the questions in the second module of the interview to require questions which would likely elicit uninterrupted narratives and minimize the occurrence of yes-no responses, while also being aware that the players needed to be able to relate to the questions being asked. Due to the limited time-frame which each interview had to occur, I wanted to maximize the likelihood of obtaining uninterrupted narrative as early as possible.

After I knew where each player had grown up and began playing hockey, I was able to briefly discuss my past involvement with the sport demonstrating that I was also a member of the hockey community, although obviously of a lower skill level than the professionals being interviewed. For players from Michigan, this process typically was more easily achieved, as many of us had played youth hockey for the same organizations or in the same ice arenas throughout the Detroit metropolitan area. Interestingly, this led to the discovery that I had played against two of the players in the past. One of the two happily reminded me that he had beaten me back when both of us were playing high school hockey. For players from other states, this process typically involved talking about the youth hockey organizations in their city and throughout their state, focusing on the major youth tournaments in which we had both participated. By selecting a framework that was easily relatable for both interviewer and interviewee, I was able to get players talking more freely while still keeping the focus of narrative on hockey. Players were asked to outline the various teams which they had played on as they moved from their youth career to their current state as a professional. These in-depth summaries provided information about players who had to look outside of their local youth organizations, and at what age they did so, to play for more competitive teams. While some players were able to play for nearby "travel" organizations, typically consisting of higher skill level players, many had to relocate to be noticed by collegiate and major junior teams.

Most players in this study played junior hockey between the ages of 16 and 20. While still considered an amateur level of play, junior hockey almost always requires players to transplant and live with billet families closer to team facilities. USA Hockey currently recognizes four junior leagues across three tiers, the United Stated Hockey League (Tier I), the North American Hockey League (Tier II), and the Eastern Hockey League and the North American 3 Hockey League (Tier 3). A fifth US junior league, the United States Premier Hockey League, operates outside of USA Hockey. Most of these junior teams are located in Midwestern and Eastern states; however, there are some teams in the South and West as well. 14 players in this study played at the junior level before playing college hockey. Three players were able to go directly to the collegiate level from a high school or preparatory school team. However, there were three players who took a different developmental pathway to professional hockey. The Ontario Hockey league, the Quebec Major Junior League, and the Western Hockey League are classified as major junior leagues and make up the Canadian Hockey League. These major junior hockey leagues are recognized as "professional,"[44] and by playing in one, a player forfeits their rights to play college hockey. Major junior hockey is often viewed as a foil to college hockey. Major junior hockey leagues provide the other most viable route to the NHL for players ranging in age from 16 to 20. Three players went from other local "travel" teams to the major junior level of hockey before playing in the AHL or ECHL.

[44] I place professional in quotation marks because major junior players receive a salary, but the league is still viewed as a junior league. Professional hockey in North America typically refers to only the NHL, AHL, ECHL, the Federal Prospects League, and the Southern Professional Hockey League.

While it might seem like a trivial aspect of the organization of the sport, the decision of whether to play collegiately or for a major junior team almost exclusively coincides with a split in whether players spend these crucial late teenage years predominately in the US or Canada. Those who choose the collegiate route likely play entirely in the US throughout their junior year, a trend which would continue into their college years. While players are eligible to play junior hockey in Canada before playing collegiately, all NCAA college hockey programs are in the US. Only one player in this study opted for a Canadian junior league over the four American leagues. However, those who choose to play at the major junior level will most likely be required to move to Canada or at least play most of their games in the country, as the vast majority–all but eight of 60 major junior teams–are based in Canadian cities.

By asking players to focus on their youth hockey careers, I was often able to solicit long uninterrupted narratives from the players. While some players had spent most of their youth in the same organization, many of the players spoke in depth about the various teams on which they had played, often in different cities, sometimes in different states, and occasionally in different countries. As the narratives transitioned to college and junior level hockey, I asked follow-up questions pertaining to the rationale for picking the developmental pathway each player had picked. This typically led to conversations about the importance of education weighed against the speed at which a player could reach the professional level. Players often went into great detail about their teams' fan base and facilities at the collegiate and major junior levels as well. Once again following Wolfram's (1974, p. 51) methodology, I attempted to pursue these areas of interest with additional questions. I often asked the collegiate players about their universities and the fan bases which they had during their time at school. This led to great narratives about the traditions and rivalries of their university. When interviewing major junior players, I focused on their experiences living and playing abroad.

The focus of the interview then shifted to players' professional careers, addressing how the skill level and demands differed from the amateur, collegiate, and major junior levels. This question was also very helpful in producing narratives. Some players addressed the higher levels of training expected at the professional level, while others noted that they had more free time as a professional compared to their days in college which were filled not only with hockey but with academic study. Players were asked about their thoughts on the city/cities where they had played professionally, both in terms of quality of their team's fan base and overall quality of the city. For players that had been professional for a longer time, this question often solicited longer narratives explaining the cities in which they enjoyed playing the most up to this point. Many of the players used this portion of the interview to mention how much they appreciated the fan base of their team and the teams they had played for in the past.

Players were then asked to analyze the current social dynamic of their team with respect to nationality and also to comment on any differences between US states. I asked players if nationality influenced the way in which networks within the team formed. I had initially expected this question to return more narratives about the social structure of the team, but it was often the case that nationality had little to no influence on how players grouped together. Outside of the occasional reference to the language barrier that exists for European players who did not know English, very few players addressed any issues concerning nationality as it related to the social dynamic of the locker room. Finally, players were asked to describe their routines for both a practice day and a game day. These daily descriptions typically elicited some of the longest uninterrupted narratives from each player.

In the first portion of each interview, it was important to establish myself as a hockey player, not only to lessen the formality of the interview situation, but also to help construct my identity as an interviewer. Eckert (2000) explains the importance of jointly constructing the identity of interviewer and interviewee in her work at Belton High:

> Identity is fluid, and particularly in telling the story of their lives, individuals may move through a broad range of identities [...] As they present these stages of their lives to the interviewer, the interviewee may present a variety of sides of themselves. The interviewer and interviewee, then, are developing a joint construction of the interviewee and of their relationship. And the end of the interview does not have a final product, but a collection of memories. (p. 81)

By focusing on player's hockey history, I was able to get them to produce a narrative that not only traced decades of their lives but one that was also grounded in the context of hockey, while also creating connections with the players being interviewed. By beginning with youth hockey and highlighting shared experiences, I was able to get players more comfortable with the interview situation. As the context of the questions pertained to hockey and both interviewer and interviewee had a shared interest in the sport, it was easier to collect large samples of speech data. By the time most of the interviews reached the third module, players appeared to be comfortable answering my questions, and often produced longer answers as the lines of questioning continued. By the end of this second module, I found myself speaking very little.

The third module of the interview focused on the influence of Canada on the sport of hockey, with specific focus on the difference and similarities in the speech of American vs Canadian players. Questions focused on if American players spoke similarly to their Canadian teammates, or if there were noticeable dialect differences between the two nationalities. Players were asked if they were commonly confused as being Canadian by those outside of the hockey community. In this portion of the interview, many players explained their perceived differences between the two Englishes ranging from phonetic and phonological variants, occasionally mentioning the variables being studied here, to lexical variation. Players were asked about any potential motivations for Americans players to adopt SCE variables, and if they believed this process was occurring. Numerous players addressed the possibility of accommodation within the locker room, and the question of who was accommodating more, Americans or Canadians, became relevant. Finally, players were asked if the history of the sport had impacted these processes, and if potential changes of nationality distribution would impact the speech of future players.

Interviews were recorded on a Marantz PMD661 MKII solid state recorder using the built-in stereo condenser microphone at a sample rate of 44.1 kHz.

The recorder was placed on a table no more than a foot away from the participant. All interviews were saved on a 32 Ultra GB SanDisk SD Card. A WAV file of each interview was then transferred from the SD Card to the hard drive of my personal MacBook Pro for storage and subsequent transcription. To retain anonymity, the data from each interview was saved using file names constructed of the initials of the team and pseudonym of a given player. This format was followed for all new data frames created based for each player. After the analysis was complete, the full pseudonyms replaced this code in all tables and figures.

5.3 Player Metadata

Table 5.1 presents all relevant player metadata. Each player was assigned a pseudonym to protect their anonymity. Throughout the interview process, players provided 11 states as their home state which corresponded to six *ANAE* regional dialects: ENE, the IN, the Mid-Atlantic (MA), the UM, the West, and Western Pennsylvania (WPA). While there was an attempt to get players from a variety of regions, all players interested in the study were interviewed, leading to an imbalance in the distribution of regions. The IN was the most common region with Michigan being the most represented state. Since Bray (2017, 2019) found that region was relevant to both CR and monophthongal FACE and GOAT although the effect of region was not entirely predictable, region was again included in this analysis. Both home states and regions are provided in Table 5.1. Paired with these names, states, and regions are the ages of each player, calculated based on the date that each interview was conducted.

Players ranged in age from 21 to 31, though most where in the 24-26 age range. Not included in Table 5.1 are players' developmental pathways, the league in which they were playing at the time of their interview, or their status as a rookie or veteran on their team. Status on the team was separated out from age as it did not directly correspond to age, and it represented another potential impact on the degree of SCE influence. These were intentionally left out to maintain anonymity. All players interviewed were men, as both leagues currently are comprised entirely of male athletes, although the impact of gender on hockey-based speech will be the focus of future research. Information about ethnicity and socioeconomic status was not collected, though the vast majority of players interviewed were white.

Table 5.1: Players' demographic information

Pseudonym	*State*	*Region*	*Age*
Allen	Ohio	Inland North	21
Anderson	New York	Inland North	23
Bell	Pennsylvania	W. Pennsylvania	32
Campbell	Michigan	Inland North	24
Carter	Minnesota	Upper Midwest	26
Clark	Minnesota	Upper Midwest	24
Collins	Michigan	Inland North	27
Cook	Iowa	Upper Midwest	23
Hall	Wisconsin	Upper Midwest	22
Jackman	Illinois	Inland North	26
Johnson	Colorado	West	24
Jones	Michigan	Inland North	28
King	Colorado	West	25
Martin	Maryland	Mid-Atlantic	26
Mitchell	Pennsylvania	W. Pennsylvania	24
Nelson	Michigan	Inland North	23
Phillips	Michigan	Inland North	25
Taylor	Wisconsin	Upper Midwest	25
Thomas	Massachusetts	E. New England	25
Vasquez	New York	Inland North	25

5.4 Acoustic Analysis

5.4.1 Transcribing the Interviews

Praat 6.1.03 (Boersma & Weenik, 2019) was used to remove portions of each interview containing my own speech, to highlight only the speech of the player being interviewed. The remaining audio of each interview was then manually transcribed as plaintext (TXT) files which would later be paired with corresponding WAV files and then uploaded to the Dartmouth Linguistic Automation (DARLA) suite interface (Reddy & Stanford, 2015).

While transcribing these interviews, I developed a set of protocols to return the best possible data from DARLA. I avoided the inclusion of any punctuation except the use of apostrophes in contractions and possessives. Only proper nouns and the pronoun *I* were capitalized. I decided that it was best to write out all numbers with attention paid to how a given number had been pronounced during each utterance; for example, *5500* could either be transcribed as *five thousand five hundred* or *fifty five hundred*. Abbreviations were transcribed in their entirety, for instance, *St. John's*, *St. Lawrence*, and *St. Louis* were transcribed as *Saint John's*, *Saint Lawrence*, and *Saint Louis*, respectively. Standard American English spelling was used in most instances; however, exceptions were made for words such as *gonna* and *cuz* to capture the actual vowel being produced, which in turn removed these tokens from this analysis. The same spelling procedure was not required for the variant productions of *want to* and *wanna*, as BOT tokens preceding nasals were removed from this analysis. All words that were identifiable were included in the transcription, including instances where sentences were syntactically or semantically ill formed. All false starts and stutters were included if they were identifiable.

5.4.2 Categorizing and Filtering Tokens

After transcribing a players' portion of the interview, corresponding TXT and WAV files were uploaded to DARLA which utilizes the Prosodylab-Aligner (Gorman et al., 2011) for force alignment and FAVE-extract (Rosenfelder et al., 2014) to measure vowel formant values. DARLA returned spreadsheets containing non-normalized and Lobanov-normalized (1971) single point measurements for all vowel tokens and also measurements taken at five interval percentages throughout the duration of the vowel: 25%, 35%, 50%, 65%, and 80%. The single point measurements were insufficient for this study, as I am trying to capture the degree of raising in TIGHT and HOUSE tokens and the total degree of movement in FACE and GOAT tokens; therefore, the measurements taken throughout the duration percentages were more important for this analysis. DARLA additionally returned Praat TextGrids which contained phoneme by phoneme transcription of the original transcription based on the CMU Pronouncing Dictionary (CMUdict) for each word. These TextGrids were reanalyzed to ensure that each token had been assigned the proper phoneme, and all instances of improper assignment were corrected. As CMUdict does not account for the expected allophony of SCE, some tokens had to be reclassified for analysis, which I will describe in further detail later in this chapter. DARLA does allow the option to remove stop words automatically from the data; however, I felt it was best to initially include these words to see how many tokens each speaker had for all allophones. After all data was initially processed, I chose to exclude all stop words identified by DARLA, which are given below:

> a, ah, am, an, and, are, aren't, as, at, aw, because, but, been, could, couldn't, eh, for, from, get, gonna, got, gotta, gotten, had, has,

> have, he, he'd, he'll, her, her, he's, his, how, huh, I, I'll, I'm, I've, I'd, in, is, it, it's, its, just, my, nah, not, of, oh, on, or, our, ours, says, she, she'd, she'll, she's, should, so, than, that, that's, the, them, there, there's, they, they'd, they'll, they're, they've, their, theirs, to, uh, um, was, wasn't, we, we'd, we'll, were, we're, we've, what, when, where, which, who, with, would, yeah, you, yours, you'd, you'll, you've

After removing the stop words from data, I additionally removed all tokens that did not carry primary or secondary stress. Any stressed tokens that was unable to be analyzed properly, typically due to background noise or poor audio quality, was not included in the analysis.

Following the outline for measuring the LBMS (Becker, 2019, p. 23), all tokens of each allophone which preceded any nasal (/m/, /n/, and /ŋ/), laterals, rhotics, and velars (/g/) were excluded as these environments "condition some vowel's behavior." The ANAE provides further rationale for the removal of pre-rhotic tokens due to the "complete merger of /ey/, /æ/, and /e/ in *Mary, marry, merry*" (Labov et al., 2006, p. 14), where the ANAE notation corresponds to my FACE, BAT, and BET. Because the *Mary-marry-merry* merger impacts three of the vowels being analyzed here across two of the three variables of study, I decided to remove all pre-rhotic tokens for every allophone included in this study. Furthermore, due to the potential impact on F1 and F2 values of vowels preceding laterals noted by Olive, Greenwood, and Coleman 1993, all pre-lateral tokens for every allophone included in the study were removed as well. All allophones not involved in either the LBMS, CR, or monophthongization, using Wells (1982) lexical sets, STRUT, FOOT, and GOOSE were also removed from analysis.

As outlined earlier, 20 players interviews were included in this analysis. A total of eight hours, 46 minutes and 52 seconds of audio was recorded between these 20 players with each interview averaging 26 minutes and 21 seconds. DARLA returned data on 37,332 vowels. After removing tokens following the guidelines outlined above, 14,448 tokens were included in the analysis. A list of the allophones included in this study is provided in Table 5.2. Each allophone is represented by a keyword, in small caps, and grouped together with the other allophones involved in the three variables being analyzed. The keywords for the allophones involved in the LBMS are taken from (Becker, 2019), the keywords for the allophones involved in CR after taken from *ELC*, and the (Wells, 1982) lexical sets are used for the monophthongal mid vowel allophones. Given with each of the keywords are the top ten most frequently used words for each allophone and also the total number tokens for each allophone. The categorization of allophones by DARLA was typically accurate; however, some corrections were required. Looking first at the allophones of the LBMS originally categorized as BOUGHT, and *watching* as BOT. I decided to place both token types within the BOT category. A greater deal of correction was necessary for the CR allophones, as CMUdict does not account for any expected raising. All tokens of TIE which preceded voiceless consonants (/p/, /t/, /k/, /f/, /s/, /ʃ/, and /tʃ/) were re-categorized as TIGHT. Chambers (1973) notes that raising typically is blocked by word boundaries, and therefore *high school* should not undergo raising. However, he notes that "a minority inexplicably raise the nucleus in the compound *high school* (=[hʌ́y#skùwl])" (pp. 116-7). Contra Chambers, Vance (1987) notes that all three of his speakers (two from Minnesota and one from Rochester, New York) produced raised variants for *high school*. Furthermore, Dailey O-Cain's (1997) analysis of Ann Arbor, Michigan shows that 29.6%, 77 individuals in total, produced a raised vowel in HIGH SCHOOL. Due to this, I decided to analyze initially all tokens of *high school* independent from TIE and TIGHT. After this preliminary analysis, I categorized *high school* tokens as TIGHT.[45] The same re-categorization was necessary for COW tokens which preceded voiceless consonants, but an additional sub-categorization was required as well. In *ELC*, Boberg provides three allophones, COW, DOWN, and HOUSE, where COW tokens were those which occurred in syllables with open codas or when the following sound was a voiced non-nasal consonant, DOWN tokens were those occurring before nasals, and HOUSE tokens were those occurring before voiceless consonants. I adhered to this three-way allophonic distinction in my analysis. There was no need to re-categorize any tokens of FACE and GOAT.[46]

[45] I provide the results from this preliminary analysis and offer a rationale for this decisions in Chapter 7.

[46] I analyze the impact of phonological environment in Chapter 8.

Table 5.2: Summary of word classes in this study

Low-Back Merger Shift			Canadian raising			Monophthongal high-mid vowels		
Keyword	*n*	*10 most frequent words*	*Keyword*	*n*	*10 most frequent words*	*Keyword*	*n*	*10 most frequent words*
BIT	883	*if, different, bit, kids, did, pick, city, fifteen, kid, difference*	TIE	1,351	*guys, kind, time, I'd, five, guy, I've, by, trying, why*	FACE	2,931	*say, played, play, Canadian, maybe, way, game, same, day, playing*
BET	1,141	*definitely, guess, every, never, said, better, whatever, best, together, everyone*	TIGHT	2,207	*like, right, high school, ice, might, life, night, quite, liked, twice*	GOAT	2,540	*know, don't, go, no, Minnesota, those, going, home, most, growing*
BAT	906	*back, after, actually, practice, last, half, bad, exactly, nap, dad*	COW	250	*how, now, thousand, proud, crowd, shower, loud, vowels, crowds, cloud*			
BOT	558	*lot, probably, obviously, watching, body, watch, top, o'clock, job, locker*	DOWN	375	*around, down, sound, town, sounds, downtown, sounding, found, pounds, pronounce*			
BOUGHT	447	*talk, Boston, talking, off, awesome, thought, talked, coffee, often, taught*	HOUSE	466	*out, about, south, outside, house, without, throughout, mouth, outcast, touted*			
HOCKEY	393	*hockey*						
Total:	4,328		Total:	4,649		Total:	5,471	

5.4.3 Filtering, Normalizing, and Analyzing the Data

This dissertation utilizes expected mean F1 and F2 values taken from *ANAE* along with *ELC* for impressionistic comparison to establish if the players' vowel production aligned with expected SCE variants. Both *ANAE* and *ELC* feature F1 and F2 values measured at a single point, the nucleus of the vowel. *ANAE* notes that most short and long vowels tend to incorporate a downward movement of the tongue into the nucleus before rising into any subsequent upglide, making a distinction between front and back upgliding vowels, BEET, BIT, BET, BAT, TIE, TIGHT, COW, DOWN, HOUSE, FACE, and GOAT. Because of this expected movement, maximal F1 values are measured at the time F1 values are the greatest throughout duration with F2 values being measured at this same point. However, with a tendency of movement towards and subsequently away from either the front or back of the vowel space, ingliding vowels–BOT and BOUGHT–are measured at the maximal or minimal F2 value and presented along with corresponding F1 value (Labov et al., 2006, p. 38). Most of the vowels in this study were expected to be either upglides or short vowels. F1 value were measured at 50% for comparison with the maximal values of *ANAE* and *ELC*.[47] Additionally, this dissertation analyzes F1 and F2 values throughout the entire vowel trajectory, from onset (20%) to offset (80%), to judge the degree of raising in CR and monophthongization for tokens undergoing these processes.

[47] These comparisons were only to establish if players produced formant values similar to those expected in SCE. Each variable being studied was further analyzed with a more specific measurement in addition to this impressionistic comparison.

To make these impressionistic comparisons with *ANAE* and *ELC*, the data returned from DARLA was normalized following the same procedure, utilizing log-mean normalization first described by Nearey (1978). Because this study does not include any women, the group log mean G was replaced with the Telsur project mean of, G = 6.896874. This led to all the players having a uniform scaling factor greater than 1 (Labov et al., 2006, p. 40). However, this was only one of three different normalization processes that were used. While it was sufficient for measuring CR, which will be outlined in greater detail below, Lobanov (1971) normalization and the Bark Difference Metric (Traunmüller, 1990) were also required.

For the analysis of the LBMS, single point measurements, taken at 50% duration, were used to analyze the position of BEET, BIT, BET, and BAT along the front diagonal of the vowel space. As the LBMS is thought to be triggered by the LBM, the degree of overlap between BOT and BOUGHT was calculated using Pillai Scores (Hay et al., 2006). The lower the Pillai Score returned, the greater the degree of overlap between the vowels, quantifying the level that the two vowels have merged. Paired with Pillai scores, one-tailed non-parametric Wilcoxon signed-rank tests were used to establish statistical significance ($p < 0.05$) between variants looking at F1 and F2 individually, to establish if the overlap was more in the F1 or F2 dimension. Data from all vowel tokens involved in the LBMS was normalized using the Lobanov (1971) methodology, the preferred method outlined in Becker (2019). Lobanov normalization "creates roughly equivalent scales of F1 and F2 dimensions, making a distance measurement calculated in two dimensions appropriate" (Becker, 2019, p. 22). Initially introduced by Boberg (2019b), the LBMS Index score calculates the average Euclidean distance each front vowel has potentially lowered and retracted by utilizing BEET as an anchor point of measurement. To establish the LBMS Index score for each player, the Euclidean distances of BIT, BET, and BAT from BEET were calculated factoring in both mean F1 and F2 values, measured at 50% vowel duration. The sum of these three Euclidean distances was then divided by three providing an average distance of movement measurement of the short front vowels. The equations for calculating Euclidean distance from BEET and also LBMS Index scores, recreated from (Becker, 2019, p. 22), are given below.

$$d_{\nu_1-\nu_2} = \sqrt{(\mathrm{F2}_{\nu_1} - \mathrm{F2}_{\nu_2})^2 + (\mathrm{F1}_{\nu_1} - \mathrm{F1}_{\nu_2})^2}$$

$$\text{LBMS Index} = \frac{d_{\textsc{beet}-\textsc{bit}} + d_{\textsc{beet}-\textsc{bet}} + d_{\textsc{beet}-\textsc{bat}}}{3}$$

The Pillai Scores for the LBM, paired with LBMS Index scores were used in tandem to determine if each player was exhibiting the LBMS, either in full or in part. If players produce low Pillai scores, and also larger LBMS Index scores, then this will demonstrate that they have adopted this variable. This would suggest that my initial hypothesis about this variable is inaccurate, as I do not theorize that this variable will be common across players.

For the analysis of CR, all F1 values returned from DARLA, 20%, 35%, 50%, 65% and 80%, were evaluated to establish the nucleus of the vowel as well as to follow the trajectory of each token as it moved into its offset, capturing the expected upglide, establishing them as either the unraised variants TIE and COW or raised variants TIGHT and HOUSE. Furthermore, *ELC* lists DOWN as a third variant, occurring before nasal sounds, which speakers produced lower than COW. All tokens potentially involved in CR were normalized following the *ANAE* methodology. To establish if the 60 Hz difference expectation, as outlined in *ANAE*, between the raised and unraised variants in CR is being met, the mean value of tokens in which CR is expected was subtracted from the corresponding mean value of tokens in which CR is not expected at each duration percentage. The equation for calculating the TIGHT Raising is given below. Alpha represents the percentage from where the F1 measurement was taken. Testing of the raising HOUSE against both COW and DOWN utilized variations of the same equation.

$$\text{TIGHT Raising}_\alpha = \text{TIE F1}_\alpha - \text{TIGHT F1}_\alpha$$

In conjunction with this, one-tailed non-parametric Wilcoxon signed-rank tests were used to establish statistical significance ($p < 0.05$) between variants. As DARLA data uses the CMU pronouncing dictionary which does not account for the SCE allophony of CR, hand corrections of all four variants had to be done to the data. Any environments that would traditionally have undergone raising, as outlined above, were reclassified as one of the raised variants, TIGHT or HOUSE. Additionally, DOWN tokens had to be reclassified in the data. To determine if players had undergone any fronting of the nucleus of COW, F2 values were analyzed at all percentages returned by DARLA. If players produce differences of greater than 60 Hz between unraised and raised variants, this will demonstrate that CR is occurring. As I hypothesize that CR will be prevalent, at least TIGHT raising, players' differentials should surpass this benchmark for raising.

For the analysis of monophthongal high-mid vowels, F1 and F2 values were analyzed at each percentage to establish if the vowel was behaving more monophthongally. Movements in F1 values were indicative of upgliding, while movement in F2 were indicative of either fronting or backing. Both values were necessary to analyze if players produced variants which were more diphthongal and in line with what is attested in Standard American English (SAE). F1 and F2 values were converted to Bark using the Vowels: Vowel Manipulation, Normalization, and Plotting in R (Kendall & Thomas, 2010) using the following equation (Traunmüller, 1990). F1 and F2 values were input as F_i, returning Bark converted Z1 and Z2 values for each token.

$$Z_i = 26.81/(1 + 1960/F_i) - 0.53$$

Since the Bark scale is logarithmic above roughly 500 Hz, the higher degree of movement in F2 throughout the trajectory of the vowel does not outweigh the smaller movements of F1 values after Bark conversion. As outlined by Farrington et al. (2018) building upon Fox and Jacewicz (2009), the Trajectory Length (TL) of FACE and GOAT was calculated using the Vector Length (VL) from mean onset (20%) value to mean midpoint (50%) value of F1 and F2, added to the VL from the mean midpoint value to the mean offset (80%) value. The formula for establishing both VL_{onset}, VL_{offset}, and TL is given below, reproduced from Farrington et al. (2018, p.196).

$$\text{VL}_{\text{onset}} = \sqrt{(\text{F1}_{\text{onset}} - \text{F1}_{\text{midpoint}})^2 + (\text{F2}_{\text{onset}} - \text{F2}_{\text{midpoint}})^2}$$

$$\text{VL}_{\text{offset}} = \sqrt{(\text{F1}_{\text{midpoint}} - \text{F1}_{\text{offset}})^2 + (\text{F2}_{\text{midpoint}} - \text{F2}_{\text{offset}})^2}$$

$$\text{TL} = \text{VL}_{\text{onset}} + \text{VL}_{\text{offset}}$$

Lower trajectory lengths were indicative of more monophthongal vowels. Another possible measurement to capture this degree of monophthongization would be to simply take the vector length from onset to offset of the vowel; however, this might fail to capture the degree of movement in its entirety. While the trajectory length can be calculated using all five percentages returned by DARLA, creating four segments to add together, Farrington et al. (2018, p. 197) explains that this is unnecessary, as using three points, onset, midpoint, and offset, captures the vowel dynamic to the same degree as measurements including more points. The trajectory length allows an analysis of the degree of movement in both F1 and F2, presented as Z1 and Z2 respectively after Bark normalization, both independently and together. Simply put, lower trajectory lengths indicate more monophthongal vowels while higher values indicate a more diphthongal vowel. Furthermore, trajectory length allows an analysis that captures which movement is occurring and to what degree, capturing any upgliding, fronting, or backing. Trajectory lengths will be used to establish if players are producing more monophthongal variants. As I hypothesize that this will be the case, trajectory lengths should remain low across all players.

The LBMS Index utilized single point F1 and F2 values at 50% duration, returning two values for each token of the six vowels involved. CR utilized F1 values at all five duration percentages, returning five values for all tokens of the five vowels. Monophthongal FACE and GOAT utilized F1 and F2 values at all percentages, returning 10 values for every token.

Due to the large number of tokens, it was not possible to check the accuracy of each value by hand. To minimize the impact of errors which occurred during forced alignment and or extraction, and to account for potential outlier tokens, Mahalanobis distance (Mahalanobis, 1936) was used to exclude the furthest 5% of values from the mean at each percentage for each vowel. Establishing an outlier exclusion point of two standard deviations away from the mean removed tokens which were misaligned or potential outliers. For a more in-depth explanation of the value of using Mahalanobis distance as a filter see Stanley (2020).

5.5 Sociolinguistic Analysis

After determining which SCE variables were present within the speech of the players, differing factors were tested to identify any statistically significant differences in the degree of usage for each variable. As the three variables are being utilized to differing degrees, either completely absent, occurring below expected SCE equivalents, or adhering to these expectations, further analysis of social factors and their potential influence was key to understanding the larger influence of SCE on the average player's speech. The factors analyzed were taken directly from demographic information players gave during their interviews, focusing mostly on specific knowledge about each player's career up to, and including, where they currently are playing.

5.5.1 Social Factors Analyzed

Looking specifically at the demographic information, I tested if hometown and state correlate with the aforementioned vowel patterns. As there are nine states represented by players in this study, it is possible that players from certain states utilize a variable to a higher degree, or possibly reaching the expected SCE values, while others are not. Furthermore, as there are states included from many different US regions, from the UM (Minnesota, Wisconsin), IN (Michigan, New York, Ohio), ENE (Massachusetts), WPA, the MA (Maryland), to the West (Colorado), it is possible that players from these regions utilize a variable more than others. In addition to hometown, age is tested to see if it has any effect on usage.

Using a combination of player's interviews and their career statistical information, additional social factors are constructed based specifically on the sport. The first factor of analysis was a categorical distinction between career pathway between the age of 18-21 years old. At this point, players had to pick between playing collegiate or major junior, semi-professional hockey. As this came up as a potentially impactful aspect of group formation within the team in multiple interviews, it presented a factor that potentially shapes the speech of each group. A secondary reason for the importance of this factor is tied to the national distribution of the programs between the NCAA and the three major junior leagues. The vast majority of these major junior teams are located in Canada, meaning players on those teams would have spent far more of their career there as opposed to collegiate players in the US.

The second factor analyzed was also a categorical distinction between which level the player was currently playing, the AHL or the ECHL. AHL players are typically more skilled, as this league is typically considered the prime developmental league for the NHL. Players in the AHL can be called up to their NHL affiliate at any point throughout a season. ECHL players are more likely to have to rise up the hierarchy, first into the AHL and then into the NHL. AHL players typically receive higher salaries and are more likely to have a longer career in the sport than their ECHL counterparts.

A final categorical distinction was made between rookies and veterans. All players in their first or second year playing professionally were designated as rookie players, with all other players veterans. Because some players joined their professional team later in the season, I included second year players in the rookie designation. Building upon this idea, age at the time of interview was also analyzed. Due to the different developmental paths, some players reach the professional level as early as 18 years of age. However, those who take the college route are typically much older when they become professionals. Due to this, rookie players ranged in age from 21 to 26, while veteran players ranged from 22 to 32. It is possible that the age of the player is just as, if not more, important in SCE influence than the years they have played as professionals. Testing both aspects offered a better understanding of the importance of age and years played as a professional.

5.5.2 Modeling Social Factor Effects

Linear mixed-effects models using the R package lmer4 (Bates et al., 2015) were used to test the statistical significance of each factor outlined above. Secondary metrics from those gathered in the phonetic analysis were required for these mixed-effects models. The LBMS Index only supplies a single number for each player; however, it offers a framework to establish how far each individual token of BIT, BET, and BAT has shifted along the front diagonal of the vowel space. Utilizing the stable mean F1 and F2 of BEET, the Euclidean distance of each token from the anchor vowel could be established, thus providing values for every token for mixed-effects model. While this does not show how the vowels have moved in tandem, it does allow an analysis of each individual vowel, capturing the influence of each factor outlined above. This analysis also demonstrated how far each vowel had shifted independent of the other two. An updated version of Becker's (2019) equations, used to determine each token's Euclidean distance, equation is given below.

$$d_{\nu_1} = \sqrt{(\mathrm{F2}_{\nu_1} - \mathrm{F2}_{\textsc{beet}})^2 + (\mathrm{F1}_{\nu_1} - \mathrm{F1}_{\textsc{beet}})^2}$$

For CR, mean F1 values of TIE and COW were used as a base from which each potentially raised variant was subtracted. This allowed a degree of raising to be calculated for each token at each duration percentage from the expected unraised mean. HOUSE tokens were tested against the mean of each unraised variant COW and DOWN. The equation of this calculation for TIGHT tokens is given below. Again, alpha represents the percentage from where the F1 measurement was taken. Testing of the raising HOUSE against both COW and DOWN utilized variations of the same equation.

$$\nu_1 \text{ Raising}_\alpha = \text{TIE F1}_\alpha - \nu_1 \text{ F1}_\alpha$$

Monophthongal FACE and GOAT was able to be analyzed at a token level following the same methodology outlined above, the only difference being that the trajectory length for each token was calculated instead of utilizing means.

The single values outlined above were then used as the dependent variables of linear mixed effects models. All social factors were then tested as fixed effects, to establish if they were affecting the data in any significant way. Players were treated as a random effect to minimize the impact of individual differences between each player and focus on the social factor being studied.

Chapter 6

Results: The Low-Back-Merger Shift

In this chapter, I present players' results measuring the state of the Low-Back-Merger Shift (LBMS). I begin with an impressionistic comparison of the mean formant values, both F1 and F2, against the corresponding SCE values provided by *ELC* and also against the *ANAE* benchmarks. I then make a case that HOCKEY functions as a distinct third vowel in the Low Back vowel space for the players. Utilizing Pillai scores, I measure the degree of merger between BOT and BOUGHT. I then calculate LBMS Index scores to measure the degree of shifting in the short front vowels BIT, BET, and BAT. The chapter concludes with an analysis of the impact of social effects on these Index scores, specifically the degree to which each of the short front vowels has shifted.

6.1 Comparison with Standard Canadian English

Mean F1 and F2 values for all players for each of the vowels involved in the LBMS are presented below in Table 6.1. Individual player mean values can be found in Appendix B. Values were measured at the midpoint (50%) of vowel duration. All tokens occurring before laterals and rhotics were excluded. Additionally, all tokens occurring before nasals and /g/ were not factored into these mean values. HOCKEY was treated as a separate vowel distinct from both BOT or BOUGHT due to the potential variation mentioned by players throughout their interviews.[48] While the calculation of these means followed the methodology of *ANAE* or *ELC* directly, the values can be used for impressionistic comparison to establish if these players are aligning more with the expected averages of SCE, or their own potential regional American Englishes. It should be noted that *ANAE* and *ELC* both analyze data that includes male and female speakers,

[48] It is possible that HOCKEY functions as a stereotype indexing inclusion within the hockey community which will be addressed further in Chapter 9 of this dissertation.

and this dissertation only includes male speakers. However, for this impressionistic comparison, all data was normalized following the *ANAE* methodology establishing scaling factors for each player using the Telsur G value of 6.896874 (Labov et al., 2006, p. 40). Each player's scaling factor was greater than 1, allowing the data to be compared with the speakers in the *ANAE* and *ELC*. Given with the mean values are the corresponding SCE values from the *ELC* and also the *ANAE* benchmarks for the LBMS vowels. Bold values indicate alignment between the players' data and *ANAE* benchmarks.

Table 6.1: Low-Back-Merger Shift vowel mean F1 and F2 values at 50% duration with *ELC* data and *ANAE* benchmarks

	Player Data		*ANAE Benchmarks*		*ELC Data*	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
BIT	555	1,891			563	2,051
BET	**687**	1,771	> 650		732	1,891
BAT	792	**1,791**		< 1,825	885	1,727
BOT	775	1,288		< 1,275	771	1,214
BOUGHT	763	**1,232**				

ANAE suggests that speakers who exhibit the LBMS will produce BET F1 values greater than 650 Hz, BAT F2 values of less than 1825 Hz, and BOT F2 values, merged with BOUGHT, of less than 1275 Hz (Labov et al., 2006, p. 219). The players' mean formant values aligned with two of the three *ANAE* benchmarks, the mean BET F1 value was 687 Hz and mean BAT F2 was 1,791 Hz which showed the lowering and retraction of both vowels expected as part of the LBMS. The players' mean BOT F2 value fell just short of the benchmark, but only by 12 Hz. However, the players' mean BOUGHT F2 value did surpass the benchmark. It is possible that if these vowels were not analyzed as distinct, then the merged value would also align with the *ANAE* benchmark for F2.

Although *ANAE* does not provide benchmarks for the F1 or F2 values of BIT, *ELC* data can provide some insight on the expected positioning of the high vowel undergoing the shift in SCE. *ELC* presents an interregional SCE mean BIT F1 value of 563 Hz paired with an F2 value of 2,051 Hz. When compared to Boberg's data, the players produced a remarkably similar mean F1 value but a rather different F2 value. F1 values differed by only 8 Hz but F2 values differed by 160 Hz. The players' F2 value was more centralized in the vowel space at 1,891 Hz suggesting more retraction than Boberg's Phonetics of Canadian English data. In fact, the players produced an F2 value for BIT which was identical to the F2 value for SCE BET which demonstrated that the movement of BIT was largely retracting. Moving further down the front diagonal, the players started to show greater deviation from SCE formant values. The players' mean BET F1 value of 687 Hz was far less than the 732 Hz seen in the *ELC* for SCE speakers suggesting less lowering in the speech of the players. Additionally, their mean BET F2 of 1,771 Hz was far more centralized than the SCE mean of 1,891 Hz which was, once again, more indicative of retraction rather than the lowering expected for the LBMS. The players' mean BAT F1 value was 792 Hz, 93 Hz less than the 885 Hz value given by Boberg as the mean SCE counterpart, suggesting that the players did not lower to the degree expected for SCE speakers. Mean BAT F2 values between the groups were relatively similar. However, the players' BAT F2 values were larger than Boberg's SCE speakers, indicating that they were produced further forward in the vowels space, indicative of less retraction. Overall, the players did not lower or retract BAT nearly as much as SCE speakers.

Turning to the Low-Back Merger (LBM), *ELC*, analyzing BOT and BOUGHT as a single vowel, provides a mean F1 value of 771 Hz and F2 value of 1,214 Hz. Although these were treated as two separate vowels in the players' data, the mean formant values for both were very similar. The players produced BOT slightly lower in the vowel space with a mean F1 value of 775 Hz and BOUGHT slightly higher, with a mean value of 763 Hz. Boberg's SCE mean is directly between the two. Players' mean BOUGHT F2 was 1,232 Hz while BOT was 1,288 Hz, suggesting a position which was further backed in the vowel space for BOUGHT. Both values were more centralized than the SCE mean F2 value for the merged vowel of 1,214 Hz but only slightly. Overall, the players' formant values for the low back vowels were similar to Boberg's SCE speakers. The players' F1 means were both within 10 Hz, of the SCE merged low back vowel. Both F2 values the players produced were slightly greater than the SCE speakers, though BOUGHT was closer. Furthermore, these F2 values were on either side of the *ANAE* benchmark, suggesting that when analyzed together, they results would have likely aligned more closely with this benchmark, even though the values were greater than those seen in Boberg's data.

6.2 Establishing HOCKEY as a Distinct Vowel

Before discussing the results of my analyses of the LBMS, I first wanted to give further explanation as to why HOCKEY was analyzed as a separate vowel that was neither BOT nor BOUGHT. CMUdict categorizes the vowel in *hockey* as BOT; however, numerous players mentioned that the pronunciation of the word was a good indicator on whether an individual was a hockey player and therefore associated with the larger hockey community. Below is one of the quotes to best describe this difference. The I have replaced each token of *hockey* with an IPA transcription corresponding to what was said. I have chosen to transcribe the vowel in *hockey* as [ɑ̞] for reasons which will be discussed later in this section.

> "Well I heard like [ˈhɑ̞ki], like a lot of like [ˈhɑ̞ki] players say [ˈhɑ̞ki] but like- not like [ˈhɑki]. You know what I mean? Like I don't know I- I- just know it as [ˈhɑ̞ki] but I guess like if you play [ˈhɑ̞ki] you say [ˈhɑ̞ki], not like 'Oh, do you play [hæ]- [hɑ]- do you play [ˈhɑki]?' Like no I don't play [ˈhɔki]. I play [ˈhɑ̞ki]." – Jones

Due to this, I decided it would be beneficial to analyze these tokens as a belonging to a separate vowel class to establish how they differed from other BOT tokens. By assigning all *hockey* tokens to a separate vowel, BOT F1 and F2 values should have been indicative of each player's actual pronunciation of that vowel without being skewed towards a potentially different location in the vowel space due to influence from this novel HOCKEY vowel. Lobanov-normalized mean F1 and F2 values of BOT, BOUGHT, and HOCKEY at 50% are given below in Table 6.2 for each player. Once again, the average F1 and F2 values are provided at the bottom of the table.

Figure 6.1 shows the vowels space for the low back vowels, including my new categorization of the HOCKEY vowel. Each point represents an individual player's mean with the ellipse representing one standard deviation from the mean of the group. Individual plots for each players' low back vowels can be found in Appendix B.

Looking fist at mean F1 values, a trend emerged for the most of players differentiating HOCKEY from both BOT and BOUGHT. Apart from two players, Allen and Vasquez, all players had mean HOCKEY F1 values which were greater than 1.00, indicative of a lower tongue position. Additionally, 95% of the players produced HOCKEY F1 values which were greater than the other two low back vowels. This uniformity was captured by the average mean HOCKEY F1 value being 1.20, 0.36 greater than the 0.84 seen for BOT. Comparing the mean F1 values of *hockey* and BOT, only four players produced a mean BOT F1 value of 1.00 or greater: Allen, Campbell, Carter, and Collins. Of those four, Campbell and Collins still had differences of 0.32 and 0.20 between HOCKEY and BOT mean F1 values, respectively, with HOCKEY being produced lower in the vowel space. The two mean F1 values produced by Carter were relatively similar, with a mean HOCKEY F1 of 1.17 and a mean BOT F1 of 1.05, still following the trend of a lower HOCKEY vowel. Allen was the only player who did not produce a mean HOCKEY F1 value greater than the mean F1 value of BOT; Allen's BOT F1 value of 1.00 was 0.19 greater than his HOCKEY value of 0.81. Comparing

Table 6.2: Lobanov-normalized mean F1 and F2 values for BOT BOUGHT and HOCKEY at 50%

Player	HOCKEY		BOT		BOUGHT	
	F1	*F2*	*F1*	*F2*	*F1*	*F2*
Allen	0.81	-1.21	1.00	-1.26	0.78	-1.49
Anderson	1.13	-0.79	0.95	-1.29	0.77	-1.24
Bell	1.37	-1.22	0.82	-1.44	0.85	-1.62
Campbell	1.41	-1.38	1.08	-1.54	0.75	-1.92
Carter	1.17	-1.30	1.05	-1.31	1.07	-1.37
Clark	1.15	-1.45	0.81	-1.52	0.93	-1.51
Collins	1.34	-1.38	1.14	-1.46	0.64	-2.04
Cook	1.22	-1.23	0.85	-1.25	0.64	-1.50
Hall	1.24	-1.07	0.79	-1.26	1.06	-1.37
Jackman	1.31	-0.94	0.82	-0.95	0.69	-1.20
Johnson	1.16	-1.58	0.61	-1.65	0.89	-1.70
Jones	1.15	-0.92	0.61	-1.29	0.45	-1.35
King	1.17	-1.38	0.75	-1.36	0.92	-1.30
Martin	1.29	-1.16	0.74	-1.35	0.62	-1.62
Mitchell	1.27	-1.45	0.91	-1.40	1.22	-1.39
Nelson	1.71	-1.16	0.99	-1.28	0.81	-1.50
Phillips	1.21	-1.17	0.67	-1.21	0.62	-1.43
Taylor	1.08	-1.50	0.64	-1.46	0.57	-1.74
Thomas	1.03	-1.50	0.75	-1.58	0.78	-1.59
Vasquez	0.79	-1.49	0.71	-1.48	0.53	-1.57
Average	**1.20**	**-1.26**	**0.84**	**-1.37**	**0.78**	**-1.52**

mean HOCKEY and BOUGHT mean F1 values, every player produced a lower mean HOCKEY F1 value. Although only marginally so, even Allen's 0.81 mean HOCKEY F1 value was greater than his 0.78 mean BOUGHT. The overall average mean BOUGHT F1 values was 0.78, 0.06 less than the average mean BOT value of 0.84 and 0.42 less than the average mean HOCKEY value. This is not overly surprising, as only seven of the 20 players had a greater mean BOUGHT F1 value when compared to BOT.[49]

[49] A comparison between mean BOT and BOUGHT F1 and F2 values will be provided later in this chapter.

Turning to mean F2 values, there was less separation between the three vowels although not necessarily a lack of uniformity. Apart from four players, King, Mitchell, Taylor, and Vasquez, all players produced a mean HOCKEY F2 value greater than their mean BOT value, indicative of a more forward tongue position. The four players who did not follow the trend produced incredibly similar mean F2 values between the vowels; King's mean F2 values differed by

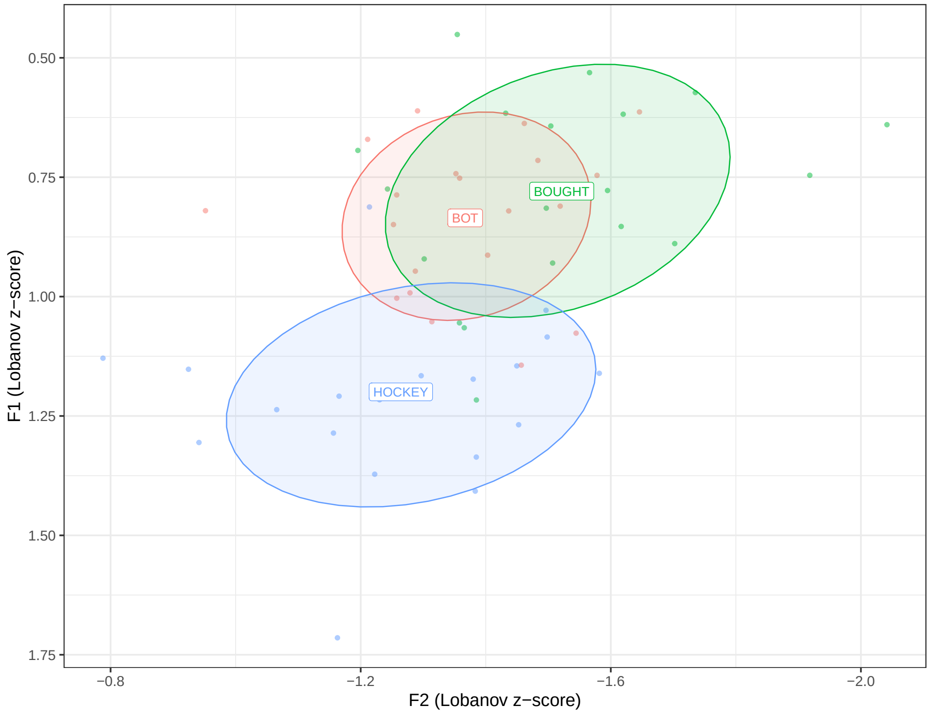

Figure 6.1: Low-Back-Merger vowels at 50% for all players (ellipse indicates one standard deviation)

only 0.02, Mitchell by 0.05, Taylor by 0.04, and Vasquez 0.01. Due to this, it seems that all 20 players either produced HOCKEY at either the same point or more fronted than BOT. This uniformity explains why the average mean HOCKEY F2 value, -1.26, was 0.11 greater than that of BOT, -1.37. However, this degree of fronting is noticeably less different than the lowering seen when comparing the average mean F1 values of both HOCKEY and BOT. Comparing mean HOCKEY and BOUGHT mean F2 values, every player produced a lower mean HOCKEY F2 value apart from King and Mitchell, two of the four players who failed to produce more fronted HOCKEY tokens. Once again, both King and Mitchell produced mean HOCKEY and BOUGHT F2 values that were very comparable; King produced a difference of 0.08 and Mitchell a difference of 0.06 between the two vowels.

Even though the mean F1 and F2 values seemed to indicate that the players were producing a distinct third low back vowel, one which seemed to be produced lower in the vowel space than BOT, it was important to measure the degree of overlap between this potentially novel vowel and both traditional low back vowels. The results of MANOVA tests for each player measuring the degree of overlap between HOCKEY and both BOT and BOUGHT are given in Table 6.3. The Pillai score–returned by the MANOVA test–ranges from 0-1. Lower scores were indicative of more merged vowels, while larger scores suggested more distinct vowels with less overlap.

Table 6.3: Results for MANOVA tests of HOCKEY-BOT and HOCKEY-BOUGHT

Player	HOCKEY-BOT		HOCKEY-BOUGHT	
	Pillai	*Approx. F-value*	*Pillai*	*Approx. F-value*
Allen	0.170	1.64	0.175	1.38
Anderson	0.261	6.17	0.291	4.11
Bell	0.262	9.57	0.394	5.53
Campbell	0.195	3.52	0.797	74.43
Carter	0.065	3.10	0.069	3.14
Clark	0.346	9.27	0.181	4.19
Collins	0.218	7.79	0.868	134.46
Cook	0.181	3.87	0.621	27.05
Hall	0.214	5.46	0.541	14.13
Jackman	0.243	4.18	0.595	18.39
Johnson	0.152	2.07	0.135	0.94
Jones	0.389	21.99	0.464	31.20
King	0.258	5.57	0.113	1.78
Martin	0.413	26.72	0.697	66.72
Mitchell	0.214	6.25	0.063	0.64
Nelson	0.497	19.29	0.697	18.40
Phillips	0.438	12.08	0.518	15.05
Taylor	0.317	13.21	0.623	43.00
Thomas	0.241	13.30	0.382	20.41
Vasquez	0.017	0.25	0.365	3.74
Average	**0.255**	**8.76**	**0.429**	**24.43**

Pillai scores from the MANOVA test of HOCKEY-BOT ranged from 0.017 in the speech of Vasquez to 0.497 in the speech of Nelson. While this is a very large degree of difference, most of the players had relatively large Pillai scores. Only two players did not produce a score greater than 0.1, Carter and Vasquez. Furthermore, only six players had Pillai scores of less than 0.2, the two previously mentioned players and also Allen, Campbell, Cook, and Johnson. Overall, 70% of the players had Pillai scores which were rather large. The average Pillai score for HOCKEY-BOT was 0.255, suggesting that HOCKEY was a distinct vowel in their speech not merged with BOT. It was also important to test the degree of overlap between HOCKEY and BOUGHT to establish that players were not producing *hockey* tokens with the BOUGHT vowel and that CMU-dict had incorrectly categorized these tokens as BOT. The Pillai scores returned from the MANOVA test of HOCKEY-BOUGHT were typically larger than those seen between HOCKEY-BOT, with only four players having a lower Pillai score in the latter; Clark, Johnson, King, and Mitchell. This suggests that these four players produced HOCKEY tokens with a larger degree of overlap with BOUGHT tokens than when compared to BOT tokens. Similar to the HOCKEY-BOT, only two players had HOCKEY-BOUGHT scores less than 0.1, Carter and Mitchell, 0.069 and 0.063, respectively. Four additional players, Allen, Clark, Johnson, and King had Pillai scores of less than 0.2. Once again 70% of the players had scores that were above 0.2 which further established the HOCKEY vowel as distinct from both the low back vowels, BOT and BOUGHT.

6.3 The Low-Back Merger

Having established HOCKEY as a third distinct vowel in the low back portion of the vowel space, I decided to remove HOCKEY from the analysis of the LBM, an important aspect of the LBMS.[50] Returning to the Lobanov-normalized F1 values, most of the players produced mean BOT values greater than BOUGHT; seven players went against this trend: Bell, Carter, Clark, Hall, Johnson, King, and Mitchell. The average mean BOT F1 value was 0.84 while the average mean BOUGHT value was 0.78. Overall, this difference, only 0.06, was much smaller than the differences seen between HOCKEY and either of the low back vowels, 0.36 for BOT and 0.42 for BOUGHT, respectively. Mean F2 values for the low back vowels showed more uniformity across the players. All but four players, Anderson, Clark, King, and Mitchell, produced a greater mean BOT F2, suggesting a more forward position in the vowel space. However, Clark and Mitchell produced mean F2 values that only differed by 0.01. Anderson's mean F2 values differed by 0.05 and King's by 0.06. Overall, these differences were minimal, suggesting that all 20 players produced BOT either more forward or in line with BOUGHT in the vowel space with respect to frontedness. The average mean BOT F2 value was -1.37 and the average mean BOUGHT value was -1.52. The difference in average mean BOT F2 was comparable when compared to the average mean HOCKEY value, a difference of 0.11, and the average mean BOUGHT value, a difference of 0.15.

[50] It is possible that the existence of HOCKEY could block the retraction of BAT and impact LBMS Index scores.

To further test the degree of overlap between BOT and BOUGHT, MANOVA tests were again used to calculate Pillai scores. The results of these tests for each player are given in Table 6.4. The average of all player Pillai scores was 0.169 with an approximate F-value of 7.94. This average was noticeably smaller than the equivalent values for HOCKEY - BOT, 0.255, and also HOCKEY - BOUGHT, 0.429. The average HOCKEY - BOUGHT Pillai score was more than double that of BOT-BOUGHT; however, this is not particularly surprising, as CMUdict categorizes *hockey* tokens as BOT, so the largest Pillai score would be expected between HOCKEY and BOUGHT.

Table 6.4: Results for MANOVA tests of BOT-BOUGHT

Player	BOT-BOUGHT	
	Pillai	*Approx. F*
Allen	0.105	1.69
Anderson	0.046	0.73
Bell	0.036	0.82
Campbell	0.314	7.99
Carter	0.013	0.48
Clark	0.024	0.43
Collins	0.749	88.12
Cook	0.127	2.91
Hall	0.078	1.57
Jackman	0.409	9.35
Johnson	0.180	2.74
Jones	0.068	1.73
King	0.039	0.43
Martin	0.210	12.10
Mitchell	0.190	5.73
Nelson	0.247	5.73
Phillips	0.188	4.52
Taylor	0.243	9.13
Thomas	0.007	0.37
Vasquez	0.103	1.79
Average	**0.169**	**7.94**

Based on the MANOVA test results, players seemingly fell into five different ranges of Pillai scores. Five players had a Pillai score lower than 0.05: Anderson, Bell, Carter, Clark, and Thomas. These players exhibit the greatest degree of overlap for BOT and BOUGHT. Three players had a Pillai score between 0.05 and 0.1: Hall, Jones, and King. While not as overlapping as the first group, these speakers still demonstrated a large degree of merger. Five players–Allen, Cook, Martin, Taylor, and Vasquez–had Pillai scores ranging from 0.1 to 0.2, moving further away from merged vowels. An additional five players ranged from 0.2-0.4 in Pillai score, Campbell, Johnson, Nelson, and Phillips, which suggests more distinct vowels. Finally, two players had Pillai scores greater than

0.4, Collins and Jackman. The larger Pillai scores seen in the last two groups, those with scores greater than 0.2, demonstrated that the LBM was, minimally, not uniform for all players and potentially absent in those at the far end of the range. While these high Pillai scores did not necessarily disqualify players from undergoing the LBMS, it did present a problem for the theory that the LBM is a cause of the shift. Specifically, if players with high Pillai scores measuring the merger of BOT and BOUGHT also have large LBMS Index scores, then it is possible that the merger is not the catalyst for the shift occurring at the front of the vowel space. I provide the results of this analysis of the LBMS in the next section of this chapter.

Intriguingly, 15 players produced larger Pillai scores when the overlap of HOCKEY-BOT was measured than when the same measurement was taken between BOT-BOUGHT. Only Campbell, Collins, Jackman, Johnson, and Vasquez fell outside of this generalization. It is worth noting that the analysis of BOT-BOUGHT overlap for Campbell, Collins, and Jackman all returned relatively high Pillai scores, 0.314, 0.749, and 0.406, respectively. Thus, even though their HOCKEY-BOT Pillai scores were lower, it still seems that they produced three distinct vowels. Furthermore, Johnson's two Pillai scores were very similar, 0.152 for HOCKEY-BOT and 0.180 for BOT-BOUGHT. Only Vasquez showed merging between HOCKEY and BOT and a smaller Pillai score when compared to BOT-BOUGHT. The implications from this will be analyzed in further detail in Chapter 9.

6.4 The Low-Back-Merger Shift Index

Turning to the short front vowels involved in the LBMS, Lobanov-normalized mean F1 and F2 values of BIT, BET, and BAT at 50% are given below in Table 6.5 for each player. The average F1 and F2 values are provided at the bottom of the table. Figure 6.2 shows the vowels space for the short front vowels. Each point represents an individual player's mean with the ellipse representing one standard deviation from the mean of the group. Individual plots for each player's LBMS vowels can be found in Appendix B.

LBMS Index scores of Lobanov-normalized data, calculated using the sum of the Euclidean distance of each short front vowel from the anchor point of BEET divided by three, are given in Table 6.6. The individual Euclidean distances used to calculate the Index scores are also provided. Greater LBMS Index scores were indicative that the LBMS had taken place and that a player's speech was more comparable to dialects where this shift has been attested. LBMS Index scores ranged from 2.41, in the speech of Johnson, to 1.57 for Vasquez. The

Table 6.5: Lobanov-normalized mean F1 and F2 values for Low-Back-Merger Shift vowels at 50% vowel duration

Player	BIT		BET		BAT	
	F1	*F2*	*F1*	*F2*	*F1*	*F2*
Allen	-1.12	0.49	0.10	-0.03	1.05	-0.12
Anderson	-0.95	0.29	0.16	0.05	0.85	0.28
Bell	-0.68	0.21	0.06	-0.17	1.23	0.13
Campbell	-0.73	0.44	0.31	-0.13	0.86	-0.16
Carter	-0.63	0.44	0.23	-0.23	1.24	-0.19
Clark	-0.76	0.53	0.30	0.07	0.86	-0.14
Collins	-0.58	0.13	0.54	-0.23	0.87	0.18
Cook	-0.77	0.47	0.12	0.19	1.44	0.16
Hall	-0.72	0.26	0.15	-0.14	1.05	0.18
Jackman	-1.00	0.30	0.26	-0.34	0.88	0.10
Johnson	-0.86	0.38	0.23	0.14	0.83	-0.22
Jones	-0.97	0.35	-0.05	-0.06	0.64	0.06
King	-0.60	0.41	0.08	-0.02	1.05	-0.38
Martin	-0.65	0.37	0.23	0.15	1.26	0.38
Mitchell	-0.95	0.50	0.24	0.04	1.00	-0.04
Nelson	-0.84	0.10	-0.09	-0.08	0.68	0.03
Phillips	-1.06	0.22	0.11	0.03	0.82	-0.23
Taylor	-0.70	0.38	0.07	-0.05	0.68	-0.04
Thomas	-0.56	0.38	0.44	0.47	1.44	0.38
Vasquez	-0.61	0.01	0.36	0.08	0.77	0.55
Average	**-0.68**	**0.29**	**0.18**	**-0.01**	**0.88**	**0.03**

average value was 1.92. Scores on the extreme high end of this range were comparable to SCE and Western American English dialects, i.e., dialects which exhibit the LBMS. The opposite could be said for the low end of the range, where scores indicated that the shift had not occurred.

Turning to Euclidean distances, the average BIT for all players was 1.1 z-score units retracted from BEET, with BET a similar distance further down at 2.01 z-score units, with a difference of 0.9 units between BIT and BET. BAT was shifted to lesser extent at only 2.64 z-score units from BEET, only 0.63 units further retracted than BET. Figure 6.3 positions the LBMS Index scores for all players increasing in value descending the y axis. The black dashed lined indicates the mean for the entire group, 1.92 z-score units.

Similar to that seen in Pillai scores, players LBMS Index scores varied within a large range. While Vasquez had the lowest value of 1.57, there were five speak-

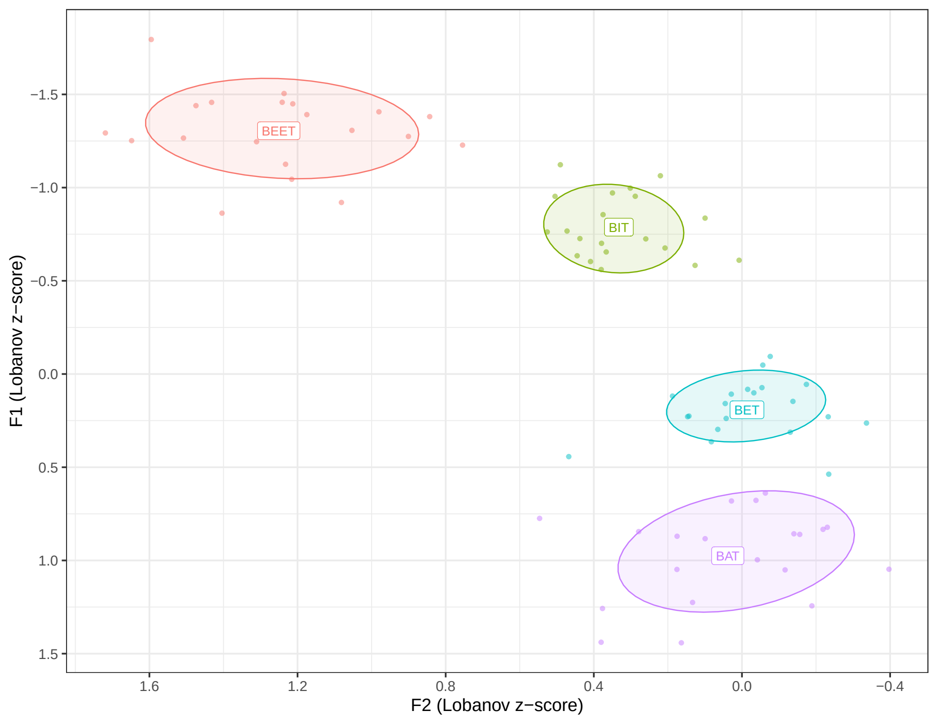

Figure 6.2: Low-Back-Merger Shift vowels at 50% duration (ellipse indicates one standard deviation)

ers with very similar low Index scores, between 1.6 and 1.75; Bell, Cook, Hall, Nelson, and Phillips. 12 players, the vast majority of those studied, had LBMS Index scores ranging from 1.8 to 2.15: Allen, Anderson, Campbell, Carter, Clark, Collins, Jackman, Jones, Martin, Mitchell, Taylor, and Thomas. Only two players had a LBMS Index score greater than 2.15: Johnson and King.

Individual Euclidean distance for each vowel from the BEET anchor point offered some explanation as to why the LBMS Index scores varied a considerable amount amongst the players. Looking specifically at BIT, Bell, Clark, Cook, Martin, Thomas, and Vasquez, all had a Euclidean distance under 1 z-score unit. While this did not keep Martin and Thomas from reaching an Index score similar to the other players in the study, it did start to explain the low values seen in Bell, Clark, Cook, and Vasquez. Inversely, Johnson, Jones, and King all had distances greater than 1.4 units. Continuing down the diagonal, most of players had a BET distance approaching or surpassing 2 z-score units; however, Bell, Cook, Nelson, Phillips, and Vasquez all remained under 1.75 units, continuing a trend for Bell, Cook, and Vasquez of reduced movement

Table 6.6: Low-Back Merger Shift Index scores with Euclidean distance between short front vowels and BEET

Player	*LBMS Index Score*	BIT *Eud*	BET *Eud*	BAT *Eud*
Allen	2.07	1.16	2.16	2.90
Anderson	1.86	1.08	2.01	2.50
Bell	1.62	0.91	1.59	2.35
Campbell	2.14	1.24	2.37	2.92
Carter	2.04	1.07	2.15	2.92
Clark	1.91	0.97	2.09	2.67
Collins	1.92	1.18	2.25	2.37
Cook	1.68	0.66	1.56	2.81
Hall	1.73	1.02	1.81	2.35
Jackman	2.02	1.06	2.37	2.64
Johnson	2.41	1.54	2.49	3.19
Jones	2.07	1.41	2.17	2.63
King	2.20	1.35	2.13	3.11
Martin	1.85	0.98	1.84	2.73
Mitchell	1.97	1.06	2.10	2.75
Nelson	1.67	1.17	1.67	2.17
Phillips	1.74	1.20	1.68	2.35
Taylor	1.79	1.06	1.92	2.40
Thomas	1.9	0.95	1.87	2.87
Vasquez	1.57	0.97	1.73	2.02
Average	**1.91**	**1.10**	**2.00**	**2.63**

of the short front vowels compared to their counterparts. Campbell, Jackman, and Jones experienced the largest BET distance, all being greater than 2.3 units. While both BIT and BET distances were influential in LBMS Index scores, variation in BAT distance appeared to have the biggest impact on overall value. The only two players who surpassed a BAT distance of 3 units, Johnson and King with distances of 3.19 and 3.11 units, respectively, also exhibited the largest LBMS Index score. Bell, Hall, Nelson, Phillips, Taylor, and Vasquez all had BAT distances under 2.45 units. Bell and Vasquez uniformly exhibited smaller Euclidean distances for all three vowels; however, the low LBMS Index scores of Hall, Nelson, and Phillips seem to be more influenced by small BAT distances than the other two vowels. Cook appeared to be somewhat of an outlier among those with lower LBMS Index scores, with smaller BIT and BET distances, but

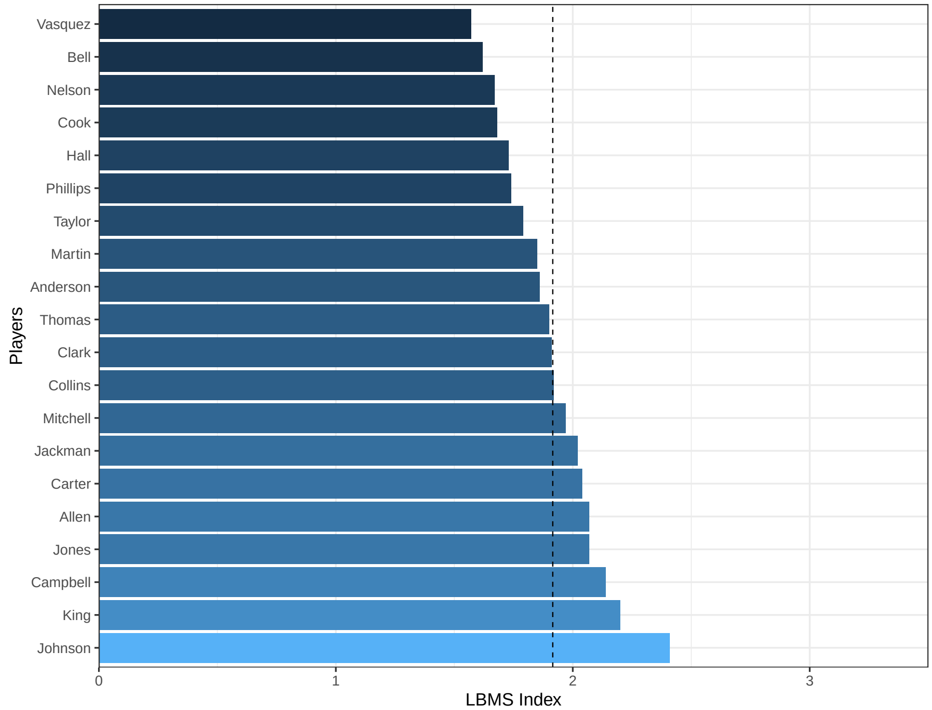

Figure 6.3: Low-Back-Merger Shift Index Scores

a normal BAT distance. How these values compared to different Canadian and American dialects will be analyzed in Chapter 9.

6.5 Social Effects on Low-Back-Merger Shift Index Scores

Linear mixed effect regression models were used to test the statistical significance of various sociological and hockey-specific factors on the positioning of BIT, BET, and BAT along the front diagonal. As the LBMS Index score only provided a single number for each player, the Euclidean distance of each short front vowel token was measured from the mean BEET F1 and F2 value. These Euclidean distances were the variable tested against various fixed effects, with player as a random effect. The fixed effects included player's region of hometown, league each player was current playing in (AHL or ECHL), developmental pathway (NCAA or Major Junior), status on their team (rookie or veteran), and categorical age (21-22, 23-24, 25-26, and 27+). The results for both BIT and BAT Euclidean distances against the fixed effect of region are given in Table

6.7. The intercept for each model was set as the region which had produced the smallest estimate for Euclidean distance to establish if any regions produced differences which were significantly greater than the smallest region and, therefore, more indicative of the movement expected with the LBMS. The same methodology was employed for age. All other fixed effects represented only two possible values, and, thus, this was not required.[51]

[51] The results from all linear mixed effects regression models which did not have statically significant results can be found in Appendix B.

Table 6.7: Linear mixed models of Euclidean distance of short front vowels from BEET at 50% duration with player as a random effect and region as a fixed effect

Vowel	*Region*	*Estimate*	*t-Value*	*p-Value*
BIT	(Intercept)	0.99	10.54	<0.001***
	Mid-Atlantic	0.04	0.30	0.77
	Upper Midwest	0.06	0.54	0.60
	W. Pennsylvania	0.10	0.81	0.44
	Inland North	0.25	2.51	0.034*
	West	0.50	4.16	0.002**
BET	(Intercept)	1.92	9.83	<0.001***
	Mid-Atlantic	0.01	0.03	0.977
	E. New England	0.02	0.06	0.950
	Upper Midwest	0.16	0.69	0.500
	Inland North	0.19	0.87	0.397
	West	0.25	0.73	0.480
BAT	(Intercept)	2.53	30.19	<0.001***
	W. Pennsylvania	0.10	0.54	0.599
	Upper Midwest	0.17	1.24	0.236
	Mid-Atlantic	0.33	1.27	0.223
	E. New England	0.44	1.68	0.117
	West	0.66	3.37	0.005**

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Looking at the effect region had on BIT Euclidean distance, it was unsurprising that the West region had the largest estimate of 1.49, 0.50 greater than the intercept which in this model was Eastern New England. As the occurrence of LBMS has been extensively studied in this region, I expected a significant difference for players from the West. However, the West was not the only region which produced an estimate which was significantly distinct. The Inland North (IN) also had a relatively large estimate at 1.24. While this difference of 0.25 from the intercept was significantly different, it was still only half of the difference seen in the West, 0.50. These results demonstrate that players from the other regions, outside of the West and to a lesser extent the IN, were not lowering or retracting BIT the same degree. However, as BIT is only one of the three short front vowels, it is important not to over analyze this single metric but consider it in tandem with both BET and BAT. The statistical significance of region was entirely lost when measuring the Euclidean distance of BET to BEET. While players from the West still had the largest estimate, 0.25 greater than the intercept, Western Pennsylvania in this model, this difference was not significant. Furthermore, the West difference was only half of that seen for the Euclidean distance of BIT. The statistical significance of the West was present again when analyzing BAT Euclidean distance. The West estimate was 0.66 greater than the intercept, the IN in this model, of 2.53. However, it must be noted that the players from the IN might have been affected by the Northern Cities Vowel Shift (NCVS). If so, it is possible that players from the West were not retracting BAT but rather players from the IN were raising BAT. Either way, the West region produced estimates which were different at a statistically significant level for two of the three short front vowels, BIT and BAT. This would suggest that players from the West were more likely to display the LBMS, which aligns with the previous literature. The mixed models also showed potential lowering and retracting of BIT and BET for speakers from the IN, but the raising of BAT went against the LBMS. This would also potentially explain why these speakers ended with lower LBMS Index scores. These findings will be discussed further in Chapter 9.

6.6 Summary

The analysis of the LBMS provided intriguing results for the players. Overall, the status of the LBM was variant across the players. Although the Pillai scores for multiple players were relatively low, indicative of merged low back vowel, the scores ranged from 0.007 to 0.409. Because of this large range, the LBM was not uniform and therefore cannot be assessed with regard to any hockey-based linguistic persona. However, the analysis of this merger led to the unexpected finding of HOCKEY as a new distinct low back vowel for the players. The vast majority of players produced HOCKEY lower in the vowel space than BOT. Furthermore, many of the players mentioned that this pronunciation was indicative of being a hockey player, which established metalinguistic awareness of the value of this variant pronunciation. This awareness, further backed by distinct formant values, suggested that HOCKEY had gained indexical value linked to the sport. This will be discussed in further detail in Chapter 9.

Although the LBMS was present for some players, it was largely absent for others. LBMS Index scores ranged from 2.41 to 1.57. The only players with relatively large Index scores were both from the West, a region where this shift has been historically well documented. In fact, region did significantly impact the Euclidean distances of both BIT and BAT to BEET. For both, the West produced distances which were significantly larger than the other regions. The players with the lowest Index scores typically presented little to no lowering or retraction of BAT, which brought down their overall Index scores. The lack of BAT lowering or retraction could be linked to the NCVS, which stipulates that BAT raises. This variation in LBMS Index scores suggested that this variant has not been uniformly adopted by the players, and region dialect impacted usage. As the shift was absent for many players, it has not gained any indexical value linked to the sport, and therefore is not a variable of a hockey-bases persona. Again, this will be discussed in further detail in Chapter 9

As the LBMS was only one of the three vowels being analyzed in this dissertation, the results have been split among three chapters with this being the first. In Chapter 7, I present the findings for the analysis of Canadian raising. Chapter 8 then shifts focus to measuring the degree of movement within face and GOAT. The LBMS, including the LBM and the importance of the novel HOCKEY vowel, will be discussed again in Chapter 9.

Chapter 7

Results: Canadian Raising

In this chapter I present the results of my analysis for the speech of the 20 players interviewed. I begin with an impressionistic comparison of the mean formant values, both F1 and F2, for the players in the study against the mean F1 and F2 values provided for Canadian speakers in *ANAE* and *ELC*. The following section highlights the the degree of raising between the allophones involved Canadian raising (CR), TIE, TIGHT, COW, DOWN, and HOUSE for all players. I also address the placement of COW within the vowels space with respect to tongue advancement in this section.

7.1 Comparison with Standard Canadian English

The players' mean F1 and F2 values for each of the SCE vowels involved in CR are presented in Table 7.1. Individual player mean values can be found in Appendix C. Again, values were measured at the midpoint (50%) of vowel duration and tokens occurring before laterals and rhotics were excluded. Following *ELC* classification, DOWN, an allophone in which the vowel in COW is occurring before nasals, was analyzed as distinct from COW, where the vowel occurred before any voiced non-nasal sound or in an open coda position, and from HOUSE, which only occurs before voiceless segments. Bold values indicate alignment between the players' data and *ANAE* benchmarks.

ANAE establishes a benchmark of 60 Hz difference in F1 values between unraised, TIE and COW, and raised variants, TIGHT and HOUSE, respectively. When analyzing the difference between TIE and TIGHT, the players' mean F1 values differed by 110 Hz, well surpassing the 60 Hz benchmark. However, the same cannot be said for COW and HOUSE where the difference was only 31 Hz.

Table 7.1: Mean F1 and F2 values for Canadian raising vowels measured at 50% duration

	Player Data		ANAE Benchmarks		ELC Data	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
TIE	760	1,574			843	1,428
TIGHT	**650**	1,657	< TIE - 60		733	1,657
COW	768	**1,404**		< 1,550	874	1,604
DOWN	788	1,467			817	1,838
HOUSE	737	1,381	< COW - 60		732	1,692

While the mean HOUSE F1 value was less, indicating some degree of raising, it failed to reach the 60 Hz benchmark. Although *ANAE* does not comment on the expected position of DOWN with respect to COW and HOUSE, the players did produce a larger differential here indicative of potential DOWN lowering. This too failed to hit 60 Hz but was 20 Hz greater than the difference between COW and HOUSE. The players did align with one of the benchmarks pertaining to COW, as their mean F2 value was 1,404 Hz, well below the 1,550 Hz benchmark. This shows that, while the players were not uniformly raising to the same degree as expected in SCE, tongue advancement was comparable. Players produced COW in a backed position.

Again, as *ANAE* does not provide precise measurements for the F1 and F2 values of the CR variants, Boberg's *ELC* means will be used for impressionistic comparison between the players and SCE. Surprisingly, every mean F1 value for the players was less than the corresponding SCE value, indicating that the players produced these vowels higher in the vowel space. However, the difference between TIE and TIGHT for the players was 110 Hz, the exact same value seen in the *ELC* data. The players produced mean F1 values which were 83 Hz less for each variant. Thus, while the difference between variants was consistent, the actual height in the vowel space was very different. This largely carried over into COW and HOUSE with the main difference being that the players produced a mean HOUSE F1 value nearly identical to the SCE value. The players' mean COW F1 value of 768 Hz was far less than the SCE value of 874 Hz. Therefore, it appears the players produced a comparable raised HOUSE variant when height was accounted for, but a rather different COW variant which is also raised when compared to SCE speakers. It is possible that players were producing raised variants in both pre-voiceless and non-nasal pre-voiced positions. The mean DOWN F1 value for the players was lower than COW, a reversal of what is seen in Boberg's data where the mean COW F1 value is 57 Hz greater. Due to this, the players were closer to their SCE counterparts for mean DOWN F1 value than COW F1 value. The players differed by only 29 Hz when DOWN F1 is compared to SCE. Overall, height appeared to be a major difference for players and SCE. TIE, TIGHT, and COW were all produced higher in the vowel space than expected for SCE speakers.

Further differences were apparent when analyzing the players' mean F2 values. One major difference in the results for the players is the position of TIE and COW with respect to each other. The players produced TIE further forward in the mouth with a mean F2 value of 1,574 Hz. The mean TIGHT F2 value was even more advanced at 1,657 Hz. Player's mean COW F2 value was 1,404 Hz, far less than their corresponding TIE value. Although the mean DOWN F2 value was larger than COW at 1,467 Hz, this was still less than TIE. The mean HOUSE F2 value was the lowest of all variants at 1,381 Hz, suggesting it was produced the furthest back in the vowel space. These results are the opposite of what Boberg presents in *ELC* for SCE speakers. In SCE, the mean TIE F2 value is greater than COW values. Intriguingly, Boberg's data does not align with the *ANAE* benchmark for SCE COW F2 values, with his speakers producing F2 values 54 Hz greater than the benchmark. Although the players did match the F2 value for TIGHT with Boberg's SCE speakers, all other variants appeared to be flipped for the players. The SCE mean DOWN and HOUSE F2 values are very large when compared to the values produced by the players. For SCE, these are central or even approaching the front position of the vowel space at 1,838 Hz and 1,692 Hz. The players produced more backed variants of DOWN and HOUSE.

Although the players' data showed that raising had occurred to varying degrees, it is hard to argue that these variants would sound very Canadian. All variants were produced higher in the vowel space than what is expected for SCE and only TIE and TIGHT differed by the expected amount. Furthermore, TIE and COW appeared to be flipped in the vowel space for the players with respect to advancement, a result which will be discussed in further detail later in this chapter.

7.2 Classifying Canadian Raising Tokens

Following Chamber's (1973) categorization of CR, the players data was analyzed as participating in Dialect A, those who raise before voicing occurs in instances where flapping is possible. Chambers explains that Dialect B, a reversal of order for these rules, disappeared and Dialect A became "ubiquitous throughout heartland Canada" (p. 121). Therefore, Dialect A would be the style of raising expected of players who are adopting modern SCE CR. Due to this, *excited*, *fighting*, *fighters*, *lighter*, *untied*, and *writing* tokens were all categorized as TIGHT. Although players were likely to produce a voiced flap in all tokens, Dialect A stipulated that this flapping, or voicing, occurs after raising, and, therefore, the voicing of the flap was not relevant to the preceding vowel. This rule was far less influential when looking at COW and HOUSE. However, there was a single token type that was impacted; *scouted* tokens were categorized as HOUSE.

Chambers (1973) also addresses the somewhat problematic nature for tokens of *high school*. He notes for some speakers, "a minority inexplicably raises the first nucleus in the compound *high school*" (p. 116). However, in a footnote, he addresses that while only a single informant of his raised *high school* tokens consistently, raising of *high school* is more common than his data suggests. Due to this, and the abundance of *high school* tokens in the the data for this study, preliminary testing was done before final categorization of these tokens was determined. 14 of the 20 players produced at least one token of *high school*. These tokens were initially categorized neither as TIE nor TIGHT, and *ANAE*-normalized mean F1 values for each group were calculated. The average F1 values across all 14 players who produce *high school* tokens are given in Table 7.2.

Table 7.2: Average TIGHT, *high school*, and TIE F1 values throughout the vowel duration

Vowel	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
TIGHT	616	650	653	608	570
high school	743	735	677	594	547
TIE	655	719	759	743	682

Looking at TIGHT tokens, when excluding all tokens of *high school*, it was immediately apparent that average TIGHT F1 value was raised a considerable degree above TIE. This will be analyzed in-depth later in this chapter; however, what is important now is that this raising was uniform and surpassed the *ANAE* benchmark at every duration percentage after the onset (20%). While *high school* tokens did have a difference of -88 Hz at 20% and -15 Hz at 35% when compared to TIE, at the midpoint (50%) and throughout the remainder of duration percentages, the difference increased to 82 Hz, 149 Hz and 135 Hz at each concurrent percentage. This initial lower F1 position of *high school* tokens could possibly be attributed to the consistency of the preceding sound, /h/, while the phonological environment of TIE and TIGHT varied. Furthermore, at 65% and 80% duration, *high school* tokens had an average F1 value smaller than TIGHT tokens, 14 Hz and 23 Hz greater at 65% and 80%, respectively. Again, the consistency of the following sound for *high school* tokens, /s/, potentially explains this higher position when compared to TIGHT. With all compounding factors considered, *high school* tokens were categorized as TIGHT, and represented one of the most common tokens for the allophone. The trajectory of these tokens from the midpoint (50%) on, demonstrated that they were categorically more similar to other TIGHT tokens than to TIE tokens.

7.3 TIGHT Raising

Table 7.3 contains the mean TIGHT values subtracted from mean TIE values at five vowel duration percentages, 20%, 35%, 50%, 65%, and 80%, for all players. The overall trend of the data was an increase in distance between raised and unraised mean values reaching its peak at 65% duration before experiencing a slight decrease at 80% duration. This pattern can be seen in the average for all players, which began at 40 Hz, subsequently climbing to 142 Hz at 65% before it fell back to 118 Hz by 80%. In addition, one-tailed non-parametric Wilcoxon signed-rank tests were used to establish statistical significance between F1 values. Since five testes occurred for each player, the Bonferroni correction method was used to correct p-values to minimize the potential of committing a type 1 error. The Bonferroni-corrected p-value which indicated significance was p-value < 0.01. Significant p-values results are represented with asterisks.

Figure 7.1 shows the average TIGHT F1 subtracted from TIE F1 value in Hz for all players across the five duration percentage. This mean is given paired with each players' individual mean TIE-TIGHT differences. The dark line represents the mean difference for all speakers, while the lighter lines represent each individual speaker.

Returning to *ANAE*, the benchmark between unraised TIE and raised TIGHT F1 values is greater than 60 Hz. The average F1 value difference for all players was greater than this expectation at four of the five duration percentages, with the 20% being the outlier. Three players, Jones, Nelson, and Taylor maintained this 60 Hz difference throughout all duration percentages. By 35% duration, all but six players had differences greater than 60 Hz, and, as the duration increased to 50%, every player surpassed this expected difference in F1 values. The trajectory for each player seemed to pattern tightly together, following the pattern seen in the average, with the smallest differences occurring at 20%, increasing at each percentage before reaching maximal difference at 65% duration. At this maximal difference, Anderson, and King raised TIGHT to

Table 7.3: Mean TIGHT F1 subtracted from TIE F1 values throughout the vowel duration

Player	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
Allen	55^{***}	88^{***}	121^{***}	139^{***}	104^{***}
Anderson	27	65^{***}	88^{***}	96^{***}	89^{***}
Bell	28^{*}	50^{***}	86^{***}	127^{***}	88^{***}
Campbell	-2	63^{***}	125^{***}	158^{***}	145^{***}
Carter	47^{*}	116^{***}	181^{***}	211^{***}	145^{***}
Clark	29	44^{*}	91^{***}	148^{***}	145^{***}
Collins	34^{**}	85^{***}	140^{***}	170^{***}	113^{***}
Cook	45^{***}	40^{***}	87^{***}	115^{***}	102^{***}
Hall	34^{**}	75^{***}	104^{***}	120^{***}	90^{***}
Jackman	39^{*}	55^{**}	94^{***}	130^{***}	119^{***}
Johnson	47^{**}	50^{***}	64^{***}	99^{***}	100^{***}
Jones	61^{***}	49^{***}	81^{***}	139^{***}	120^{***}
King	17	71^{***}	78^{***}	96^{***}	73^{***}
Martin	39^{**}	83^{***}	129^{***}	177^{***}	142^{***}
Mitchell	35	83^{***}	130^{***}	170^{***}	158^{***}
Nelson	101^{***}	110^{***}	159^{***}	190^{***}	180^{***}
Phillips	20	60^{***}	107^{***}	138^{***}	118^{***}
Taylor	69^{***}	64^{***}	85^{***}	117^{***}	99^{***}
Thomas	27^{*}	65^{***}	121^{***}	155^{***}	125^{***}
Vasquez	49	77^{***}	125^{***}	152^{***}	114^{***}
Average	**40**	**70**	**110**	**142**	**118**

$^{*}p < 0.01$; $^{**}p < 0.002$; $^{***}p < 0.0004$.

the lowest extent, but both still produced variants which differed in value by 96 Hz. Carter exhibited the greatest difference of 211 Hz. While all players experienced a subsequent drop off in the degree of raising at 80% duration, the differences in F1 value remained above the 60 Hz expectation.

While not every player managed to surpass the *ANAE* benchmark by 35% duration, all did produce differences between variants which were statistically significant. In fact, only six players failed to have statically significant differences at the onset. After statistically significance was reached, no player managed to lose this distinction throughout the duration of the vowel. The data demonstrated that every player produced distinctly unraised TIE and raised TIGHT variants, well above the expected difference in F1 value. According to Boberg

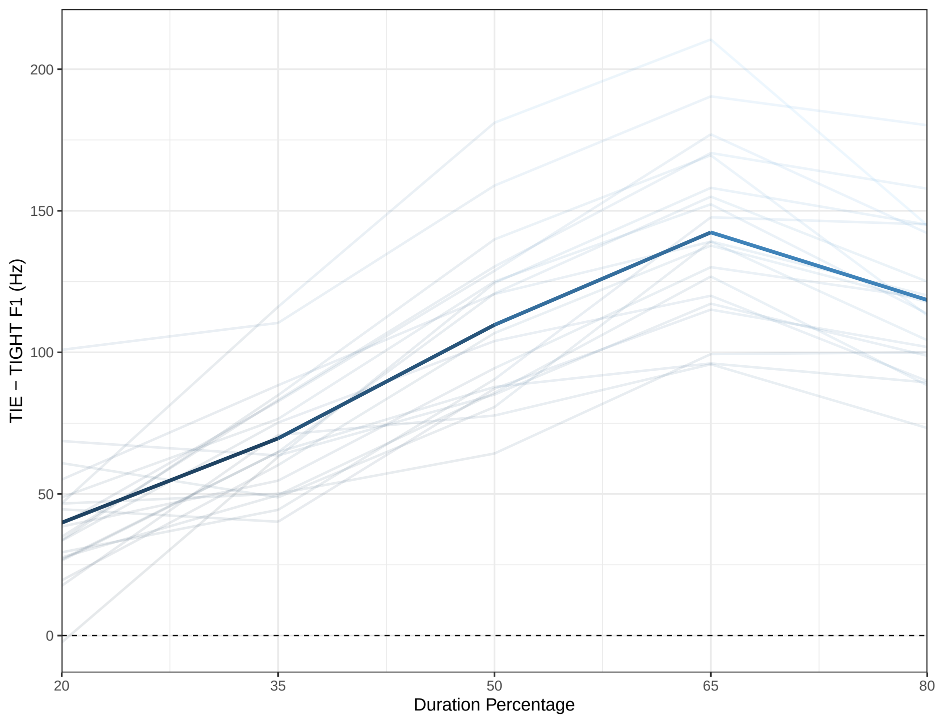

Figure 7.1: Mean TIGHT F1 subtracted from TIE F1 paired with individual player data

(Boberg, 2010), this is not entirely unexpected for speakers of certain American English dialects, such as Eastern New England (ENE) and the Inland North (IN). The degree to which this patterns with SCE will be analyzed in Chapter 9 of this dissertation.

7.4 HOUSE Raising

The uniformity seen in the difference between TIE and TIGHT F1 values was largely lost when analyzing COW and HOUSE. Table 7.4 displays the mean HOUSE values subtracted from mean COW values at five vowel duration percentages for all players. COW tokens do not include the vowel before nasals which were treated as a third distinct allophone, DOWN. The increasing difference pattern seen in TIE-TIGHT was lost for most players, and the average difference demonstrated that the opposite pattern was occurring. Most players produce their largest difference at 20% vowel duration, with an average difference of 47 Hz. The average difference dropped a total of 34 Hz by 80% duration, falling 10 Hz, 8 Hz, 7 Hz, and 9 Hz at each subsequent percentage. Again, the results of one-tailed non-parametric Wilcoxon signed-rank tests were used to establish significance. Bonferroni-corrected *p*-values are represented by asterisks.

Table 7.4: Mean HOUSE F1 subtracted from COW F1 values throughout the vowel duration

Player	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
Allen	17	-1	5	18	19
Anderson	1	-30	-48	-42	-23
Bell	66	48	41	6	-23
Campbell	40	44	21	21	20
Carter	86*	68**	83*	30	22
Clark	55	79**	71*	52	26
Collins	24	-1	-15	-36	7
Cook	48	39	19	0	-36
Hall	53	51	60*	89**	64*
Jackman	80***	58	52	42	11
Johnson	30	22	31	8	-14
Jones	9	10	18	18	18
King	56	40	9	28	47
Martin	52	43	23	-1	-17
Mitchell	47	62**	43**	25	13
Nelson	124*	87**	73*	88*	62
Phillips	81	10	-4	-3	-32
Taylor	53*	53	45	43	16
Thomas	99*	91***	80***	81***	81*
Vasquez	-30	-35	-28	-28	6
Average	**47**	**37**	**29**	**22**	**13**

$^*p < 0.01$; $^{**}p < 0.002$; $^{***}p < 0.0004$.

Figure 7.2 shows the average HOUSE F1 subtracted from COW F1 value in Hz for all players throughout the duration of the vowel, once again given with each player's individual mean COW-HOUSE differentials. The darker line represents the mean difference for all speakers, while the lighter lines represent each individual player.

The average F1 difference between COW and HOUSE followed an entirely different trajectory than that seen in TIE and TIGHT. For most players, the greatest difference was seen at the 20% duration. At this duration, six players had differences greater than the 60 Hz benchmark: Bell, Carter, Jackman, Nelson, Phillips, and Thomas. Mitchell reached the benchmark immediately after

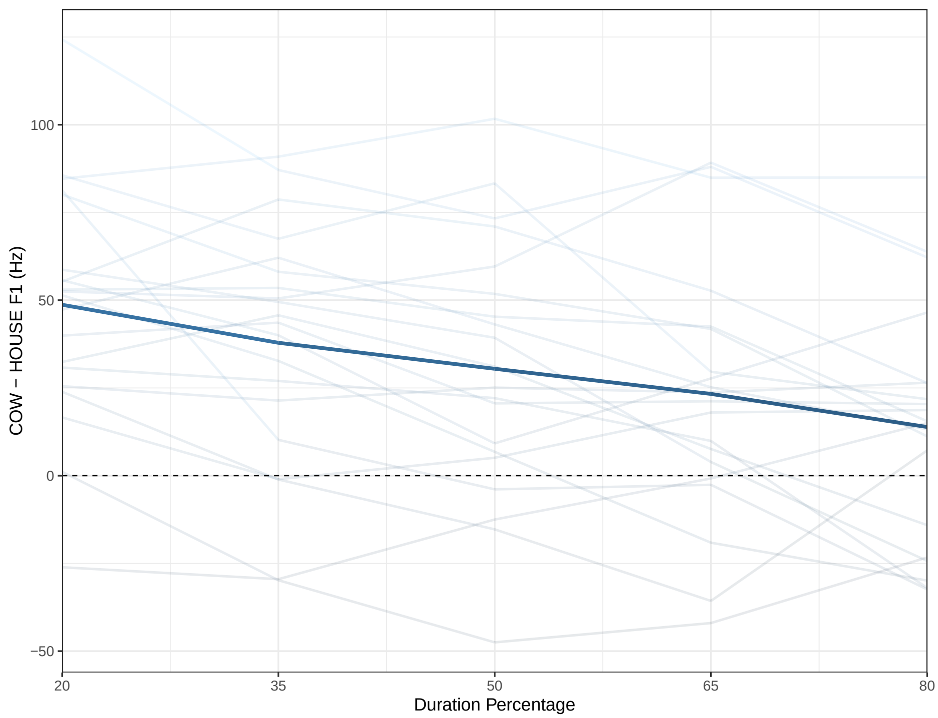

Figure 7.2: Mean HOUSE F1 subtracted from COW F1 paired with individual player data

at 35% with an F1 value of 62 Hz. Additionally, Clark, Hall, King, Martin, and Taylor all approached this expectation, with differences in the 50-60 Hz range; however, all but Clark and Hall experienced their greatest difference at 20% duration. As differences dropped for most players as the duration increased, only five players maintained a 60 Hz difference at 50% duration: Carter, Clark, Hall, Nelson, and Thomas. Hall and Nelson reached maximal differential at 65%, following the trajectory seen in TIE and TIGHT, with a difference of 89 Hz and 88 Hz, respectively. By 80% duration, only three players still exceeded the benchmark difference: Hall, Nelson, and Thomas. Intriguingly, many players had negative differences, suggesting that the "raised" HOUSE was produced lower than the "unraised" COW. It is also possible that both variants were produced in a somewhat raised position by these players. These negative differences were seen immediately at 20% duration for Vasquez. By 35% duration, Allen, Anderson, and Collins had negative differentials. Phillips's differential became negative by 50% duration, Martin by 65% duration, and Bell, Cook, and Johnson by 80% duration. Overall, nine players had negative differentials at a single duration percentage or more throughout the vowel duration.

Once again statistical significance did not directly correlate with the *ANAE* benchmark difference. Eight players produced variants which distinct to a statistically significant level at a single duration percentage or more. However, only six players produced different variants that maintained statistical significance across multiple percentages: Carter, Clark, Hall, Mitchell, Nelson, and Thomas. Due to this, only these five players can be categorized as raising HOUSE against COW. Bell, and Jackman also surpassed the benchmark and should be included in this group bringing the total to seven. Taylor could be categorized as near-raising as he produced different variants which were statistically significant. While these results suggested that most players were not patterning with SCE with respect to HOUSE raising when measure against COW, this did not mean that players exhibited no HOUSE raising when measured against the second "unraised" variant, DOWN.

Table 7.5 provides the mean HOUSE values subtracted from mean DOWN values throughout the vowel duration for all players. The increasing differentials seen in TIE-TIGHT, largely lost in COW-HOUSE, were once again present for most players with respect to DOWN-HOUSE. The average difference increased to a peak at 65%. At 20%, the average differential was relatively minimal, only 18 Hz, and remained so through 35% at 27 Hz. The largest increase was seen between 35% and 50% duration where the value approached the *ANAE* benchmark, falling just 9 Hz short. The final two duration percentages both surpassed this benchmark and were equal at 66 Hz. There were still players who exhibited a negative differential, though fewer than for COW-HOUSE. Again, the results of one-tailed non-parametric Wilcoxon signed-rank tests were used to establish significance. Bonferroni-corrected p-values are represented by asterisks.

Figure 7.3 shows the average HOUSE F1 subtracted from DOWN F1 value in Hz for all players throughout the duration of the vowel, given with each player's individual mean DOWN-HOUSE differences. The dark line represents the mean difference for all speakers, while the lightened lines represent each individual speaker.

The individual trajectories seen for TIE and TIGHT were largely replicated when looking at DOWN and HOUSE. Only two players, Carter and Thomas, maintained a difference greater than 60 Hz throughout the entirety of the vowel duration. By 35% duration, Hall and Nelson surpassed 60 Hz differential with values of 71 Hz and 80 Hz, respectively. Four additional players reached this benchmark at 50% duration: Clark, Cook, Jackman, and Taylor. By 80% duration, 11 players produced distinct DOWN and HOUSE variants with differen-

Table 7.5: Mean HOUSE F1 subtracted from DOWN F1 values throughout the vowel duration

Player	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
Allen	8	-26	-4	16	15
Anderson	8	-33	-43	-47	-36
Bell	-10	-4	35	21	3
Campbell	53	42	-2	16	28
Carter	98*	122***	164***	150***	87**
Clark	-12	28	80***	94***	99***
Collins	-28	-34	-9	-2	18
Cook	-53	3	95	156*	140*
Hall	29	71***	97***	131***	85***
Jackman	35	34	62	85*	74**
Johnson	3	7	17	41	43*
Jones	2	0	41**	51***	57***
King	37	29	33	25	40
Martin	-20	-12	23	24	41
Mitchell	28	43	51*	54**	61*
Nelson	35	80*	119***	147***	144***
Phillips	32	34	49***	81***	85**
Taylor	-6	29	73***	94***	101***
Thomas	108***	96**	90**	98***	153***
Vasquez	4	39	55	84	78
Average	**18**	**27**	**51**	**66**	**66**

*$p < 0.01$; **$p < 0.002$; ***$p < 0.0004$.

tials of more than 60 Hz the previously mentioned six players as well as Hall, Mitchell, Nelson, Phillips, and Vasquez. Cook, Phillips, and Vasquez all exhibited greater HOUSE raising when measuring against DOWN than COW, surpassing the *ANAE* benchmark at numerous duration percentages. Furthermore, every player that had surpassed the benchmark for COW-HOUSE also surpassed the benchmark for DOWN-HOUSE with all but Mitchell reaching a larger differential between DOWN-HOUSE. Additionally, while the number of players with negative differences at any percentage throughout the duration was actually greater than that seen in COW-HOUSE, only Anderson and Collins remained negative at more than two duration percentages, and only the former had a negative differential by 80%.

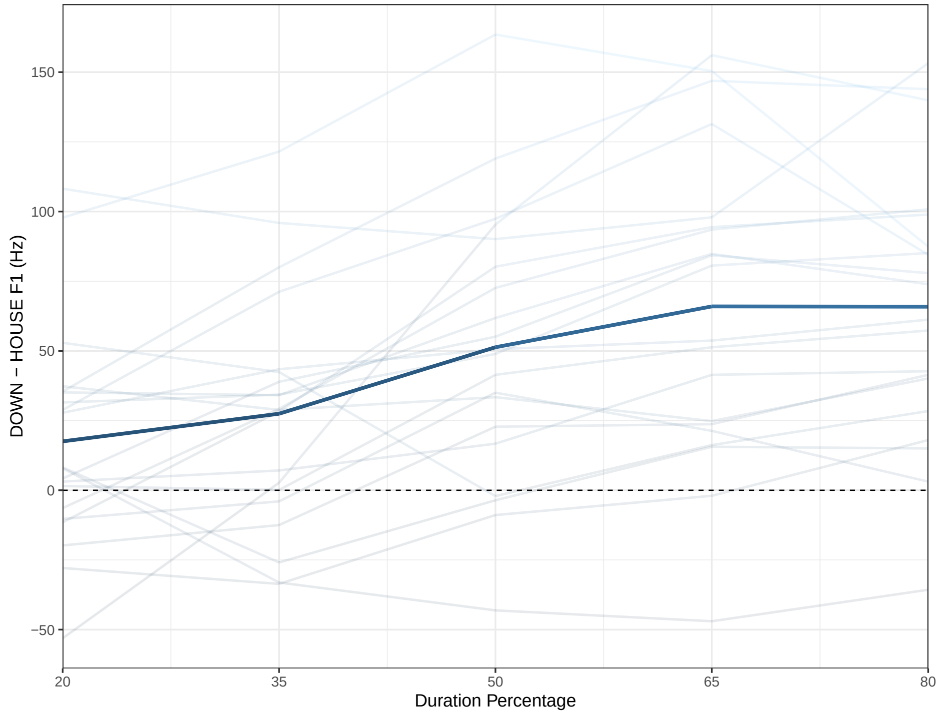

Figure 7.3: Mean HOUSE F1 subtracted from DOWN F1 paired with individual player data

Although 11 players surpassed a 60 Hz differential, 12 produced variants which differed to a statically significant degree. Johnson and Jones produced statically significant distinct DOWN and HOUSE. Furthermore, both approached the 60 Hz differential, with values in the 40 - 50 Hz range. Jones fell just short of the *ANAE* benchmark reaching a differential of 57 Hz at 80% duration. Due to this, 11 players could be categorized as raising HOUSE when compared to DOWN, while an additional two players approached raising, which I have classified as near-raising. The raising of HOUSE, measured against both COW and DOWN, will be compared to SCE and other American English dialects in Chapter 9 of this dissertation.

It is important to analyze not only the F1 differentials between variants, but also the actual *ANAE*-normalized F1 values for all variants throughout the duration of the vowel. The mean F1 values of TIGHT, TIE, HOUSE, DOWN, and COW for all players measured at each of the five duration percentage are given in Table 7.6.

Table 7.6: Mean F1 values for Canadian raising vowels throughout the duration

Vowel	*Duration Percentage*				
	20%	*35%*	*50%*	*65%*	*80%*
TIE	661	721	759	742	682
TIGHT	623	653	650	600	564
COW	730	770	766	734	690
DOWN	698	760	788	778	743
HOUSE	680	733	738	712	678

When compared directly to the allophone values in *ELC*, some key differences became apparent. Both unraised variants, TIE and COW, are produced lower by SCE speakers in *ELC*, with F1 values of 843 Hz and 874 Hz respectively. The players produced mean F1 values far higher in the vowel space, 759 Hz for TIE and 770 Hz for COW. Both variants were roughly 100 Hz higher than those seen in the Canadians of *ELC*. In tandem with this, the raised variants were also produced higher in the vowel space, though this was more apparent for TIGHT than HOUSE. The players reached their highest mean TIGHT F1 value, 653 Hz, at 35% duration, 15% earlier than that seen in TIE. It should also be noted that this value was 80 Hz less than the equivalent from *ELC* of 733 Hz. As players produced both variants higher in the vowel space, this did not impact the overall degree of raising seen between TIE and TIGHT tokens.

Figure 7.4 presents trajectory plots of the mean TIE and TIGHT F1 values throughout the duration of each vowel. The x-axis captures the duration percentage of the vowel throughout the trajectory. The y-axis has been inverted to better represent the positioning of the tongue within the vowel space. Individual trajectory plots for each player can be found in Appendix C.

The trajectory for each allophone followed similar paths. Both variants saw an increase in F1 value as the duration rose from 25% to 30%; however, it was at this point that the players reached their largest value for TIE. While TIE continued to increase all the way until the midpoint, the mean TIGHT value began to decrease at this point and continued this trajectory throughout the remainder of the vowel duration. By the midpoint, the difference between variants reached 109 Hz. This difference increased to 142 Hz at 65% duration but the trajectories took on a very similar shape after the midpoint. By 80% duration, the difference was 118 Hz, a slight decrease from 65%, but still overall stable, establishing two distinct variants, with similar trajectories throughout the entire duration. This uniformity was largely lost for COW and HOUSE.

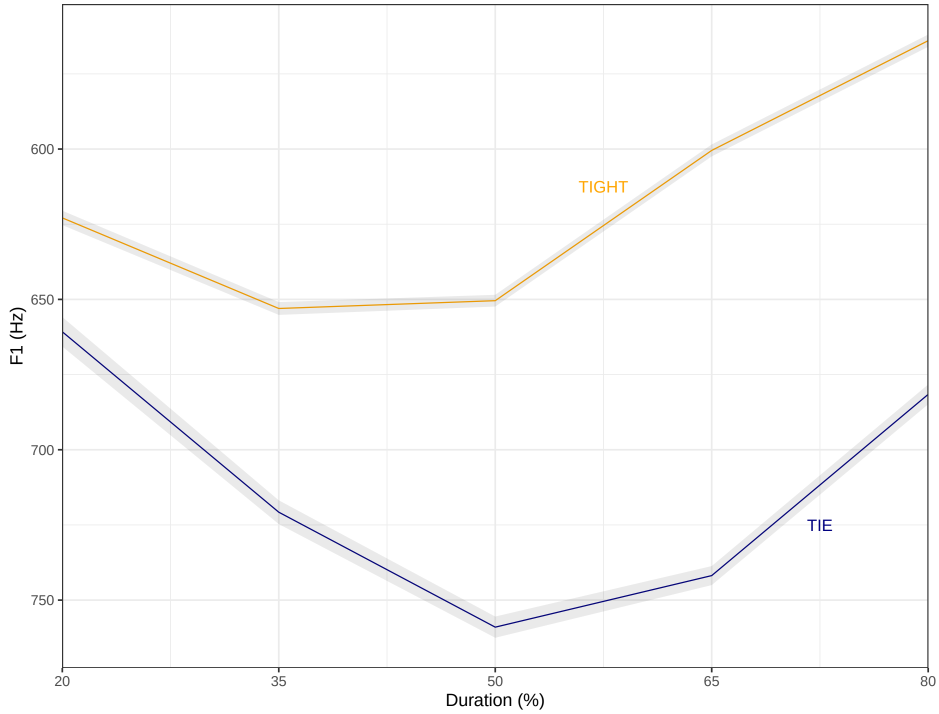

Figure 7.4: Mean TIGHT and TIE F1 values with 95% confidence intervals throughout the trajectory of the vowel

Players reached their greatest mean HOUSE F1 value, 738 Hz, at 50% duration. Boberg's Canadians have a remarkably similar mean HOUSE F1 value of 732 Hz. However, as the players produced COW tokens with smaller F1 values, the difference between those tokens and HOUSE tokens was much smaller. Players hit their maximal mean F1 value for COW tokens at 35% duration, but did not reach this point until 50% duration for HOUSE tokens. By the midpoint of duration, the mean COW F1 value was already decreasing while the mean HOUSE F1 values were still increasing. Due to this, the remainder of the trajectory led to a decrease in differential at every point between the two variants. By 80% duration, the differential had dropped to only 12 Hz. However, when the third variant of DOWN was taken into consideration, the degree of raising changed considerably. While mean COW F1 values increased more rapidly than HOUSE, accounting for the smaller differences seen after the midpoint, mean DOWN F1 values seemed to mirror HOUSE throughout the trajectory of the vowel. Furthermore, the difference between the DOWN and HOUSE followed the trajectory seen in TIE and TIGHT.

Figure 7.5 presents trajectory plots of the mean COW, DOWN, and HOUSE F1 values throughout the duration of each vowel. The y-axis has been inverted to better represent the positioning of the tongue within the vowel space. Individual trajectory plots for each player can be found in Appendix C.

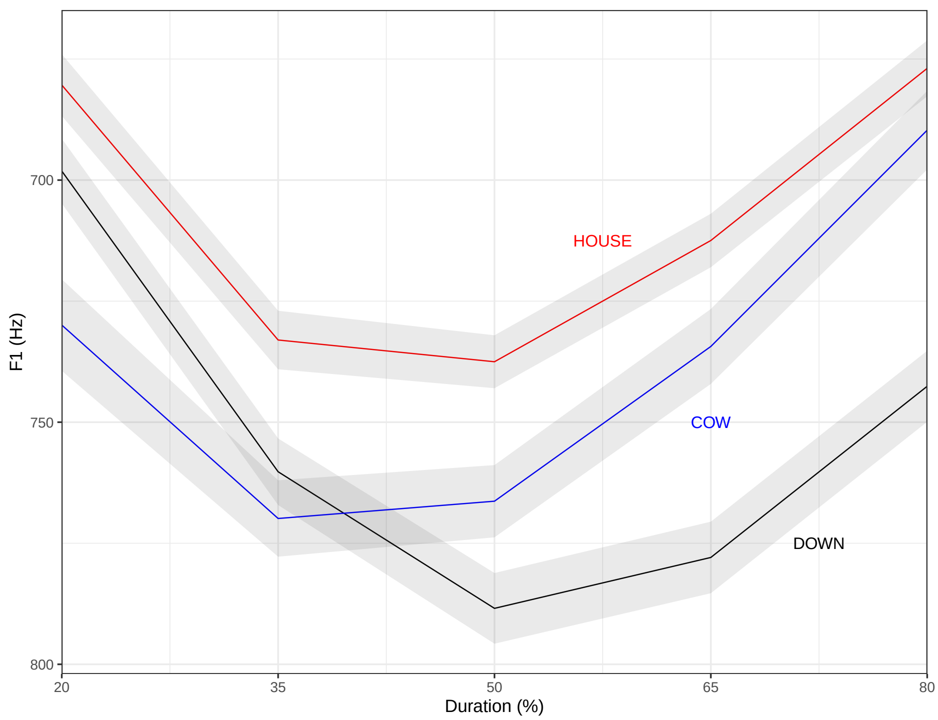

Figure 7.5: Mean HOUSE, DOWN, and COW F1 values with 95% confidence intervals throughout the trajectory of the vowel

At 25% and 30% duration percentages, the distribution of mean F1 values was comparable to that seen in the ELC. COW, was the lowest of the three at 730 Hz and 770 Hz, followed by DOWN, 698 Hz and 760 Hz, with HOUSE raised to 680 Hz and 733 Hz. However, players reached their maximal COW F1 value at 35%, which then experienced a subsequent decrease in value throughout the duration of the vowel. Both HOUSE and DOWN reached their maximal mean F1 value at 50% duration. As the mean COW F1 values had already began decreasing at this point, the difference between mean COW and HOUSE F1 values dropped as the duration progressed. Furthermore, 50% duration DOWN surpassed COW in mean F1 value, indicating that the players produced this vowel the lowest in the vowel space of all three variants. The opposite is presented in the *ELC*, where Canadians produce a mean DOWN F1 value of 817 Hz, which is 60 Hz less than the mean COW. For Boberg's speakers, COW is the lowest of the three variants; for the players in the current study, DOWN took this position at the midpoint and remained there throughout the remainder of the vowel's trajectory. At this point, the players' mean HOUSE F1 value was 50 Hz less than DOWN. By 65% duration, this difference had increased to 66 Hz. The difference between the two remained stable through 80% duration, with a difference of 65 Hz. The expected trajectory of COW in SCE was seemingly replaced by DOWN in the speech of the players. Additionally, mean COW F1 values appeared to be occupying a space in between the unraised DOWN and raised HOUSE.

7.5 COW Advancement

While the degree of difference between unraised and raised variants constitutes the bulk of the difference between SCE and American English dialects, the advancement of COW is also relevant and therefore was included in this analysis. Mean COW F2 values throughout the duration of the vowel for all players are given below in Table 7.7. The average of these means is provided at the bottom of the Table. Bold values indicate alignment between the players' data and *ANAE* benchmarks.

ANAE provides a benchmark for COW F2 value being less than 1,550 Hz for the Inland Canada dialect. When analyzing the players' data, it is important to remember that Labov et al. measure this F2 value when F1 reaches a maximal value; therefore, the players' average 20% and 35% F2 values being greater than this benchmark is not overly surprising as players had not reached their maximal F1 value this early in vowel duration. Even so, at 20% duration, half of the players produce F2 values less than 1,550 Hz. This number increased to 16 at 35%. By the midpoint of the vowel, every player had an F2 value less than 1,550 Hz. This trend can be seen in the overall average of the means. At 20% it was 1,574Hz, just above the benchmark. By 35%, the average had dropped below the benchmark to 1,486 Hz. The average continued dropping throughout the duration at slightly smaller intervals; 1,404 Hz at 50%, 1,342 Hz at 65%, and 1,333 Hz at 80%.

These results were somewhat surprising as the speakers in *ELC* did not align with this benchmark for COW F2 value. Boberg (2010) provides a mean COW F2 value of 1,604 Hz for his speakers. He does note that this value is within the second quartile of *ANAE* F2 values which aligns Canada more with the North and West United States. He adds that the fronting of COW seems to be restricted in SCE to the pre-nasal allophone of DOWN (148). The players' mean F2 values of COW, DOWN, and HOUSE were compared to see if this pattern of fronting DOWN was occurring. The players' mean F2 values for all five variants involved in CR are given in Table 7.8.

Table 7.7: Mean COW F2 values throughout the vowel duration

Player	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
Allen	1486	1389	1320	1286	1274
Anderson	1526	1431	1371	1325	1352
Bell	1678	1517	1370	1247	1221
Campbell	1746	1643	1554	1470	1462
Carter	1489	1392	1326	1300	1354
Clark	1546	1497	1417	1363	1395
Collins	1473	1395	1295	1185	1164
Cook	1568	1473	1390	1358	1374
Hall	1689	1548	1434	1376	1398
Jackman	1426	1411	1378	1346	1341
Johnson	1586	1524	1403	1339	1347
Jones	1492	1450	1361	1292	1279
King	1799	1641	1539	1435	1375
Martin	1448	1408	1338	1293	1286
Mitchell	1637	1408	1338	1293	1286
Nelson	1491	1436	1358	1307	1299
Phillips	1569	1339	1346	1252	1147
Taylor	1481	1421	1357	1293	1266
Thomas	1722	1646	1530	1442	1455
Vasquez	1619	1552	1463	1458	1416
Average	**1574**	**1486**	**1404**	**1342**	**1333**

The fronting noted by Boberg (2010) seemed to be at least somewhat present in the speech of the players, as mean DOWN F2 values were greater than COW values at each of the duration percentages. However, the degree of fronting was markedly different than what Boberg describes. At 20%, mean DOWN F2 was 86 Hz greater than COW. This difference slightly increased at 35% to 88 Hz. By 50%, the difference had shrunk to 63 Hz, but, more importantly, the players' mean DOWN F2 value had dropped below the 1,550 Hz *ANAE* benchmark for COW, which suggested that DOWN was not undergoing the fronting seen in the speech of the speakers included in Boberg's Phonetics of Canadian English (PCE) project. Boberg provides a mean DOWN F2 of 1,838 Hz. Even at their most advanced position, 20%, the players' mean DOWN F2 value was 179 Hz less than this 1,838 Hz value. The players results broke from Boberg's PCE speakers further when comparing COW and HOUSE. Boberg reports a mean

Table 7.8: Mean F2 values for Canadian raising vowels throughout the duration

Vowel	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
TIE	1663	1575	1572	1663	1759
TIGHT	1423	1485	1655	1862	1936
COW	1574	**1486**	**1404**	**1342**	**1333**
DOWN	1659	1574	1467	1387	1374
HOUSE	1525	1459	1381	1340	1345

HOUSE F2 value of 1,692 Hz, establishing a slightly more centralized position in the vowel space than seen in COW. The players' mean HOUSE F2 value was less than COW at every duration percentage point with the exception of 80%. Throughout the duration, the mean F2 values for both variants were exceptionally similar with difference of only 49 Hz, 27 Hz, 23 Hz, 2 Hz, and -12 Hz, respectively, between HOUSE and COW. Overall, all three of the variants were less than the 1,550 Hz *ANAE* benchmark by 50% duration, demonstrating that the players produced more backed COW, DOWN, and HOUSE variants.

Directly comparing mean F2 values for COW, DOWN, and HOUSE was not entirely sufficient in establishing the potential Canadian influence on the CR allophones for the players. The *ANAE* establishes the existence of the AWY line, an isogloss separating Eastern New England, the Inland North, and the Upper Midwest, where the nucleus of COW is produced in a more backed position than that of TIE, from the other American English dialects where TIE is further backed (Labov et al., 2006, p. 188). The reason the AWY line is relevant to this study is that Labov et al. stipulate that Canada is also divided by this isogloss, with the speakers from the provinces of Alberta, Manitoba, and Saskatchewan patterned with American speakers from the Eastern New England, the Inland North, and the Upper Midwest, while those in the Atlantic provinces (Prince Edward Island, New Brunswick, Newfoundland and Labrador, and Nova Scotia), Ontario, and Quebec pattern more with the other American dialects. A map of this isogloss can be found in Chapter 3. However, Boberg's PCE data challenges the potential subdivision of Canada based on the AWY line isogloss. Boberg notes that 83 of his 86 PCE speakers produce mean TIE F2 values which are lower than their corresponding COW values, including speakers from Alberta, Manitoba, and Saskatchewan (2010, p. 148). Table 7.9 contains each player's mean TIE F2 value subtracted from their corresponding COW value at each duration percentage. Negative values were indicative of

TIE tokens being produced further back in the vowel space than COW tokens, while positive value were indicative of the opposite.

Table 7.9: Mean TIE F2 subtracted from COW F2 values throughout the vowel duration

Player	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
Allen	70	102	178	331	444
Anderson	230	249	286	378	408
Bell	-75	-2	147	346	510
Campbell	77	25	60	191	294
Carter	187	136	233	388	462
Clark	75	10	85	245	352
Collins	188	127	215	489	707
Cook	219	266	280	360	370
Hall	-116	-10	164	277	296
Jackson	121	85	122	190	253
Johnson	86	65	217	403	495
Jones	93	102	178	333	437
King	-19	47	169	352	495
Martin	134	103	189	343	479
Mitchell	27	44	103	253	311
Nelson	260	217	277	363	423
Phillips	122	188	170	405	636
Taylor	176	174	225	361	474
Thomas	28	-56	58	270	389
Vasquez	-111	-95	4	145	280
Average	**89**	**89**	**168**	**321**	**426**

The average of all players started at 89 Hz at 20%, remained at 89 Hz at 35%, and then increased with each subsequent duration percentage. The directionality of the upgliding, TIE being a forward upglide and COW being a backward upglide, lead to a rapid increase in the differentials throughout the duration of the vowel. By the midpoint, the average difference had increased 168 Hz, followed by 321 Hz at 65% duration, and finally 426 Hz by 80% duration. Looking at individual players, only five of the 20 had negative differentials at any point throughout the vowel duration: Bell, Hall, King, Thomas, and Vasquez. Of these five, both Bell and King had positive differentials by 35% duration, which means that these two players might group more closely with those who had positive differentials throughout. These results demonstrate that the players' differentials largely aligned more closely with *ANAE* North region than what would be expected for SCE. The implications of this will be discussed in greater detail in the Chapter 9.

7.6 Variant Placement in the Vowel Space

Figure 7.6 contains trajectories for all five variants involved in CR. Both x and y axes been inverted to better represent the positioning of the tongue within the vowel space. Trajectories begin at F1 and F2 values measured at 20% and move in the direction of the arrow based on the F1 and F2 values at the remaining percentages. TIE and TIGHT are front upgliding and COW, DOWN, and HOUSE are back upgliding.

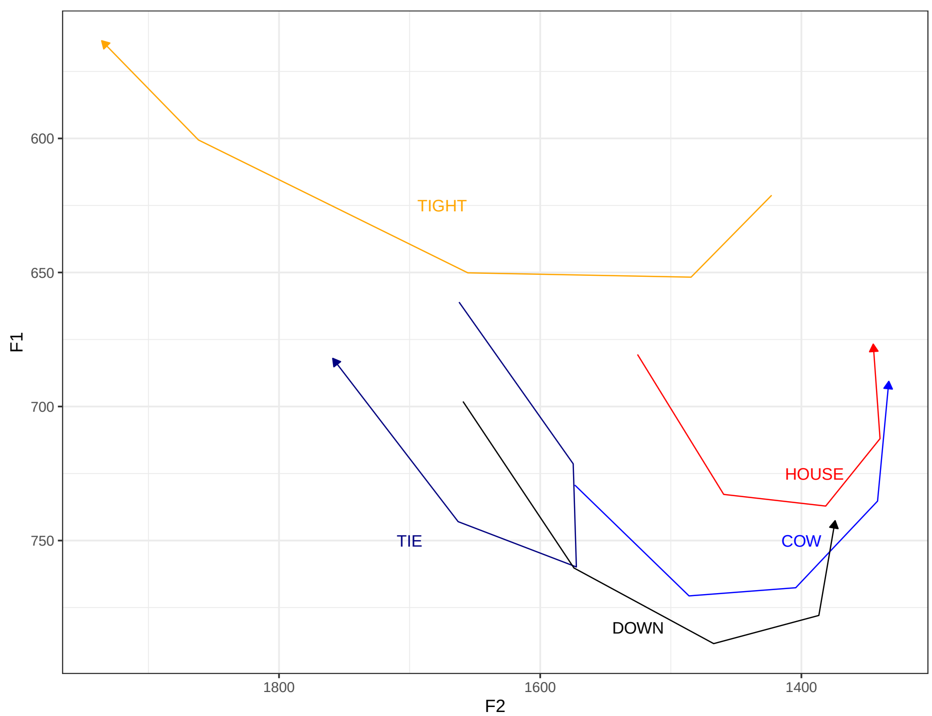

Figure 7.6: CR variant trajectories throughout the duration of the vowel

When viewing F1 and F2 values simultaneously, it was apparent that TIE and TIGHT were quite distinct. Not only was TIGHT produced higher in the vowel space, but there was a great deal of advancement that was paired with the upgliding. The trajectory of TIE was largely backing and downward until 50% duration. At this point, the trajectory shifted into the expected front upgliding movement expected.

The distinction between trajectory shape was mostly absent from COW, DOWN, and HOUSE. With respect to shape, these vowels appeared to mirror each other. However, the placement of the demonstrated the uniqueness of the players' results. DOWN occupied the lowest and also most advanced placement of the three. COW was produced slightly higher in the vowels space and also slightly retracted. HOUSE again was produced slightly higher in the vowel space, pushing it even further upwards when measured against DOWN. Although HOUSE began with a more retracted tongue position than COW, the smaller overall trajectory led to COW surpassing HOUSE in backness by the end of vowel duration.

Looking specifically at F2, both HOUSE and COW were produced in a more backed position than TIE. Interestingly, both variants began in a more advance position than TIGHT. The rapid fronting of TIGHT placed the variant in a more advance position, surpassing HOUSE by 35% and COW by 50%. Although DOWN began in a more advanced position than TIE and TIGHT, the large backward movement placed the variant more in line with COW and HOUSE by 50%.

7.7 Social Effect on Raising

Linear mixed effect regression models were again used to test the statistical significance of fixed effects on mean TIE - TIGHT, mean COW - HOUSE, and mean DOWN - HOUSE differentials at all five duration percentages. Because F1 differentials were measured at each duration percentage, models were created measuring the impact of fixed effects at each duration percentage. Due to this, the number of models increased dramatically compared to what was done for the LBMS and monophthongal FACE and GOAT. Once again, the region and age with the smallest differential estimates were set as the intercept to see if any difference rose to statistical significance. The results of these regression models produced very few instances of statistical significance.[52]

There were instances of statistical significance for both differentials involving HOUSE where the fixed effect of region functioned as a catalyst. Even still, this significance only occurred at a single duration percentage for COW - HOUSE differentials and at two percentages for DOWN - HOUSE differentials. The results of the linear mixed model of COW - HOUSE differential at 80% duration with region as a fixed effect are provided in Table 7.10.

The intercept in this model represented the Mid-Atlantic (MA) region and the model produced an estimate differential of 29.90 Hz between COW and HOUSE. This positive value suggested that MA players were likely to have HOUSE F1 values which were greater than their COW values at 80% duration, meaning these players did not raise HOUSE against COW. Based on this model,

[52] The results of these mixed effects models can be found in Appendix C along with non-significant models measuring COW-HOUSE and DOWN - HOUSE differentials.

Table 7.10: Linear mixed model of COW - HOUSE differentials at 80% duration with player as a random effect and region as a fixed effect

Duration	*Region*	*Estimate*	*t-Value*	*p-Value*
80%	(intercept)	29.90	1.06	0.314*
	W. Pennsylvania	-23.97	-0.68	0.510
	West	-41.30	-1.48	0.274
	Inland North	-44.30	-1.48	0.168
	Upper Midwest	-46.60	-1.46	0.173
	E. New England	-114.93	-2.88	0.016*

only players from the West, IN, Upper Midwest (UM), and ENE had negative differentials indicative of raising HOUSE against COW, expected for CR. However, of these four, only ENE differed at a significant level with an estimate of -114.93 Hz. These results demonstrate that only players from ENE are expected to raise HOUSE against COW to a statically significant degree when measured against the other American region. It is important to note this result was only for a single duration percentage, 80%.

The same minimal impact of region is seen when DOWN - HOUSE differentials. Additionally, age is predicted to be significant for DOWN - HOUSE differentials, but at 35% duration. The results of two models, the first at 20% with region as a fixed effect, and the second at 35% with age as a fixed effect, are given in Table 7.11.

Table 7.11: Linear mixed models of DOWN - HOUSE differentials at different duration percentages with player as a random effect and different fixed effects

Duration	*Fixed Effect*	*Estimate*	*t-Value*	*p-Value*
20%	(intercept)	19.85	0.56	0.590
	W. Pennsylvania	-28.30	-0.64	0.535
	Upper Midwest	-30.14	-0.77	0.459
	Inland North	-36.20	-0.95	0.360
	West	-38.12	-0.83	0.420
	E. New England	-128.10	-2.53	0.027*
35%	(intercept)	12.71	0.56	0.584
	21-22	-35.83	-0.98	0.341
	23-24	-38.97	-1.42	0.175
	25-26	-59.37	-2.22	0.042*

Looking first at the regional model, the MA again served as the intercept with an estimate differential of 19.85 Hz. This positive value suggested that MA players were likely to have HOUSE F1 values which are lower than their DOWN values at 20% duration. Every region outside of the MA has a negative differential, which is indicative of raising when DOWN is the variant of comparison at this duration percentage. However, just as with the COW - HOUSE model at 80% duration, only the estimate for ENE reaches a level of statistical significance.

Age also proved to be statically significant at 35% duration. The intercept in this model was the 27-year-old and older cohort. The model predicts an estimate of 12.71 Hz difference between HOUSE and DOWN. While each of the other age cohorts produce negative differentials, only the 25-26 cohort have a statically significant estimate of -59.37 Hz difference. Again, it is important to note that age is only a significant effect at a single duration percentage.

7.8 Summary

The results for CR in the speech of the players varied based upon which two variants were being analyzed. TIGHT raising was incredibly common across players and furthermore, it was rather consistent. Every player surpassed the *ANAE* benchmark for TIGHT raising, with 85% of the players raising TIGHT to a greater degree than attested by Boberg in SCE. Additionally, Wilcoxon tests demonstrated that all players produced distinct TIE and TIGHT variants which differed at a statically significant degree. While this uniformity is promising in proving my initial hypothesis about CR accurate, at least with respect to TIGHT raising, this specific raising has been historically attested in various regional American English dialects. In Chapter 9, I analyze how players align with the expected TIGHT raising of their regional dialects to establish if these results are explicable without the variable having gained indexical value linked to hockey. For now, this uniformity at least demonstrates that TIGHT raising has the potentially to function as a variable which has gain indexical value linked to the sport and is therefore one which is being used to establish a hockey-based linguistic persona.

The same cannot be said for HOUSE raising. The results showed that players were raising HOUSE to varying degree and this was further complicated by which variant was used to measure this raising against, either COW or DOWN. Only five players exhibited HOUSE raising against DOWN which surpassed the *ANAE* benchmark. Wilcoxon test demonstrated that an additional five players did manage to produce distinct COW and HOUSE variants which differed by a significant degree. Even by combining both groups, only half of the players managed to raise HOUSE at all when measured against COW. When DOWN was treated as the unraised variant, the number of players who surpassed the *ANAE* benchmark for HOUSE raising doubled to 10. Furthermore, six players produced variants which differed significantly. Players did not uniformly raise HOUSE, but there was a great deal of raising present still. Because of this, HOUSE raising must be analyzed distinct from TIGHT raising. This further complicates the status of CR as a variable which has gained indexical value linked to hockey. In Chapter 9, I establish categories of raising. This replaces the binary distinction of raising or non-raising, and presents a more accurate representation of the state of CR in the speech of the players. One clear point of divergence for the player from SCE that is apparent from the CR data was COW fronting. The *ANAE* establishes the AWY line, an isogloss which groups together ENE, IN, and UM with the Canadian prairie provinces of Alberta, Manitoba, and Saskatchewan. Labov, Boberg, and Ash stipulate that these regions produce COW F2 values which are less than corresponding TIE values. In *ELC*, Boberg finds that all of Canada, and therefore SCE, should not be included within this isogloss, and speakers throughout Canada produce COW F2 values which are greater than their correspondingTIE values. 75% of players produced mean COW F2 values which were less than their TIE values throughout the entire duration of the vowel. The remaining five only had greater mean COW F2 values at 20% or 25% duration percentages. This demonstrated that regardless of the state of CR present in the data, players were producing variant which differed from SCE due to the backness of COW, DOWN, and HOUSE variants. While this separates this variable from SCE, it does suggest that COW fronting, or really the lack thereof, has gained indexical value linked to the sport. This is apparent due to its prevalence among players not from ENE, IN, or UM. According to the AWY line, they would have grouped with SCE, but rather they aligned with their teammates from the regions within the isogloss. This will also be analyzed further in Chapter 9.

As region provided to be a significant fixed effect on raising, both TIGHT and HOUSE raising, the impact of region will need to be further analyzed. If players specifically align with their expected regional dialect, then being a hockey player would likely not be relevant to their usage of the variable. Chapter 9 will re-analyze the data presented in this chapter to demonstrate that region alone does not explain the features of raising attested in the data.

The following chapter, Chapter 8, presents the results measuring degree of monophthongization of FACE and GOAT. It is the third and final chapter covering the results for the vowels being analyzed in this dissertation. CR, including COW fronting, will be discussed again in Chapter 9.

Chapter 8

Results: Monophthongal High-mid Vowels

In this chapter I present the results of my analysis for the speech of the 20 players interviewed. I begin with a descriptive comparison of the mean formant values, both F1 and F2, for the players in the study against the mean F1 and F2 values provided for Canadian speakers in *ANAE* and *ELC*. After this, I describe the trajectory data for both FACE and GOAT in the speech of all players.

8.1 Comparison with Standard Canadian English

Mean F1 and F2 values for all players for the high-mid vowels, FACE and GOAT, are presented below in Table 8.1. Individual player mean values can be found in Appendix D. Just as in the previous two chapters, values were measured at the midpoint (50%) of vowel duration and all tokens occurring before laterals and rhotics were excluded.

Table 8.1: Mean F1 and F2 values of FACE and GOAT at 50% duration with *ELC* data and *ANAE* benchmarks

	Player Data		*ELC Data*		*ANAE Benchmarks*	
Vowel	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
FACE	562	2,058	571	2,198		> 2,200
GOAT	631	1,228	608	1,291		< 1,100

ANAE provides a benchmark for SCE FACE F2 values of greater than 2,200 Hz; additionally, the benchmark for GOAT F2 value is less than 1,100 Hz. The players did not conform to either of these benchmarks but produced variants that did approach them. The players' mean FACE F2 value was 2058 Hz, just under 150 Hz short of the benchmark. The mean GOAT F2 value was 1217 Hz. Although the players did produce a relatively high FACE F2 value and relatively low GOAT F2 value, they did not reach the peripheral status outlined by *ANAE*. Boberg's *ELC* mean FACE F2 value is basically identical to the *ANAE* benchmarks with a value of 2,198 Hz. However, the GOAT F2 value does not align with the benchmarks with a mean value of 1,291 Hz. Thus, it is possible that the *ANAE* benchmarks are too restrictive, as Boberg's Phonetics of Canadian English (PCE) data does not align with them.

Comparing the players directly to the *ELC* data presents a largely different picture. The players' mean F1 values differed by only 9 Hz and 23 Hz for FACE and GOAT, respectively, when compared to SCE speakers. This suggests that players produced variants which were virtually identical to SCE in height. Furthermore, the players' mean F2 values are very similar. Although not as advanced in the vowel space as SCE, the players' mean FACE F2 value of 2,058 Hz was very fronted, but possibly just shy of peripheral. The difference between the players and SCE was only 148 Hz. The difference was even less for GOAT F2 values. The players produced a mean GOAT F2 value of 1,228 Hz, 63 Hz less than the SCE value, and closer to the peripheral status outlined by the *ANAE* benchmark. Overall, the players produced variants which are very similar to SCE, at least at the 50% duration mark. However, measuring the vowel at a single point does not provide any insight on if the realization is more monophthongal or diphthongal.

8.2 FACE Trajectory Length

Bark-normalized FACE trajectory lengths, calculated using the sum of the Euclidean distance from 20% duration (onset) to 50% duration (midpoint) and the Euclidean distance from 50% duration to 80% duration (endpoint), are given in Table 8.2. Individual trajectory lengths of FACE in three different phonological environments: open coda, pre-voiced, and pre-voiceless, are included in the Table as well. Lower trajectory lengths were indicative of less movement of the tongue throughout pronunciation, suggesting a more monophthongal realization of FACE. Overall, FACE trajectory lengths ranged from 0.4 Bark in the speech of King to 0.81 Bark for Collins. The average length was 0.58 Bark. Turning to the differing phonological environments, pre-voiced tokens were the most monophthongal with an average of 0.55 Bark, followed by open coda tokens at 0.64 Bark, and finally pre-voiceless at 0.67 Bark, though all three environments returned small trajectory lengths, suggesting more monophthongal realizations regardless of environment.

Table 8.2: Bark-converted FACE trajectory lengths

Player	*Trajectory Length*	*Open Coda*	*Pre-voiced*	*Pre-voiceless*
Allen	0.70	1.1	0.63	0.69
Anderson	0.55	0.60	0.54	0.58
Bell	0.64	0.68	0.70	0.80
Campbell	0.55	0.57	0.5	0.63
Carter	0.54	0.65	0.47	0.62
Clark	0.58	0.71	0.49	0.67
Collins	0.81	0.82	0.79	0.92
Cook	0.67	0.81	0.61	0.41
Hall	0.49	0.41	0.47	0.76
Jackman	0.51	0.53	0.43	0.61
Johnson	0.55	0.7	0.59	0.73
Jones	0.64	0.66	0.73	0.50
King	0.40	0.41	0.40	0.71
Martin	0.52	0.62	0.47	0.60
Mitchell	0.50	0.58	0.46	0.41
Nelson	0.59	0.5	0.57	0.83
Phillips	0.57	0.73	0.44	1.07
Taylor	0.60	0.66	0.5	0.79
Thomas	0.46	0.41	0.48	0.62
Vasquez	0.67	0.59	0.71	0.52
Average	**0.53**			

Only two players had trajectory lengths of 0.7 or greater, which in and of itself is a relatively small value. The data demonstrated that players were utilizing more monophthongal FACE tokens. Phonological environment did influence overall trajectory length, as 12 players produced their most monophthongal tokens when the vowel occurred before a voiced sound. There did not seem to be a trend determining which environment produced the second most monophthongal tokens. Three players, Bell, Hall, and Nelson had their lowest trajectories for open coda tokens, and four players, Cook, Jones, Mitchell, and Vasquez, produced their lowest trajectory lengths in pre-voiceless tokens. Phillips had the greatest degree of difference between trajectory lengths with a pre-voiced token length of 0.44 and a pre-voiceless token length of 1.07. Figure 8.1 shows FACE trajectory lengths for all players increasing in value descending the y axis. The black dashed lined indicates the mean.

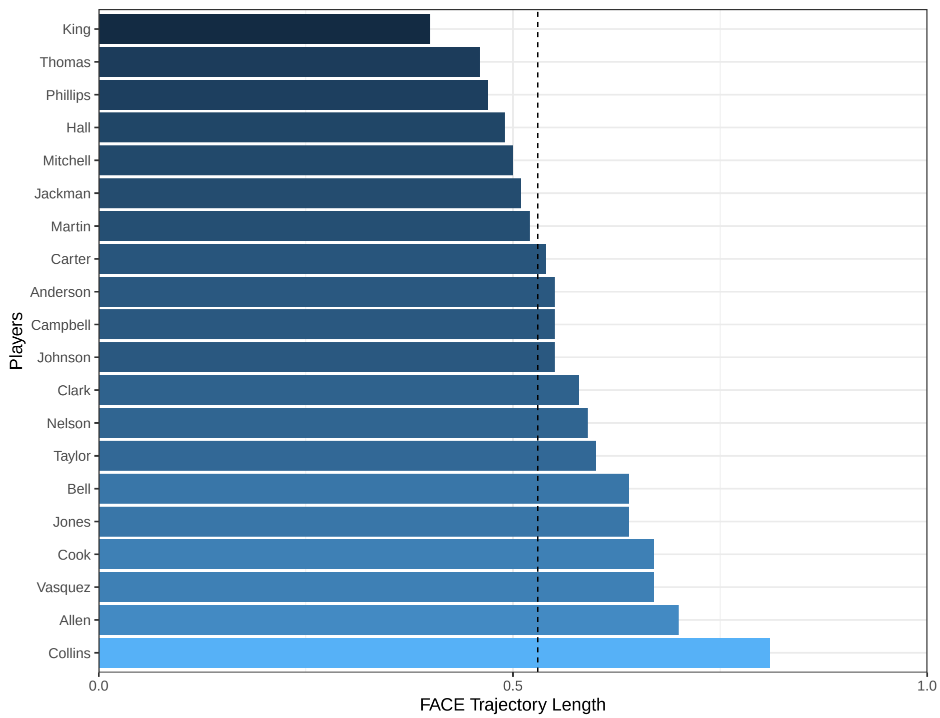

Figure 8.1: Bark-converted FACE trajectory lengths for all players

The average FACE trajectory length was 0.53 Bark. To establish if this corresponded to a more monophthongal pronunciation, comparison with vowels which were expected to be diphthongal is necessary. Fortunately, CR presents multiple vowels which can be use to fulfil this analysis. Since FACE is a front upgliding vowel, TIGHT and TIE are the two CR variants which offer the best point of comparison. The players had a mean TIE trajectory length of 1.55 Barks, nearly three times the length seen for FACE. The mean TIGHT trajectory length was even larger at 2 Barks, approaching four times the length of FACE. These results demonstrate that players produced more monophthongal FACE tokens. Figure 8.2 captures the trajectory of FACE throughout the entire vowel duration. It is given with the average trajectories of both TIE and TIGHT. Both the x and y-axis have been inverted to better correspond to the vowel space. Individual FACE trajectory plots for each player can be found in Appendix D.

Trajectory lengths can capture the entirety of the movement throughout the duration of the vowel, but that players' mean Z1 and Z2 values offer deeper insight into the directionality of movement within FACE tokens as well as how

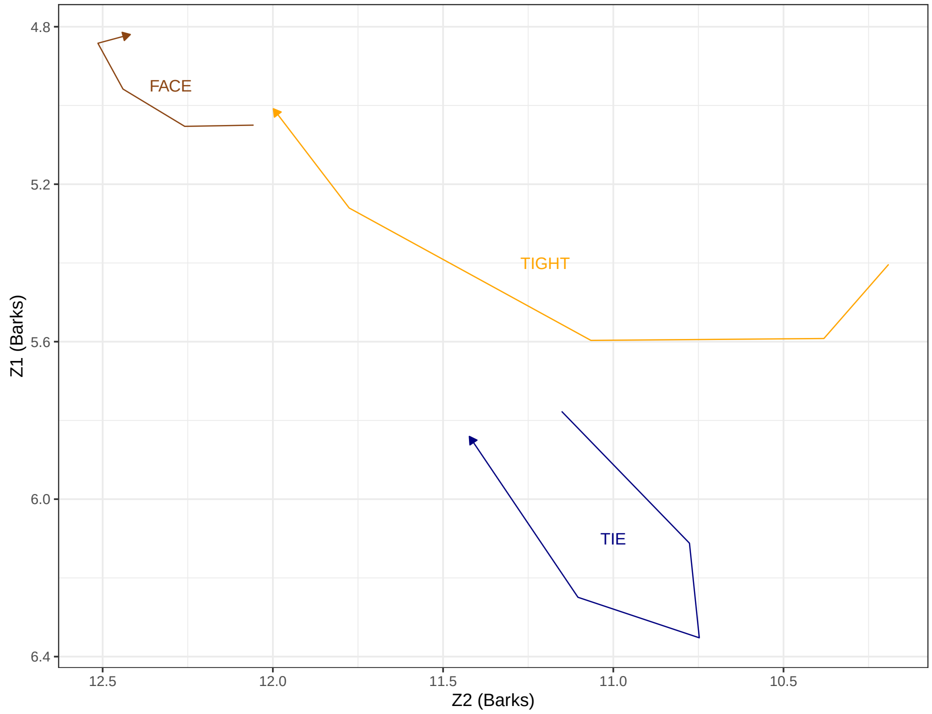

Figure 8.2: Bark-converted FACE trajectory paired with TIGHT and TIE

they compare to other diphthongs. Bark-converted mean FACE Z1 and Z2 values throughout the duration of the vowel are given below in Table 8.3. These values better captured the degree of movement throughout the trajectory of the vowel with respect to height, as Z1, and advancement, as Z2. Lower Z1 values were indicative of a higher positioning of the tongue in the vowel space and larger Z2 values indicated that the vowel was produced in a more advanced position. Due to this, Z1 values dropping throughout the trajectory of the vowel represent upward movement of the tongue, upgliding, and increasing Z2 values capture movement of the tongue forward. Paired with these values are the total degree of tongue movement throughout the duration of the vowel with respect to height and advancement. To compare the status of FACE as a monophthong, corresponding Z1 and Z2 values for TIE and TIGHT, as well as the total degree of movement for both, are provided as well.

The players' mean FACE Z1 values, which captured the amount of upgliding, displayed very little upward movement of the tongue throughout the trajectory of tokens. The mean Z1 value began at 5.05 Bark at 20% duration and remained there for 35% duration as well. Subsequently, the mean decreased

Table 8.3: Bark-converted mean Z1 and Z2 value and degree of movement for FACE, TIGHT, and TIE

Vowel	*Formant*	*20%*	*35%*	*50%*	*65%*	*80%*	*Total Movement*
FACE	Z1	5.05	5.05	4.96	4.84	4.82	0.23
	Z2	12.06	12.26	12.44	12.51	12.42	0.55
TIGHT	Z1	5.4	5.59	5.6	5.26	5.01	0.78
	Z2	10.19	10.38	11.07	11.78	12	1.81
TIE	Z1	5.78	6.11	6.35	6.25	5.84	1.09
	Z2	11.15	10.78	10.75	11.10	11.42	1.08

at each duration percentage until reaching the highest place within the vowel space at 80% duration where the mean Z1 value was 4.82 Bark. This movement from 20% to 80% duration established a total degree in Z1 movement of only 0.23 Bark, indicative of minimal upgliding. On an individual bases, King had the smallest degree of upgliding with a total change of just 0.02 Bark throughout the duration. Inversely, Collins had the largest, though still indicative of very little upgliding, of 0.53 Bark.

Mean Z2 values, which captured the degree of frontward movement, captured more movement of the tongue than Z1 values, but still largely corresponded to a more monophthongal pronunciation. The mean Z2 value began at the lowest value, 12.06 Bark, at 20% duration. This value increased at each duration percentage before reaching a maximal value of 12.51 Bark at 65% duration. After this point, the trajectory receded to 12.42 Bark at 80% duration. The largest difference, from 20% duration to 65% duration, was only 0.46 Bark. Even accounting for the slight return towards a more central position, the total degree of movement was only 0.55 Bark. Thomas had the smallest degree of frontward movement of just 0.28 Bark, while Allen the largest degree of movement of 0.75 Bark.

When these values were compared to TIGHT and TIE, it became apparent that the players were producing a more monophthongal FACE variant. The most diphthongal of the three vowels was TIGHT. While the players' TIGHT trajectory length suggested a greater degree of movement throughout duration, the Z1 and Z2 values demonstrated just how much more tongue movement really occurred. The total degree of TIGHT Z1 movement was 0.78 Bark, equaling the total degree of movement for both formants in FACE, indicating noticeable upgliding. However, an even greater degree of movement occurred in TIGHT Z2 values, where the total movement was 1.81 Barks, indicative of advancement of the tongue in tandem with upgliding. Although TIE did not include as much tongue movement as TIGHT, mean Z1 and Z2 measurements further solidified the distinction between monophthongal and diphthongal pronunciation for the players. The players' total degree of movement for TIE Z1 and Z2 were nearly identical at 1.09 Barks and 1.08 Barks, respectively. Again, both values far surpassed the corresponding values for FACE.

Overall, the bulk of the movement that made up FACE trajectory lengths was tongue advancement throughout duration. While the total change in Z2 values was minor, it still was nearly double that of change in Z1, tongue height. However, these tongue movements were still relatively small, which explains the low trajectory lengths seen in the speech of all the players in this study. Small FACE trajectory lengths, corroborated by minimal uplgiding and tongue advancement as demonstrated by Z1 and Z2 values, respectively, it is safe to say that the players produced more monophthongal FACE tokens. This would not be expected based on regional American English dialect alone for most players. Additionally, the placement of these monophthongs within the vowel space did not directly correspond with the expectations of SCE, as the mean F2 value suggested a more centralized tongue position than what has been attested for SCE.

8.3 GOAT Trajectory Length

Bark-normalized GOAT trajectory lengths are given below in Table 8.4. Once again, individual trajectory lengths of GOAT in the three different phonological environments are also provided. Overall GOAT trajectory lengths range from 0.51 in the speech of Jackman to 1.51 for Carter. The average length is 0.96. Turning to the differing phonological environments, pre-voiced tokens are once again the most monophthongal with an average of 0.86. Pre-voiceless tokens are slightly more monophthongal than open-coda at 1.07 and 1.19 respectively. The overall trajectory length and the lengths for each phonological environment are all greater than the corresponding FACE lengths, suggesting players overall have more monophthongal realizations of FACE than GOAT.

Individual players' GOAT trajectory lengths presented an entirely different result than that seen for FACE. Only two players produced trajectory lengths under 0.7 Bark. Jackman's FACE and GOAT trajectory lengths were identical at 0.51 Bark. Allen had a smaller GOAT trajectory length than his FACE length which were 0.64 Bark and 0.70 Bark respectively. The trajectory lengths of nine players' were greater than 1 Bark. However, there were still similarities between FACE and GOAT trajectory lengths with respect to the influence of

Table 8.4: Bark-converted trajectory GOAT lengths

Player	*Trajectory Length*	*Open Coda*	*Pre-voiced*	*Pre-voiceless*
Allen	0.64	0.87	0.49	1.06
Anderson	0.76	0.97	0.52	1.41
Bell	1.01	1.36	0.86	1.16
Campbell	1.05	1.36	0.93	1.11
Carter	1.51	1.75	1.24	1.59
Clark	0.86	1.02	0.85	1.06
Collins	1.3	1.58	1.16	1.66
Cook	1.04	1.17	1.14	0.98
Hall	0.82	0.98	0.68	0.82
Jackman	0.51	0.78	0.41	0.62
Johnson	0.97	1.29	0.49	0.65
Jones	0.96	1.08	0.89	1.39
King	0.8	1.27	0.86	0.82
Martin	0.88	1.2	0.72	1.11
Mitchell	0.82	0.93	1.11	0.35
Nelson	0.97	1.16	0.75	1.07
Phillips	1	1.17	1.06	0.99
Taylor	1	1.19	0.75	1.2
Thomas	1.29	1.63	1.1	1.53
Vasquez	1.09	1.13	1.11	0.72
Average	**0.93**			

phonological environments. 15 players had their shortest trajectory length for pre-voiced tokens. Once again, Cook, Mitchell, and Vasquez had all produced their shortest lengths in pre-voiceless tokens, and they were additionally joined by Hall and Phillips, who did not display this tendency for pre-voiceless FACE. Unlike FACE, no player produced their smallest trajectory length in open coda tokens. Because the trajectory length increased for 18 of the 20 players, this demonstrated more diphthongal pronunciations, at least when compared to FACE. Figure 8.3 shows GOAT trajectory lengths for all players increasing in value descending the y axis.

The mean GOAT trajectory length was 0.93 Bark, nearly double the corresponding length seen for FACE. Again, this number in isolation is somewhat challenging to interpret as monophthongal or diphthongal. I have already established the players' GOAT was more diphthongal than FACE, but it is still possible that the pronunciation was more monophthongal than the other diph-

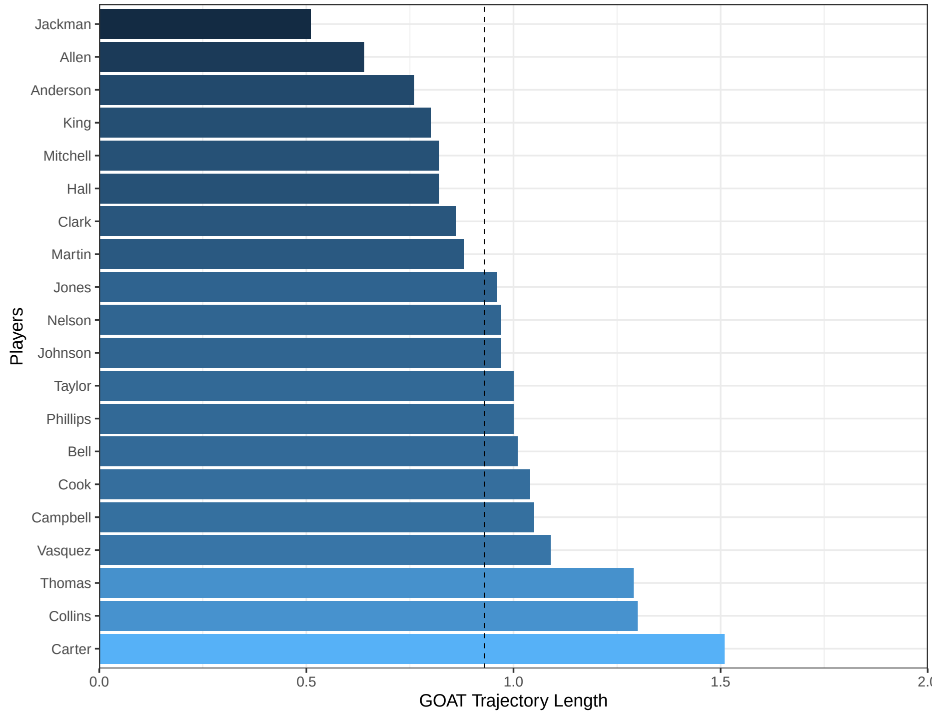

Figure 8.3: Bark-converted mean Trajectory Length of GOAT for all players

thongs. To establish FACE as monophthongal, I directly compared the average trajectory length to the front upgliding CR variants of TIGHT and TIE. A similar comparison can be made between GOAT and HOUSE, COW, and DOWN, as all are expected to be back upgliding vowels. The players' mean HOUSE trajectory length was 1.04 bark, COW was 1.19 Bark, and DOWN was 1.41 Bark. Although there was slightly less movement for GOAT, it was still very comparable to HOUSE and COW, differing by only 0.11 Bark with the former and 0.26 Bark with the latter. If both of these are to be categorized as diphthongal, then it seems that GOAT must be so as well. It should be noted that both HOUSE and COW had trajectory lengths which were much smaller than the two front upgliding variants, TIGHT and TIE. In fact, DOWN was far closer to TIE with lengths of 1.41 Bark and 1.55 Bark, respectively. Furthermore, the average TIGHT trajectory length far surpassed every other vowel analyzed here. If these three vowels are more in line with what is perceived as a diphthong, then it is possible that the players' GOAT was still slightly monophthongal.[53] Figure 8.4 captures the trajectory of GOAT. It is given with the average trajectories of HOUSE, COW, and DOWN. Once again, both the x and y-axis have been

[53] Impressionistically, many of these players did produce tokens which sounded very monophthongal.

invited to better correspond to the vowel space. Individual trajectory plots for each player can be found in Appendix D.

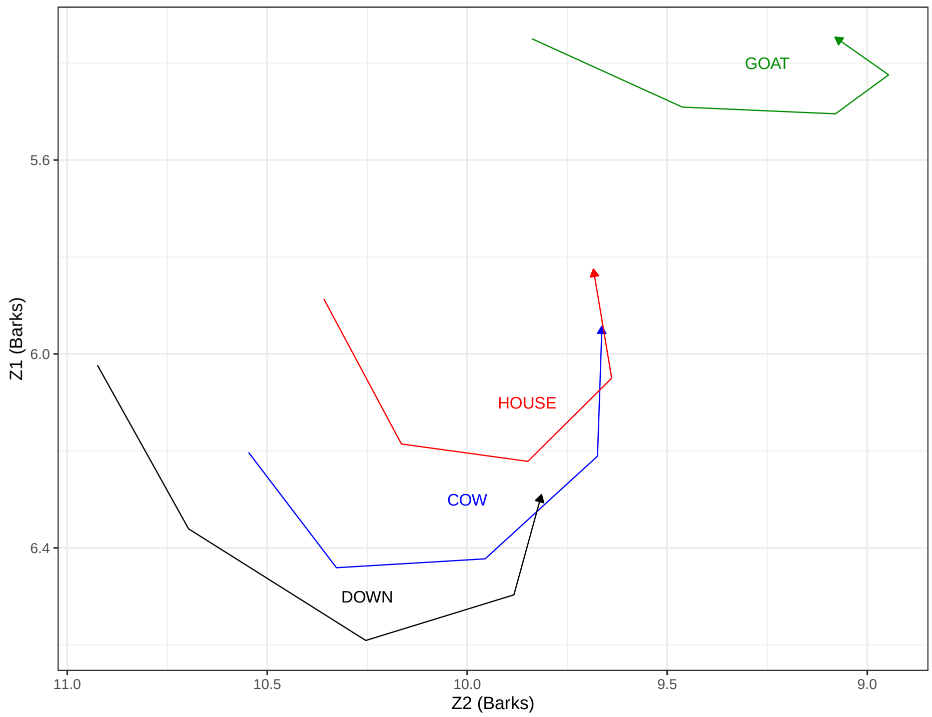

Figure 8.4: Mean Bark-converted GOAT trajectory paired with COW, DOWN, and HOUSE

The directionality of the movement was crucial in understanding if GOAT was more rising or backing within the vowel space. Once again, Bark-converted mean GOAT Z1 and Z2 values throughout the duration of the vowel are given below in Table 8.5. Similar to FACE, lower Z1 values were indicative of a higher positioning of the tongue in the vowel space. In contrast to FACE, smaller Z2 values indicated that the vowel was produced in a more backed positioning. Due to this, decreasing Z2 values captured movement of the tongue backward. Paired with these values are the total degree of tongue movement throughout the duration of the vowel with respect to height and advancement. Corresponding Z1 and Z2 values for HOUSE, COW and DOWN, as well as the total degree of movement for both, are provided as well to highlight the different pronunciation for each diphthong.

The player's mean GOAT Z1 value followed a slightly different trajectory than that seen in FACE. Mean Z1 began at 5.35 Bark then slightly increased, suggesting a drop in tongue height, to 5.49 Bark and 5.5 Bark at 35% and 50%, respectively, only to decrease again towards the value at which it began. This increase and subsequent decrease in Z1 values lead to a total degree of movement of

Table 8.5: Bark-converted mean Z1 and Z2 value and degree of movement for GOAT, HOUSE, COW, and DOWN

Vowel	*Formant*	*20%*	*35%*	*50%*	*65%*	*80%*	*Total Movement*
GOAT	Z1	5.35	5.49	5.5	5.42	5.35	0.31
	Z2	9.84	9.46	9.08	8.95	9.08	1.03
HOUSE	Z1	5.89	6.19	6.22	6.05	5.82	0.73
	Z2	10.36	10.16	9.85	9.64	9.68	0.77
COW	Z1	6.2	6.44	6.42	6.21	5.94	0.74
	Z2	10.55	10.33	9.96	9.67	9.66	0.88
DOWN	Z1	6.02	6.36	6.59	6.5	6.29	0.87
	Z2	10.92	10.7	10.25	9.88	9.81	1.11

0.31 Bark. This was quite comparable to the movement seen in FACE Z1 values, and again was indicative of minimal upgliding. What differed from FACE with respect to Z1 was the direction of said movement. For FACE, the movement that was present was entirely upgliding. However, for GOAT, the movement was downward to the nucleus, and the upgliding simply returned the tongue to roughly the same high in which it began. Individual player Z1 differences were remarkably similar to those seen for FACE. Jackman had the smallest degree of Z1 movement at 0.13 Bark, and Carter the largest at 0.63 Bark. These results were once again indicative of very little upward movement throughout the duration of the vowel. The lack of upgliding was intensified by the fact that half of the movement was downward into the nucleus, meaning that the total degree of upgliding was really only half of the total degree of movement documented for GOAT.

Because GOAT is traditionally a back upgliding vowel, the Z2 values were expected to decrease throughout the duration. At the onset, the mean Z2 value was 10.84 Bark. There was a very large drop off at the next two duration percentages, 9.46 bark at 35% and 9.08 Bark at 50%. By 65% duration, the mean Z2 value reached the most backed position with a value of 8.95 Bark, before a slight return towards central at 80%. The total movement backward was 0.39 Bark. When the small movement back towards the center of the vowel space is accounted for, the total degree of Z2 movement was 1.03 Barks. The degree of players' Z2 movement was far greater than that seen for FACE. While some players like Allen, Anderson, and Jackman had similarly low Z2 movement, the remaining 17 players all produced trajectory lengths which incorporated far greater backward movement. Among the former group, Jackman had the smallest degree of movement, just 0.46 Bark. It should be noted that this would have been near the upper end of the range for Z2 movement of FACE. Furthermore, Collins had the largest degree of movement of 1.52, more than triple Jackman's Z2 movement and more than triple any player's Z1 movement for GOAT. Once again, every player displayed greater Z2 movement than what was seen for Z1, with most players experiencing a considerable decrease in Z2 values throughout the duration of the vowel. The degree of backward movement for GOAT nearly doubled the forward movement for FACE, 1.03 Bark and 0.55 Bark, respectively. This demonstrated rapid backing of the tongue in the vowel space. Due to this, it seemed more accurate to describe most players' GOAT tokens as backing with minimal upgliding.

Where the biggest difference was seen was in the movement of mean GOAT Z2. While the degree of movement with respect to tongue advancement of GOAT mimicked that of FACE, with directionality of movement being towards the back of the vowel space instead of the front, the degree of upgliding was far greater for GOAT. Due to the greater degree of movement in mean Z2 values, it is best to categorize this GOAT variant as more diphthongal. However, the directionality of movement offered insight into why these tokens were potentially more diphthongal. The players produced F2 values that were comparable to those seen in SCE, but the mean F2 value at 20% duration was 1410 Hz. To reach the peripheral backed position of SCE GOAT, the players required a greater degree of movement towards the back of the vowel space. A larger movement of the tongue is needed to reach the back of the vowel space and produce F2 values less than 1,200 Hz. This Z2 movement of 0.89 Bark from 20% to 65% duration, demonstrated that players were producing a vowel that began in a more centralized position and rapidly moved back to a position that would be more expected in SCE, an effect which was not as prevalent in the movement of FACE. If the players were attempting to reach the front of the vowel space expected for SCE FACE, they would have had a similarly large Z2 variation, but that was not the case. Consequently, the Z2 movement seen in GOAT, it was more likely that players were producing more diphthongal GOAT tokens with minimal upgliding movement but a large degree of backward movement. Therefore, it could be said that, although FACE tokens were produced as monophthongs, GOAT tokens were produced as non-upgliding backing diphthongs.

8.4 Social Effect on Trajectory Lengths

The results from linear mixed effects regression models for trajectory length of FACE are given in Table 8.6. Throughout all the mixed effects models, league was the only fixed effect which produced estimates that were different at a statistically significant level. The results from this model can be seen in Table 8.6.[54] ECHL players were estimated to have trajectory lengths 0.15 less than AHL, which suggested slightly more monophthongal FACE tokens for ECHL players.

[54] The results from linear mixed effects models which were not significant for FACE trajectory length can be found in Appendix D.

Table 8.6: Linear mixed model of FACE trajectory lengths with player as a random effect and league as a fixed effect

League	*Estimate*	*t-Value*	*p-Value*
(intercept)	1.25	26.5	<0.001***
ECHL	-0.15	-2.29	0.035*

Again, linear mixed effects regression models were used to test for statistical significance against GOAT trajectory length. The results from the model that utilized region as a fixed effect are provided in Table 8.7. Region was the only fixed effect with any statistical significance on GOAT trajectory length.[55]

[55] The results from linear mixed effects models which were not significant for GOAT trajectory length can be found in Appendix D.

Table 8.7: Linear mixed models of GOAT trajectory lengths with player as a random effect and region as a fixed effect

Region	*Estimate*	*t-Value*	*p-Value*
(intercept)	2.30	8.06	<0.001***
Upper Midwest	-0.59	-1.87	0.085
Mid-Atlantic	-0.62	-1.53	0.151
Inland North	-0.70	-2.30	0.039*
W. Pennsylvania	-0.76	-2.15	0.050
West	-0.90	-2.55	0.024*

Eastern New England functioned as the intercept in this model with a relatively large GOAT trajectory length estimate of 2.30. Every other region had smaller estimates, which suggested that the other regions should be understood as producing more monophthongal GOAT tokens. However, these values were still larger than the corresponding estimates for the linear mixed effects model for FACE trajectory length. Two regions produced estimate GOAT trajectory lengths which differed to a statistically significant degree, the Inland North and the West, with trajectory length estimates that were -0.70 and -0.90 less than the intercept respectively.

8.5 Summary

The players uniformly produced more monophthongal FACE variants. The Bark-converted trajectory lengths ranged from 0.40 to 0.81, but even the high end of this range still contained very little movement. Furthermore, the degree of movement within FACE appeared to be equally distributed between Z1 and Z2 change. The trajectory of FACE displayed only slight upgliding and forward movement and therefore was indicative of a monophthongal pronunciation. The players did fall short of the more peripheral status of FACE mentioned in *ANAE*. The monophthongal status of FACE is not historically attested across regional American English dialects, but has been documented in the Upper Midwest (UM). While many of the players being analyzed are from that region, they did not produce more monophthongal variants than the players from other regions. This, paired with the uniformly monophthongal realizations, demonstrate that FACE has gained indexical value linked to hockey. As all the players from outside of the UM still produced monophthongal variants, it is likely they have re-interpreted the indexical value linking the variable to the UM or Canada. This will be analyzed in greater detail in Chapter 9.

The trajectory lengths for GOAT varied more than FACE. Trajectory lengths ranged from 0.51, which was monophthongal, to 1.51, likely indicative of a diphthong. The larger trajectory lengths were due to the increase movement in Z2 throughout the duration of the vowel. In fact, the degree of movement in Z1 was quite similar between GOAT and FACE. Again, the players failed to reach the peripheral status suggested by *ANAE*, but large degree of Z2 movement demonstrated that players were attempt to reach this status. The movement that was present was not upgliding as a more diphthongal but rather almost entirely backing with minimal to no upgliding. Most Z1 values dropped from the onset to the midpoint only to return to the initial height by the offset. In contrast, Z2 values rapidly backed from the onset at 20% duration until 65% duration, before a slight movement forward at 80%. While a handful of players did produce monophthongal GOAT variants, I hesitate to classify this as having indexical value linked with hockey. Instead, i think it is best to expand the classification to non-upliding, as this captured the realization of all the players. This non-upgliding GOAT variant is not explicable by regional dialect and therefore presents a perfect variable to gain indexical value linked to hockey. This will be addressed further in Chapter 9.

This chapter, along with the previous two, established the status of three variables of SCE to establish if they were present in the speech of the player. Each variable proved to be present within the players' speech, though often to varying degrees. Although the players did not uniformly exhibit the LBMS, the analysis brought about the presence of a novel low back vowel, HOCKEY. The analysis of CR demonstrated that raising was present throughout all players but was not uniform or entirely "Canadian." Monophthongal FACE was common across the players, but a non-upgliding GOAT variant was dominant. In the next chapter, Chapter 9, I will analyze what these results demonstrate about the construction of a hockey-based linguistic persona.

Chapter 9

Defining the Hockey-based Linguistic Persona

In the sections that follow, I summarize if the players' data demonstrated that they have adopted any of the SCE variables. In doing so, I establish to what extent variables which were present aligned with what would be expected in SCE. The reader should recall that I initially hypothesized that all these variables would be present within the speech of the players to varying degrees. Thus, categorizing the results is necessary to determine if players utilized SCE variables, which would help to evaluate my initial hypotheses. After that, I focus on whether the presence of these variables can be explained by regional American English dialects alone. Region was the only social effect that was found to be statically significant with each of the variables. Therefore it needs to be analyzed in further detail. If a variable occurred uniformly across the players and that variable was not attested in all the regional dialects present within this study, then I argue that it has gained indexical value marking a hockey-based persona for these players.

At the beginning of this dissertation, Chapter 1, I presented two research questions which I hoped to answer with this study. First, have hockey players adopted variables associated with SCE, and if so, which variables have been adopted and is their usage uniform across the community. Second, if SCE variables are present, what motivations are there for this adoption to have occurred. These questions guided my initial hypotheses about this study. These hypotheses could be largely grouped together as those impacting the acoustic analysis which focused on the first research question attempting to establish which of the SCE variables were present in the speech of the players and to what degree.

The second set of hypotheses then addressed the social and hockey-specific factors which could impact the degree to which any of the variables was being utilized by the players. Before discussing how my results proved or disproved these hypotheses, I want to briefly restate exactly what the hypotheses were.

I hypothesized that the players in this study have adopted SCE variables, but to varying degrees for each variable. Monophthongal FACE and GOAT variants were predicted to be the most prevalent in the speech of the players. The players were expected to be producing uniform monophthongal variants which were at the periphery of the vowel space. As it was hypothesized to be uniform for all players, this variable would be in an ideal situation to gain new indexical value linked to the sport. Additionally, this variable is not uniquely Canadian, as it can be linked to the Upper Midwest (UM). Therefore, the players might not initially view it as being "Canadian" and the interpretation of its indexical value as being linked to hockey would not require re-interpretation. Canadian raising (CR) was hypothesized to be attested in the speech of all players, but potentially not of both TIGHT and HOUSE. Players from Eastern New England (ENE), the Inland North (IN), and the UM were hypothesized to raise both TIGHT and HOUSE, but TIGHT raising was theorized to be unrestricted and uniform for all players. The stereotypical "Canadian" indexical value of HOUSE raising, was presented as a potential rationale for any lack of HOUSE raising. Finally, the Low-Back-Merger Shift (LBMS) was predicted to be the variable which was the least common across the players. Players who failed to exhibit the Low-Back Merger (LBM) were theorized to not undergo the shift at all. The Northern Cities Vowel Shift (NCVS) presented a possible explanation for the lack of merger as well. In this chapter, I will establish if these hypotheses were proven accurate or inaccurate based on the data.

I had initially hypothesized that regional dialect would not impact the presence of the variables, but that is might potentially be a reason as to why they were not attested. I suggested that region would not impact FACE and GOAT but would affect CR, more so the raising of HOUSE, and the LBMS. The previous Chapters 6, 7, and 8 demonstrated that this hypothesis was inaccurate. Region proved to significantly impact each of the variables being studied, and therefore, the impact of region will be addressed in depth throughout this chapter. In contrast, the hockey-specific factors proved to not significantly impact any of the acoustic metrics used to establish the presence of SCE variables. I did not expect any of these to significantly impact variable usage, but it was necessary to establish that they did not to claim that usage is uniform across players.

9.1 Overview of the Vowel Space

Before addressing the status of each of the variables in this study, it is important to provide a brief overview of the entire vowel space for the player. Figure 9.1 shows the vowels space for all vowels included in this study. Each point represents an individual player's mean with the ellipse representing one standard deviation from the mean of the group.

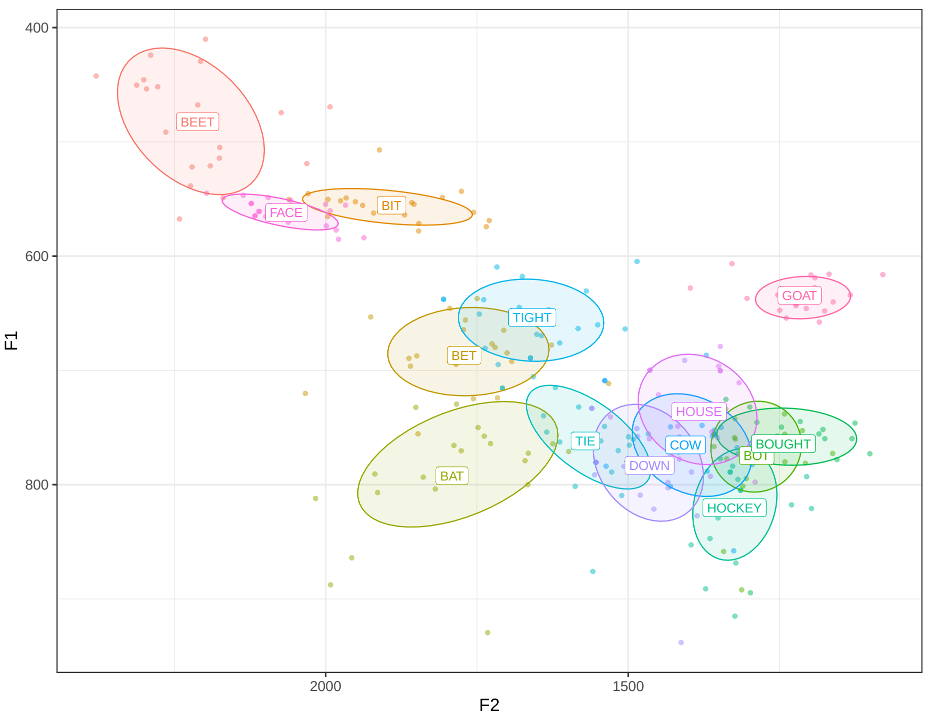

Figure 9.1: All vowels at 50% for all players (ellipse indicates one standard deviation)

Although BIT, and BET both appear retracted, lowering was less impactful. When comparing these vowels to BAT, it became apparent that BAT was not lowered and occupied a space very close to BET. The plot demonstrates that there was some degree of merger between BOT and BOUGHT. This did not lead to a more retracted BAT though, which suggested that although players had the LBM, this did not entirely correlate with the LBMS. It is possible that the novel HOCKEY impacted the degree of retracting possible for BAT, as it was slightly more advanced that either BOT or BOUGHT, but HOCKEY still was more backed than all the CR variants.

Extreme TIGHT raising can be seen, as well as slight advancement in the raised variant. The ellipses for COW, DOWN, and HOUSE are far closer together, which is unsurprising as the raising that was documented was not really as extreme, nor was it uniform for all players. The importance of the relative placement of COW in a more backed position than TIE will be addressed in further detail later in this chapter.

Finally, FACE and GOAT reached peripheral status at the front and back of the players' vowel space, respectively. The only vowel more fronted than FACE was BEET. Although the players did not align with the *ANAE* benchmark for this peripheral status, the placement of FACE, just short of BEET demonstrated that the pronunciation was peripheral at least for their own vowel spaces. Similarly, GOAT was one of the most backed vowels for the players, in line with BOUGHT. Again, the players did not quite reach the peripheral status mentioned by *ANAE*, but they still produced the vowel on the periphery of their own vowel spaces. Unfortunately, the placement of BOOT was not included in this analysis, so it is not possible to establish is GOAT was in a more backed position.

Simply establishing where these vowels were the in the players' vowels space was not enough in analyzing how they behaved with respect to SCE and other American English dialects. Fortunately, the variable specific metric results provided in Chapters 6, 7, and 8 provide excellent points of comparison for the players. If they had simply adopted the SCE variables, then these metric results should be comparable to studies documenting the variables in SCE. This would likely entail that these players have deviated from their own expected regional dialect. However, it is also possible that the players did not align directly with SCE or their own expected regional dialects. If the latter has occurred, and the players results did not align with SCE or other regional American dialects, then it is very likely that players have constructed a hockey-based linguistic persona which utilizes these variables.

9.2 The Low-Back-Merger Shift

Overall, the players did not exhibit uniform Pillai scores or LBMS Index scores. Although I did not test the Pillai scores against the social effects, region proved to be significant in the case of the LBMS Index scores. Because of this, I begin this chapter by addressing the regional impact on players' Pillai scores, before shifting focus to the same for LBMS Index scores. As region appeared to be relevant to both aspects of this variable and was proven to be significant for the LBMS Index scores, I argue that it is unlikely that this shift has gained any indexical value for a hockey-based linguistic persona.

9.2.1 The Low-Back Merger Pillai Scores

Turning first to the LBM, Becker's (Becker, 2019) volume provides data from six different studies that include Pillai scores measuring the degree of overlap between the low back vowels BOT and BOUGHT for speakers from three US states, California, Washington, and Missouri, as well as one Canadian province, British Columbia. Additionally, LBMS Index scores are provided for speakers from seven US states, the three listed above, Nevada, Oregon, and Michigan, and also British Columbia. Swan (2019) compares Pillai scores of speakers in Vancouver and Seattle and finds that Vancouverites have a smaller mean Pillai score of 0.011 but that Seattleites also display a great deal of overlap with a mean score of 0.017. Low Pillai scores are documented by Grama and Kennedy (2019) for Californian speakers. While there is some degree of variation between individual speakers, the mean Pillai score for all the speakers in Grama and Kennedy's study is 0.089. Although this is noticeably higher than the corresponding scores that Swan provides for Seattle and almost nine times larger than Vancouver, it is still a relatively small value, which still suggests a large degree of overlap. Strelluf (2019) analyses Kansas City, Missouri, separating speakers into generations to test if Pillai scores are decreasing in apparent time in Kansas City. His 1980's speakers have a mean Pillai score of 0.238 while the 1990s speakers are more merged with a mean score of 0.218.

When organized by region, it became clear that the players from ENE, the UM, and the West displayed the greatest overlap between low back vowels. The mean Pillai scores are provided in Table 9.1 scores with the players categorized by region. The average Pillai score for all players was 0.169.

Table 9.1: BOT-BOUGHT Pillai score by region

Region	*Pillai Score*
Eastern New England	0.007
Upper Midwest	0.097
West	0.110
Western Pennsylvania	0.112
Mid-Atlantic	0.210
Inland North	0.217
Average	**0.169**

Only ENE, represented here by a single player, Thomas,[56] surpassed Swan's speakers from Seattle and Vancouver with a Pillai score of 0.007. Due to this exceptionally low Pillai score, it is safe to say that Thomas has completely merged low back vowels. However, this is not entirely unexpected, as this merger has been well-documented in the ENE dialect going as far back as the 1960's by

[56] Since Thomas is the only player from ENE, these results can only suggest what might be occurring in that region. It is entirely possible that he is not a perfect exemplar, and future research will be necessary to see if other players from ENE align with Thomas's results.

Kurath and McDavid (1961). The next lowest Pillai scores were seen in the UM. While this is somewhat surprising, Allen (1973) did mention that younger speakers displayed the merger in the region. Perhaps this is the result of his observations made nearly half a decade ago. Two of the Upper Midwesterners, Carter and Clark, had the second and third lowest Pillai scores. respectively. Speakers from the West had the third lowest scores by region, with a mean value of 0.110. This is similar to mean score of 0.089 for California speakers attested by Grama and Kennedy but suggested less overlap in the players' speech. Western Pennsylvania (WPA) was incredibly similar to the West, only increasing by 0.002. The remaining two regions presented a largely different scenario. Players from the Mid-Atlantic (MA) and IN had mean Pillai scores of 0.210 and 0.217, respectively. These values were close to Strelluf's data for the 1990's speakers from Kansas City. Although this might suggest these players are still moving towards a merger, it appears that, in the present data, BOT and BOUGHT remain distinct. The most distinct vowels were seen in the speech of Campbell, Collins, and Jackman, who all produced scores which were above 0.300, suggesting no merger. All these players are from the IN.

Overall, the degree of merger appeared to correspond largely to each players' regional dialect and the only dialect which appeared similar to SCE was ENE. Players from all other regions fell well short of the merging seen in Swan's Vancouver speakers, showing that they were not merging BOT-BOUGHT comparably to Canadians, at least not those from Vancouver. The players' Pillai scores seemed to align with the expected values seen in other analyses of American regions, and more specifically with their own regional dialects. These results demonstrate that the LBM has not gained indexical value linked with hockey. As it is not being used uniformly, it is unlikely that the merger would be able to index hockey players and, therefore, is not currently a part of any linguistic persona linked to the sport. These results corroborated the hypothesis that the LBM is likely not occurring throughout the speech of the players. I initially theorized that the lack of a merger between BOT and BOUGHT in many of the players' regional dialects would lead to the absence of a uniform merger, and this proved to be accurate.

9.2.2 The Low-Back-Merger Shift Index Scores

Swan (2019), being the only study included to directly compare US and Canadian speakers, represents a perfect point of comparison for LBMS Index scores. She additionally provides separate means for male and female speakers for both Seattle and Vancouver. Because all the players interviewed in the study were male, I will compare the results against the mean established for males in both cities. Swan's males from Seattle have a mean LBMS Index score of 2.61, while their counterparts in Vancouver have a mean of 2.44. These values are the highest seen throughout the works included in Becker (2019). The values seen in Vancouver provide a good point of comparison for the players' results. If the players' LBMS Index values align with Swan's Vancouver speakers, then it is likely that they exhibited SCE style shifting.

Fridland and Kendall (2019) provide further LBMS Index scores for speakers from California, Nevada, and Oregon. Though separate values are not given for male and female speakers, these LBMS Index scores still offer further insight into what is occurring in the West, which can be compared against the players included in the study. They establish mean Index scores of 2.35 for Californians, 2.30 for Nevadans, and 2.28 for Oregonians. Strelluf (2019) analyzes speakers from Kansas City, establishing a mean LBMS Index score of 2.22 for the city. These studies suggest relative uniformity in the LBMS Index scores for speakers from Missouri to the West Coast. While none of the players studied are from any of the state mentioned above, there are a few from states that border them, specifically Iowa and Colorado.

Nesbitt, Wagner, and Mason (2019) present data from Lansing, Michigan, the most common home state provided by the players included in this dissertation. They separate mean scores for male and female speakers and additionally for older and millennial speakers. Looking specifically at the males, older speakers have an Index score of 2.01, while the millennials have a slightly greater value of 2.14. As the oldest player in the study was born in 1986 and the youngest in 1996, all players fall in the millennial generation, and can then be compared to Nesbitt, Wagner, and Mason's millennial male speakers. Due to the expected presence of the NCVS for speakers in Lansing "had to undergo some additional vowel shift just to reach [...] a 'neutral' configuration" (Nesbitt et al., 2019, p. 159).

Returning to the players' data, the average LBMS Index score was 1.91, well below all values attested by Becker (2019). Although this suggested that on average the players had not undergone the LBMS, it is valuable to look at how players grouped together, as some did have values similar to those seen in (Becker, 2019). Since region was the only statistically significant social effect for the LBMS Index, I will analyze the average degree of shifting which occurred for the players categorized by region. The average LBMS Index scores for each region, from the region with the most shifting, the West, to the region with the least, WPA are presented in Table 9.2.

The only region which produced a LBMS Index score which were was comparable to those in (Becker, 2019) was the West. The mean for the region was

Table 9.2: Low-Back-Merger Shift Index score by region

Region	*Low-Back-Merger Shift Index Score*
West	2.31
Eastern New England	1.90
Inland North	1.90
Mid-Atlantic	1.85
Upper Midwest	1.83
Western Pennsylvania	1.80
Average	**1.91**

2.31 which demonstrated that these two players from the West region exhibited the LBMS. Johnson, the player with the largest LBMS Index score, had a score of 2.41, approaching the values seen in Swan's Vancouverite male speakers. However, there was a rather large drop off to the next largest value of 2.20 in the speech of King, which is more comparable to that seen for Fridland and Kendall's Oregonian speakers. Overall, these are the only two players that I would define as having undergone the LBMS. As both of these speakers are from the West, specifically Colorado, these results were not surprising and seemed to correspond to what is presented by Becker (2019).

With the exception of the West, players from all other region exhibited very little shifting of the short front vowels. Players from ENE and the IN both produced mean Index scores of 1.90, a drop off of more than 0.40 from the West. Six players, Allen (2.08), Campbell (2.14), Carter (2.04), Collins (2.03), Jackman (2.00), and Jones (2.07), had values which correspond to a more "neutral positioning" of the short front vowels. Half of these players, Campbell, Collins, and Jones, are from Michigan, which correlates with the general findings of Nesbitt, Wagner, and Mason in the speech of those from Lansing, Michigan. However, all these players are millennials, and only Campbell patterned with Nesbitt, Wagner, and Mason's millennial speakers. The other five players, including the three not from Michigan, seemed to pattern more with the older speakers from Lansing. Allen, Carter, and Jackman are from states that boarder the Great Lakes, Ohio, Illinois, and Minnesota, although Allen and Jackman both spent a lot of their youth in Michigan. It should be noted that two other players from Michigan, Nelson and Phillips, were among those with the lowest LBMS Index scores at 1.67 and 1.74, respectively. Although there was a great deal of difference between the Index scores for players from the IN, the higher Index scores of Allen, Campbell, Collins, Jackman, and Jones had the region tied with ENE as the region with the second most participation in the Shift. In both regions, the mean LBS Index score was 1.90. The involvement of BIT and BET in the NCS could potentially explain why these players from the IN had higher Index score than those from other regions where the merger is more attested.

The remaining 12 players all had LBMS Index scores of less than 2.00, which suggested minimal shifting. Anderson, Martin, Mitchel, Taylor, and Thomas had values ranging from 1.8-1.98. Bell, Cook, Hall, Nelson, Phillips, and Vasquez all had values less than 1.75. The players who exhibited this smaller degree of shifting were not from a single region like those outlined above. Most of these players were from the IN (Michigan, New York, and Ohio), but none of the players from ENE, the MA, WPA, or the UM exhibited a large degree of shifting as measured by the Index score.

When analyzed together, the Pillai scores and LBMS Index scores presented a challenge to motivation of the shift for the players for whom it was present. Thomas, the player with the lowest Pillai score, had a LBMS Index of 1.9. Surprisingly, of the players that had Pillai scores under 0.01, only King had a LBMS Index score truly indicative of shifted front vowels–i.e., 2.21. Conversely, Johnson, who had the largest Index score of 2.41, had the third largest Pillai score, which suggests distinct low back vowels. As the merging of the low back vowels is often considered the springboard for the LBMS, Johnson's results were rather peculiar. Outside of King, three of the players with the largest LBMS Index score had relatively large Pillai scores. In addition to Johnson, Anderson had a LBMS Index of 2.08 but a Pillai score of 0.153, and Campbell had a LBMS Index of 2.14 and a Pillai score of 0.217. This is not to say that the data was entirely absent of correlation between Pillai scores and LBMS Index scores. Mitchell, Nelson, and Phillips all had relatively low LBMS Index scores of 1.98, 1.67, and 1.74, paired with relatively high Pillai scores of 0.234, 0.247, and 0.234 respectively. The data for these players suggested distinct low back vowels which could be blocking the downward movement of BAT, thought to be the first movement involved in the LBMS according to Becker (2019). At least for Nelson and Phillips, this appeared to be true, as their individual Euclidean distances from BEET to BAT were only 2.17 and 2.35, respectively, two of the shortest distances documented among all the players.

Overall, the results for the LBMS shift proved the hypothesis about this variable accurate. The players did not uniformly exhibit the shift. In fact, only two players produced LBMS Index scores which were comparable to those seen in Vancouver by Swan (2019). I had hypothesized that the lack of the LBM would inhibit the shift from occurring, but this was not entirely accurate. Some players did produce low Pillai scores, which measured the degree of merger, but failed to produce large LBMS Index scores. This demonstrated that it was possible for players to have the LBM but not exhibit the LBMS.

9.3 Canadian Raising

Unlike the LBMS, there was a great deal of uniformity for CR in the players speech, specifically for TIGHT raising. However, it was important to determine if this uniformity could have been linked to something other than hockey, specifically the impact of region on raising must be analyzed. Furthermore, previous linguistic research has shown that HOUSE raising potentially functions as a stereotype of SCE. As many of the players mentioned this specific variable during their interview, this metalinguistic awareness might have impacted the degree of raising present in the data. I argue that, while the uniformity of TIGHT raising suggested that it has gained indexical value for a hockey-based persona, HOUSE raising was used in a different way. The variation in HOUSE raising did suggest potential indexical value, but, due to the stereotyped SCE value associated with this particular variant, the players produced variants which differed from SCE.

9.3.1 TIGHT Raising Differentials

ELC provides insight into the degree of raising for SCE and also three different regional American English dialects based on the regions established by *ANAE*: ENE, IN,[57] and the Midlands-Midwest-West (MMW), a combination of three *ANAE* regions (Boberg, 2010, pp. 154–5). Boberg provides a single value capturing the degree of raising between each pair of variants, measured at the maximal F1 value, for each regional dialect. Although his methodology is slightly different from the methodology used in this analysis, these measurements can be used to compare the results of the players or to establish how their raising either correlated with or differed from each of the four dialects outlined in *ELC*.

[57] Boberg does not specify if his designation for IN includes speakers from the region that I have separated out as the UM.

Boberg's data shows a mean SCE TIE-TIGHT F1 difference of 110 Hz. This difference drops to 86 Hz for speakers from the MMW, before increasing for the remaining two US dialects. Boberg's ENE and IN speakers have differences of 141 Hz and 126 Hz and ENE speakers between TIE and TIGHT, respectively. These results suggest that SCE speakers raise TIGHT to a lesser extent than their IN and ENE counterparts. Detailed in Table 9.3 are the TIE-TIGHT differences throughout the trajectory of the vowel with players categorized by region, as well as the average for all players.

Table 9.3: Mean TIE-TIGHT F1 difference throughout the vowel duration by region

Region	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
Eastern New England	27	65	121	155	125
Inland North	35	69	112	143	120
Mid-Atlantic	39	83	129	177	142
Upper Midwest	45	68	110	142	116
West	32	61	71	98	87
Western Pennsylvania	32	67	108	149	123
Average	**40**	**70**	**110**	**142**	**118**

Figure 9.2 shows the average TIGHT F1 subtracted from TIE F1 value in Hz for all players throughout the duration of the vowel, given with mean regional TIE-TIGHT differentials. The darker line represents the mean difference for all speakers, while the lighter lines represent each region. The dotted lines correspond to Boberg's regional TIE-TIGHT differentials.

The only region which failed to hit the 110 Hz difference observed in SCE was the West. Every other region not only surpassed 110 Hz but also surpassed the most extreme TIGHT raising captured by Boberg for ENE of 142 Hz. This demonstrated that most players exhibited TIGHT raising and did so to an extreme degree. As there was little division between regions, regional dialect did not seem sufficient to explain these results. Many of the players from the IN, MA, UM, and WPA raised TIGHT to a degree unexpected for their regional dialect.

The players average difference between variant started well below the numbers provided in *ELC*, but that is not surprising as those numbers were measured at the maximal F1 value. By 35% duration, the average difference between TIE and TIGHT for the players was 70 Hz; while this was above the expectation of *ANAE* 60 Hz benchmark for raising, it was still less than all the dialects included in the *ELC*. It should be noted, however, that three individual players, Allen, Carter, and Nelson, already surpassed the 86 Hz difference, the mean for Boberg's MMW speakers, at this percentage.

By 50% duration, the players' average difference between TIE and TIGHT F1 values had increased to 110 Hz. This was still less than the raising Boberg established for ENE and IN speakers, but it was far greater than MMW speakers and also matched SCE speakers. At this duration, only four players, Johnson, Jones,

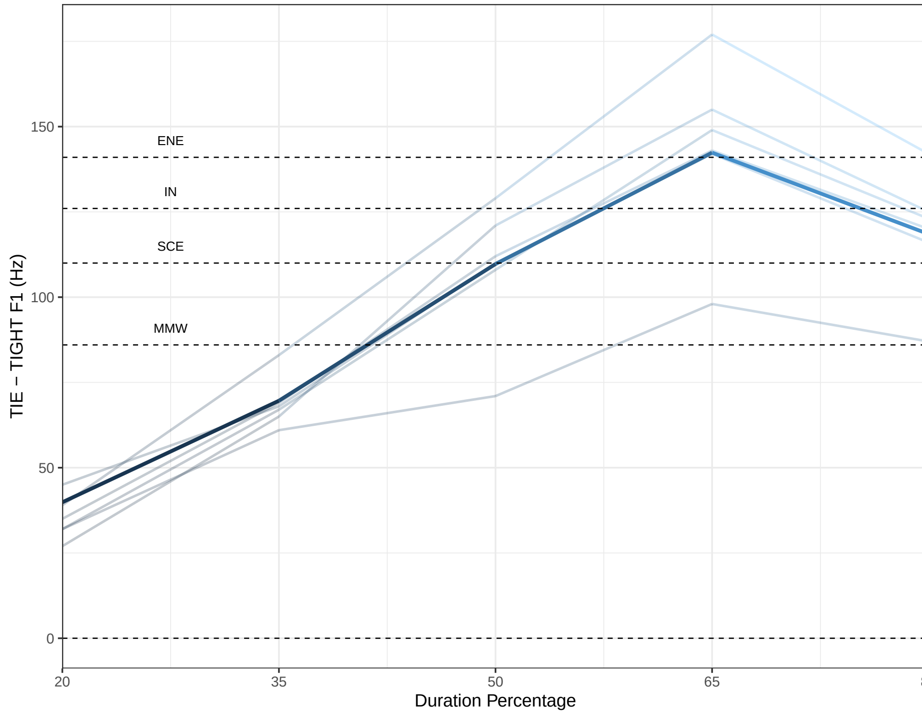

Figure 9.2: Mean TIGHT F1 subtracted from TIE F1 paired by region paired with *ELC* regional differentials

King, and Taylor displayed differences of less than 86 Hz. In contrast, Carter, Collins, Martin, Mitchell, and Nelson all produced differences greater than the 126 Hz attested for Boberg' IN speakers. In total, nine players surpassed the 110 Hz difference seen in SCE at this duration, which was not entirely surprising as any player from ENE and the IN would be expected to exhibit more advanced raising than that seen in SCE.

By 65% duration, the players' average difference was virtually identical to the extreme TIGHT raising seen in ENE with a difference of 142 Hz. This was the duration percentage where every player reached their maximal difference between TIE and TIGHT. Nine players reached or surpassed the differences attested by Boberg for ENE speakers, although an additional two were very close to doing so. Carter, Collins, Martin, Mitchell, and Nelson all had differences greater than 170 Hz, with Carter even surpassing 200 Hz between TIE and TIGHT. Campbell, Clark, Thomas, and Vasquez were the remaining players who also had differences above 142 Hz. Additionally, three players, Allen, Jones, and Phillips, fell just short of Boberg's ENE speakers with differences of 139 Hz, 139 Hz, and 138 Hz, respectively. Overall, most players, 60% in total, produced TIGHT tokens raised above TIE tokens to a degree comparable to that seen in ENE, the most extreme TIGHT raising attested by Boberg.

The results proved the initial hypothesis about TIGHT raising to be accurate. TIGHT raising occurred in the speech of every player studied. Most players raised to an extreme degree. Furthermore, this raising was not significantly impacted by region just as I had hypothesized.

In total, 100% of the players produced distinct TIE and TIGHT vowels, with a difference greater than 60 Hz at some point throughout the vowel duration. 85% of the players surpassed the raising observed in SCE, and 60% of the players raised to an extreme degree in line with ENE, although only a single player was from the region. Since most players did not align with expected regional American English dialects with respect to TIGHT raising, there must be a secondary explanation for its presence. Furthermore, none of the social fixed effects impacted TIGHT raising to a statically significant degree. Although TIGHT raising can be indexically linked to SCE, and also to the ENE and IN dialects, these results suggested that it has potentially gained additional indexical value linked to the sport. Specifically, the players here have re-interpreted the indexical value of TIGHT raising as not only indicative of being Canadian, or from ENE, or the IN, but rather have assigned it new or additional indexical value. If this is the case, which i posit it to be, TIGHT raising is available to be used to mark inclusion within the hockey community and, therefore, it functions as a *n*th + 1st order indexical linked to being a hockey player. The is new value would then be linked with the sport and usage of the variable indicative of a hockey-based linguistic persona. This will be discussed in further detail later in this chapter.

9.3.2 HOUSE Raising Differentials

As described above, most players surpassed the degree of TIGHT raising described by Boberg for SCE, and additionally their own respective dialects. The opposite, however, was true for HOUSE raising. Once again, *ELC* provides degree of raising differences between COW and HOUSE for SCE and also ENE, IN and MMW speakers. Boberg's SCE speakers have a mean COW-HOUSE F1 difference of 142 Hz, well surpassing the corresponding difference seen in TIGHT raising. SCE speakers exhibit a decrease in difference when comparing HOUSE to DOWN. When DOWN is analyzed as the unraised variant, the difference drops to 85 Hz. This establishes a hierarchy where COW occupies the lowest position, with an F1 value 57 Hz greater than DOWN, though both are unraised when compared to HOUSE. Unfortunately, Boberg does not provide measurements for the difference between DOWN and HOUSE for the three regional American English dialects. Looking specifically at the difference between COW and HOUSE, MMW speakers have a difference of only 25 Hz, IN speakers a difference of 46 Hz, and ENE speakers a difference of 110 Hz. Perhaps unsurprisingly, the first two regions are both less than the 60 Hz expected difference provided in *ANAE*, establishing HOUSE raising as more uniquely Canadian than TIGHT raising. However, it is worth noting that there are American speakers from ENE who not only surpass this 60 Hz difference expectation but do so by a large margin. Table 9.4 presents COW-HOUSE differences throughout the trajectory of the vowel with players categorized by region as well as the average for all players.

Table 9.4: Mean COW-HOUSE F1 difference throughout the vowel duration by region

Region	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
Eastern New England	85	91	102	85	85
Inland North	41	18	11	12	12
Mid-Atlantic	51	33	7	-19	-30
Upper Midwest	55	55	56	45	19
West	44	43	20	18	16
Western Pennsylvania	53	55	41	15	-9
Average	**47**	**37**	**29**	**22**	**13**

Figure 9.3 shows the average HOUSE F1 subtracted from COW F1 value in Hz for all players throughout the duration of the vowel, once again given with mean regional COW-HOUSE differentials. The darker line represents the mean difference for all speakers, while the lighter lines represent each region. The dotted lines correspond to Boberg's regional COW-HOUSE differentials.

At no point during vowel duration did the average difference between the two variants surpass the *ANAE* benchmark for raising. In fact, very few players individually managed to establish a difference of greater than 60 Hz, and even fewer maintained this distinction throughout the duration of the vowel. Only two players, Nelson and Thomas, surpassed 60 Hz difference at each duration percentage, and only Thomas would be explainable by regional dialect. Being from ENE, specifically Massachusetts, it is unsurprising that Thomas produced the greatest difference between variants, 102 Hz at 50% duration. Although this difference was still slightly less than Boberg reports for his ENE speakers. Outside of ENE, HOUSE raising, at least when measured against COW, was not common. Players from the UM produced the second largest differences, but

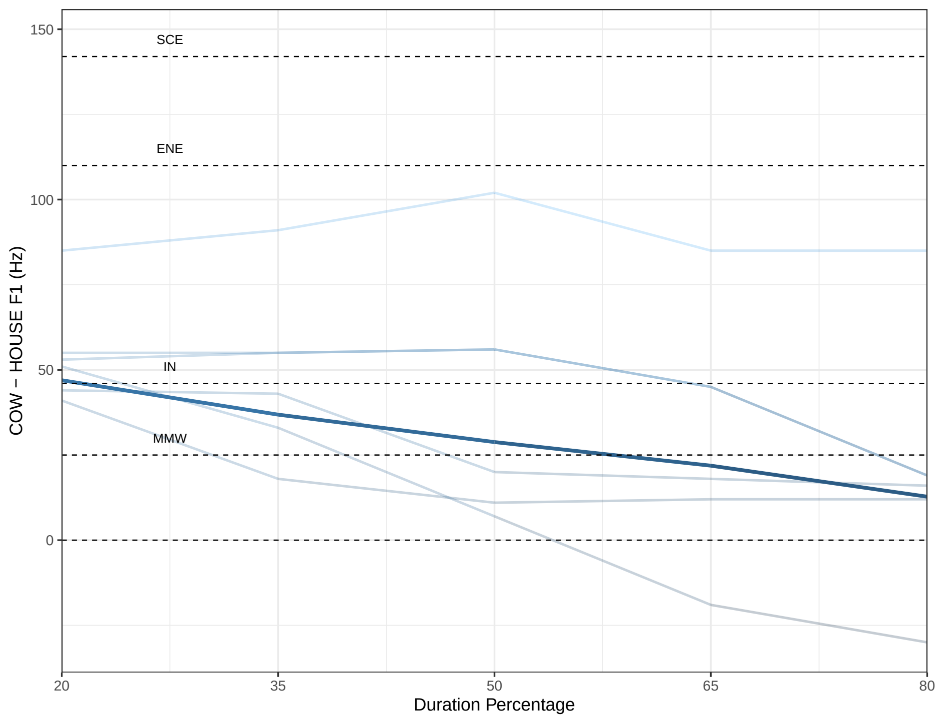

Figure 9.3: Mean HOUSE F1 subtracted from COW F1 paired by region paired with *ELC* regional differentials

fell just short of the *ANAE* benchmark. They did, however, produce differences which were very similar to Boberg's IN speakers.[58] The average for players from the IN was slightly lower than Boberg reports, but this could have been impacted by establishing the UM as a region distinct from the IN.

[58] Boberg does not specify if the UM was included in this region for his analysis.

The IN and UM regions were not entirely uniform. Certain players from UM, Carter, Clark, and Hall did surpass a 60 Hz difference at more than a single duration percentage throughout the vowel. Jackman and Phillips, both from the IN, only surpassed a difference greater than 60 Hz at 20% duration, after which point their differences decreased dramatically, becoming negative by 80% duration. Mitchell further complicated the results for players from the IN, by surpassing the 60 Hz difference at 35% duration, only to have the remaining percentages pattern with Boberg's IN speakers, with values of 47 Hz, 43 Hz, 25 Hz, and 13 Hz at the other four duration percentages. Campbell and Taylor, from the IN and UM, respectively, mostly patterned with Boberg's IN speakers, with differences ranging from 55 Hz to 15 Hz throughout the duration of the vowel. The remaining players from the IN, had far smaller differences, with Anderson and Vasquez, both from New York, having negative differences at most duration percentages. Similarly, Collins, also from Michigan, had a negative differential at three duration percentages. Allen and Jones, from Ohio and Michigan, respectively, had very similar F1 values for COW and HOUSE, showing very little raising between the two potential variants.

Looking to the West, Johnson and King, both from Colorado, did seem to pair with their *ELC* counterparts from the MME. The largest difference between the two was only 56 Hz, thought this was at 20% duration. Johnson had a difference between 20 Hz and 30 Hz from 20% duration through 50% duration. Likewise, King saw a drop from the 55.7 Hz at 20% duration to only 9 Hz at the midpoint, increasing again to 47 Hz by 80% duration. Overall, these results are only explainable by expected regional variation for five players: Thomas (ENE), Mitchel and Taylor (IN), and Jones and King (West).

Most players did not conform to expected regional dialects when raising HOUSE against COW, it seems better to group players based on the degree to which raising was evident, either surpassing the *ANAE* benchmark or producing statically significant variant tokens. In Table 9.5, the F1 differences for COW-HOUSE are provided, categorized into the following groups: those who surpassed the *ANAE* benchmark for raising of 60 Hz at multiple duration percentages (Raising), those who produced variants which differed to a statically significant degree or surpassed the benchmark at a single duration percentage (Near-Raising), and those who failed to do either (Non-Raising).

Table 9.5: Mean COW-HOUSE F1 differentials by degree of raising throughout the vowel duration

Degree of Raising	*Number*	*Duration Percentage (Hz)*				
		20%	*35%*	*50%*	*65%*	*80%*
Raising	5	80	75	78	69	52
Near-Raising	4	60	56	45	28	4
Non-Raising	11	30	14	4	1	0

Figure 9.4 presents trajectory plots of the mean COW and HOUSE F1 values throughout the duration of each vowel grouped based on the degree of raising. The solid lines represent players who raise, the dashed line players who near-raise, and the dot-dashed line players who did not raise. The y-axis has been inverted to better represent the positioning of the tongue within the vowel space.

Only five players reached the 60 Hz difference at more than a single duration percentage. The differences for this group were largely consistent through the first three percentages, going from 81 Hz to 75 Hz and then to 78 Hz. From

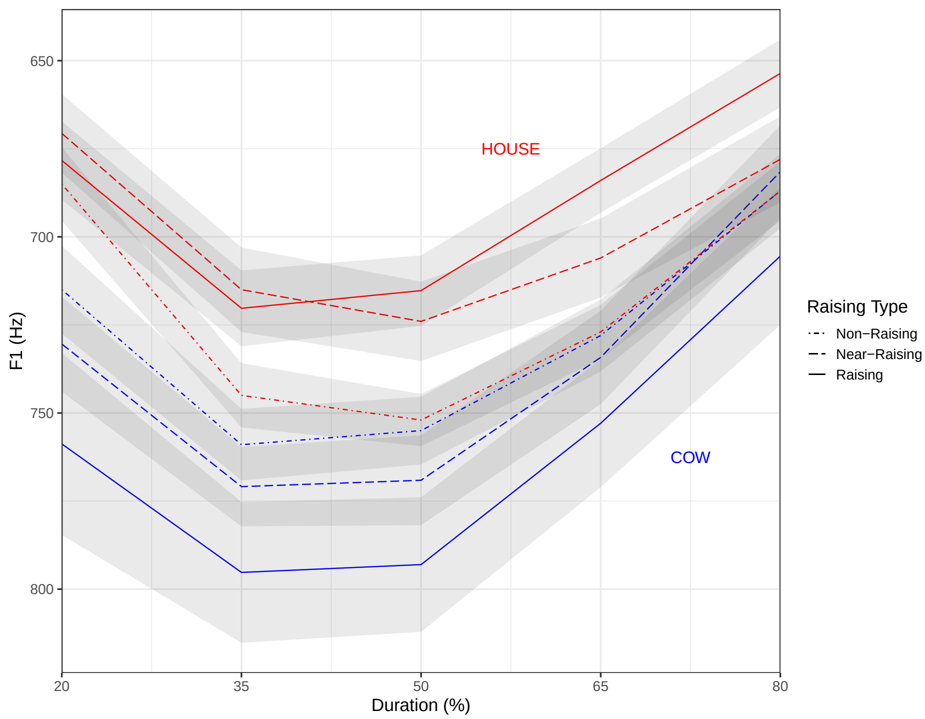

Figure 9.4: Mean HOUSE and COW F1 values with 95% confidence intervals throughout the trajectory of the vowel grouped by type of raising

the midpoint, the trajectory of each variant brought each subsequent difference down, and, by 80%, the average no longer surpassed the benchmark for raising. Although the difference dipped below 60 Hz by 80% duration, I still classified these five players as HOUSE raisers. Although the raising was significantly less than that seen for Boberg's *ELC* speakers, it was still significant and surpassed the *ANAE* benchmark for raising. However, as these five players only represented 25% of the data in this study, true HOUSE raising, at least raising which would be deemed similar to SCE, was rather uncommon.

An additional four players reached a difference which was statistically significant or surpassed the benchmark but only at a single percentage. The average raising for this group began at 60 Hz difference at 20%, but the trajectory followed a similar path to the group of players who did raise, though, as they began with a lower differential, the differences immediately dropped below the benchmark. The 35% difference of 56 Hz was comparable to the 20% difference, but by the midpoint it had dipped to 45. By 65% the average difference for this group was only 28 Hz, and by 80% the difference was almost gone at 4 Hz. While these players failed to surpass the *ANAE* benchmark consistently, they did produce variants which differed to a statically significant degree. Because of this, I believe it is best to classify these four as near-raisers.

The remaining 11 players did not produce distinct statically significant variants, and I maintain that it is best to classify these players as non-raisers with respect to HOUSE when measured against COW. Since this represented 55% of the players in this study, it did not appear that HOUSE raising had a hockey-related indexical value.

At this point, it is vital to discuss the stereotyped value that has developed in SCE for HOUSE. Below is a quote taken from my interview with Martin. When talking about the speech of his Canadian teammates, he addressed stereotypical SCE HOUSE raising in the following:

> "I'd say it's the o and u combination words like a like about. Like I say about, they say like more along like *aboot* or whatever."
> — Martin

Quotes like this were very common throughout the interview process. In fact, nine players, Allen, Clark, Hall, Jones, Martin, Mitchel, Phillips, Taylor, and Thomas, directly mentioned the words *out* and or *about*. In each interview, the player produced a high back vowel, similar to BOOT. Only one of the players, Phillips, pointed out that this was an obvious exaggeration, and, after mentioning *aboot*, he observed that "no one really says that." HOUSE raising was the second most common variable mentioned when talking about Canadians and SCE, only surpassed by "eh," which was mentioned by 13 players. This metalinguistic awareness of HOUSE raising as indexing SCE cannot be ignored. As nearly half of the players studied were explicitly aware of HOUSE raising and its indexical value linked with Canada, it is possible that this awareness explains why the raising was absent for so many players.

Of the players who mentioned *oot* or *aboot*, all but Allen were either raisers or near raisers. Jones, Martin, and Mitchell produced variants which differed to a statically significant degree, while Clark, Hall, Phillips, Taylor, and Thomas all surpassed the *ANAE* benchmark for raising. Thus, it seemed that those who expressed awareness of the variable as a SCE stereotype were more likely to use it than those who made no mention of *oot* or *aboot*. It is possible that the awareness of the stereotype *oot* and *aboot* allowed these players the chance to produce raised HOUSE tokens without viewing their own speech as "Canadian" as they did not reach the extreme level. If these players only assess extreme raising as indicative of SCE and indexically linked to Canada, then they would potentially be less likely to notice raising which was occurring to a lesser extent. This would create a situation when they could raise HOUSE above their unraised variants while still producing a vowel which they could deem lower than the SCE HOUSE.

Boberg presents a difference of 85 Hz between mean DOWN and HOUSE F1 values, establishing an order of COW, being produced the lowest in the vocal space, followed by DOWN, and then HOUSE. The same pattern was not replicated by the players in this study. 15 players produced a larger differential when DOWN was used to measure the degree of HOUSE raising. Furthermore, nine of these players reached or surpassed the 85 Hz difference seen for SCE in Boberg's data. Carter almost doubled this difference, reaching 164 Hz difference at 50% duration. Table 9.6 presents the mean DOWN-HOUSE F1 values, grouped again by type: Raising, Near-Raising, and Non-Raising.

Table 9.6: Mean DOWN-HOUSE F1 differentials by degree of raising throughout the vowel duration

Degree of Raising	*Number*	*Duration Percentage (Hz)*				
		20%	*35%*	*50%*	*65%*	*80%*
Raising	10	27	54	88	112	105
Near-Raising	3	11	17	36	49	54
Non-Raising	7	7	-5	5	8	16

Figure 9.5 presents trajectory plots of the mean DOWN and HOUSE F1 values throughout the duration of each vowel grouped based on the degree of raising. Again, the solid lines represent players who raise, the dashed line players who near-raise, and the dot-dashed line players who did not raise.

When DOWN is analyzed as the lowest variant of the three, the number of players who exhibited raising, both surpassing the benchmark and also to a statistically significant degree doubled. All five players who reached the benchmark for raising between HOUSE and COW did so again when the raised variant was measured against DOWN. Additionally, Jackson, Mitchell, and Taylor, who all failed to reach the benchmark at multiple percentages but did produce variants which differed to a statically significant degree when COW was the unraised variant, were able to surpass the benchmark when HOUSE was measured against DOWN. Two of the non-raisers for COW-HOUSE, Cook and Vasquez, also surpassed the benchmark for raising between DOWN-HOUSE.

Two players who were classified as non-raisers for COW-HOUSE produced DOWN-HOUSE variants which differed to a statically significant degree, Campbell and Mitchell. Because of this, these players are better classified as near raisers of DOWN-HOUSE, although they did not raised HOUSE when measured against COW. If COW is the only unraised variant for which raising is measured against, these players would have been categorized as non-raisers and this

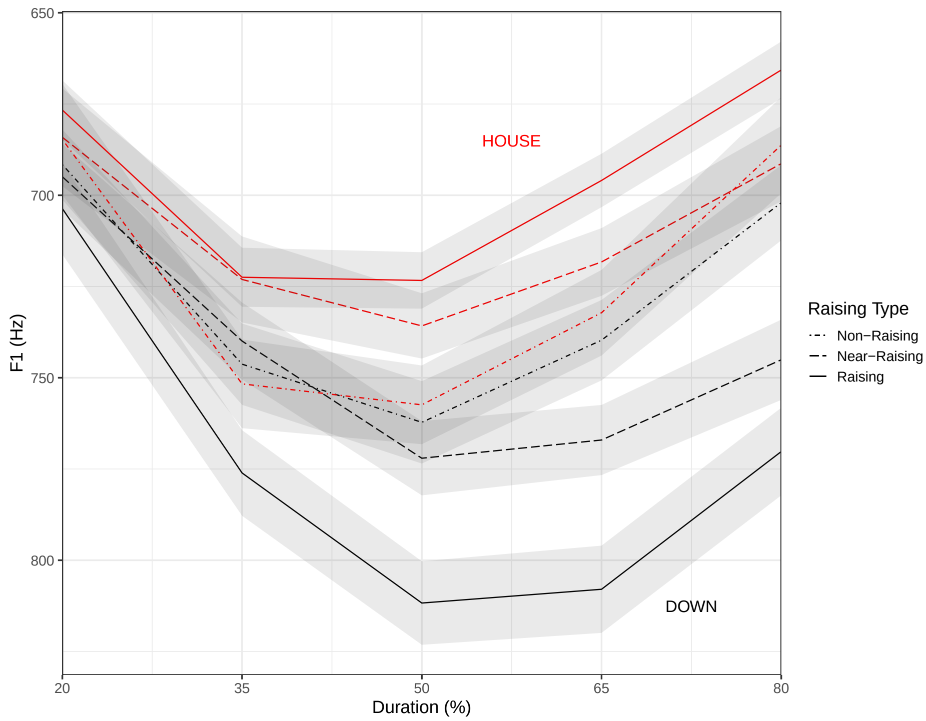

Figure 9.5: Mean HOUSE and DOWN F1 values with 95% confidence intervals throughout the trajectory of the vowel grouped by type of raising

raising would have been missed. This leaves only four players who did not raise HOUSE against either unraised variant, Allen, Anderson, Bell, and Collins.

When analyzing both TIGHT and HOUSE raising in tandem, it became clear that there were four different types of raising occurring within the speech of the players. These types largely stemmed from how each player raised HOUSE when measured against COW. The types included those who produced a differential in mean F1 value greater than 60 Hz no matter what unraised variant was being measured against, players who only failed to reach this differential for HOUSE tokens that were measured against COW tokens, players who failed to reach the 60 Hz difference between HOUSE tokens and DOWN tokens at multiple duration percentages but did produce variants with statistically significant distinction, and players who only exhibited TIGHT raising with no statistically significant distinction between HOUSE and either unraised variant. Table 9.7 provides a breakdown of the types of raising, providing a name, the number of players who raised in this manner, and a brief explanation of which raising was attested.

Table 9.7: Types of raising

Type	*Number*	*Explanation of Raising*
A	5	TIE-TIGHT F1 differential > 60 Hz COW-HOUSE F1 differential > 60 Hz DOWN-HOUSE F1 differential > 60 Hz
B	5	TIE-TIGHT F1 differential > 60 Hz COW and HOUSE F1 significantly different DOWN-HOUSE F1 differential > 60 Hz
C	3	TIE-TIGHT F1 differential > 60 Hz DOWN and HOUSE F1 significantly different
D	7	TIE-TIGHT F1 differential > 60 Hz

Carter, Clark, Hall, Nelson, and Thomas, were all Type A raisers, as they all had a differential of greater than 60 Hz no matter which unraised variant the raised tokens were measured against. Type A raising was the closest to SCE CR of all four types. While all players had the smallest degree of raising when comparing HOUSE tokens with COW tokens, they all produced differentials over 60 Hz and did so at more than a single duration percentage. The raising seen by Thomas could potentially be attributed to regional dialect as he is from ENE, where Boberg's data shows raising to be prevalent. Carter, Clark, and Hall are from the UM, where Allen (1973) attests this raising as well. Nelson complicated this group as he is from the IN. Although raising is less expected in this region, it has been attested (Dailey-O'Cain, 1997; Niedzielski, 1997, 1999). Thus, while these five players might be able to trace their total raising to regional dialect, others from their own region did not fall into this category complicating the effect of regional dialect on raising.

Two players, Jackman and Phillips, were just shy of the 60 Hz benchmark between HOUSE and both unraised variants as their results only produced this differential between HOUSE and COW tokens at 20%. Moreover, due to the potential influence on the preceding consonant, I decided that they fit Type B raising better than Type A. An additional three players, Cook, Taylor, and Vasquez, where Type B raisers as well, as they failed to produce a difference of 60 Hz or greater between HOUSE and COW tokens at multiple duration percentages but did manage to do so when HOUSE was compared with DOWN. These players were all from the IN and UM.

Three players, Campbell, Johnson, Jones, and Mitchell, all produced HOUSE and DOWN tokens that were not greater than 60 Hz different at more than a single duration percentage but did differ to a statistically significant degree minimally at a single duration percentage. This statistical significance demonstrated that these players were producing different variants; however, these variants were not as far apart as would be expected within CR. I decided to classify this as Type C raising. It is worth noting that Mitchell did hit the 60 Hz difference at one duration percentage when HOUSE tokens were compared against both COW and DOWN tokens. I was tempted to classify him as a Type A raisers but decided that a single duration percentage was not enough to justify classifying him as a raiser in all phonological environments. These players were from the IN, MA, the West, and WPA.

The results for the first three Types, A, B, and C raising, were directly opposed to the data data presented in the *ELC*, where Canadians produce a smaller difference when DOWN tokens were used as the unraised variant against which HOUSE was measured. This suggested that the players in these groups were exhibiting a new type of raising. For SCE, DOWN is expected to be in between the raised and unraised variants though much closer to the latter. In direct opposition, the players of the first two categories all produced DOWN F1 values which were greater than both COW and HOUSE, creating larger raising differentials between DOWN and HOUSE than COW and HOUSE. This is one of two ways in which raising differed for the players from SCE which will be discussed in further detail later in this chapter.

The remaining seven players, Allen, Anderson, Bell, Campbell, Collins, King, and Martin can be described as undergoing TIGHT raising only or type D raising. Bell did have a difference of greater than 60 Hz at 20% duration when HOUSE was measured against COW. However, this degree of difference disappeared at all other duration percentages for HOUSE raising when measured against either of the unraised variants. Therefore, it seemed best to categorize him with the other players who did not raise against either COW or DOWN.

The results showed that the initial hypothesis about HOUSE raising was accurate, though potentially overly simplistic. There were five players who raised HOUSE when measured against COW and they were from the regions that I hypothesized were most likely to exhibit this raising: ENE, IN, and UM. However, not every player from the latter two regions exhibited this raising, which complicates the accuracy of my hypothesis. Furthermore, the differences between DOWN and HOUSE presented a situation where my hypothesis was partially inaccurate, as players from every region outside of the West exhibited this raising. In fact, 80% of players raised HOUSE when measured against DOWN. These results demonstrated HOUSE raising had been uniformly adopted, although it was more restricted to the pre-nasal environment. I did not make any hypothesis about the importance of phonological environment.

Overall, 65% of the players exhibited some form of HOUSE raising, either in both phonological environments, only when compared to DOWN, or to a statistically significant degree that failed to reach SCE levels. Although SCE-style HOUSE raising has been attested in ENE and the UM, regional dialect alone was not sufficient in explaining these results. Once again, none of the social fixed effects produced statically significant differences among the players with respect to HOUSE raising against either unraised variant. This suggests that HOUSE raising, especially against DOWN, was another variable available within the hockey-based dialect to use in tandem with TIGHT raising. However, the usage is not nearly as uniform as TIGHT raising. This variable can be used to mark inclusion within the hockey community and, I argue, has an indexed value linked to the hockey-based persona.

9.3.3 COW Advancement

Although there was a great deal of raising throughout the data, the realization of these variants still differed from that seen in SCE. The greatest ares of divergence was observed in COW fronting. *ANAE* establishes the AWY line isogloss surrounding the region where speakers' COW F2 values are less than their corresponding TIE values, to describe the position of COW and TIE across various dialects. Those areas encircled by the AWY line produce COW with an F2 value less than the corresponding TIE value. In their data, Alberta, Manitoba, Saskatchewan, and also Western Ontario, are grouped within the isogloss while the remainder of Canada is outside of it. Due to most of the country being outside of the isogloss, Labov et al. suggest that most Canadians produce COW F2 values which are greater than their TIE values. Additionally, *ANAE* stipulates that SCE COW F2 values should be under 1,550 Hz. However, Boberg's Phonetics of Canadian English (PCE) data shows that this benchmark is too restrictive, as his speakers have a mean COW F2 value of 1,604 Hz. According to the AWY line, TIE should have F2 values greater than 1,604 Hz in Prairies, but the opposite should be observed across the rest of Canada. However, Boberg notes that "[o]f eighty-six *PCE* participants, there are only three who have [COW] further back than [TIE] and they are not concentrated on the Prairies: one is from Manitoba, but the others are from Toronto and Montreal" (Boberg, 2010, p. 148). Due to this, it seems that the Prairies are likely not within this AWY line isogloss, and COW F2 values are larger than corresponding TIE values as part of SCE as it is happening across the country. Boberg's data captures this distinction as the mean TIE F2 value is 1,428 Hz.

The AWY line isogloss extends into the United States and creates distinction between many of the regional dialects established by Labov et al. However, most players in this study are from regions included within the isogloss as ENE, the IN, and the UM are all attested as producing COW F2 values less than their TIE values. These three regions represent 75% of the players in the study. The remaining five players are spread across the MA, the West, and WPA. These three regions are all outside of the isogloss, which presented a situation where the players might have differed based on their own regional dialect. If players were relying on their regional dialect, 75% would be producing COW in a more retracted position than TIE, which would put them at odds with the expected patterns in SCE. Because of this, the positioning of these vowels presented another avenue for the influence of SCE to manifest in the speech of players even if they were one of the few who did not raise HOUSE regardless of which unraised variant it was measured against.

The players' mean value suggested that they aligned with the regions within the AWY line isogloss, where COW was more retracted than TIE. For COW, the players' mean F2 value began at 1,575 Hz. While this is below the *ANAE* benchmark for SCE COW, it is less than the value provided in Boberg's PCE data. At each subsequent duration percentage, this average value dropped, 1,486 Hz at 35%, 1,404 Hz by 50%, 1,342 Hz at 65%, ending at 1,333 Hz at 80% duration. Since both *ANAE* and *ELC* rely on single measurements, I believe it is fair to categorize this average as aligning with the *ANAE* benchmark, as F2 values are less than 1,550 Hz by 35% duration and remain that way throughout the duration. Furthermore, it is likely that the players were more retracted than the PCE speakers, as they produced valued far less at 35% duration and onward. The players' average TIE F2 began at 1,663 Hz. The average dropped to 1,577 Hz and 1,574 Hz at 35% and 50%, respectively, before increasing throughout the upglide to 1,665 HZ at 65% and 1,759 Hz at 80% duration. At no point did the players' average TIE F2 value drop below their COW value, demonstrating they aligned with the AWY line classification.

As 75% of players are from regions located within this isogloss, the average could potentially obscure relevant patterns for the players from other regions. Given in Table 9.8 are the average F2 value for TIE and COW divided intro regions encompassed by the AWY line (ENE, the IN, and the UM), and those outside of the isogloss (MA, the West, and WPA). The *ANAE* stipulates that SCE COW F2 values are expected to be under 1,550 Hz. However, Boberg explains that is not the case for his PCE speakers in *ELC* who have a mean COW F2 value of 1,604 Hz. Furthermore, Boberg provides a mean TIE F2 value of 1,428 Hz. To highlight that the players did not align with this pattern, I have bolded every instance where the players produced COW F2 values which were less than SCE COW values.

Table 9.8: Mean TIE and COW F2 values by AWY line isogloss throughout the vowel duration

AWY Line	*Vowel*	*Duration Percentage (Hz)*				
		20%	*35%*	*50%*	*65%*	*80%*
Within isogloss	TIE	1,663	1,569	1,562	1,652	1,747
	COW	**1,555**	**1,468**	**1,393**	**1,337**	**1,332**
Outside isogloss	TIE	1,660	1,591	1,602	1,695	1,794
	COW	1,629	**1,540**	**1,437**	**1,356**	**1,337**

Figure 9.6 presents trajectory plots of the mean TIE and COW F2 values throughout the duration of each vowel. Players from regions within the AWY line isogloss are represented by the solid lines and those from regions outside the isogloss by the dashed line.

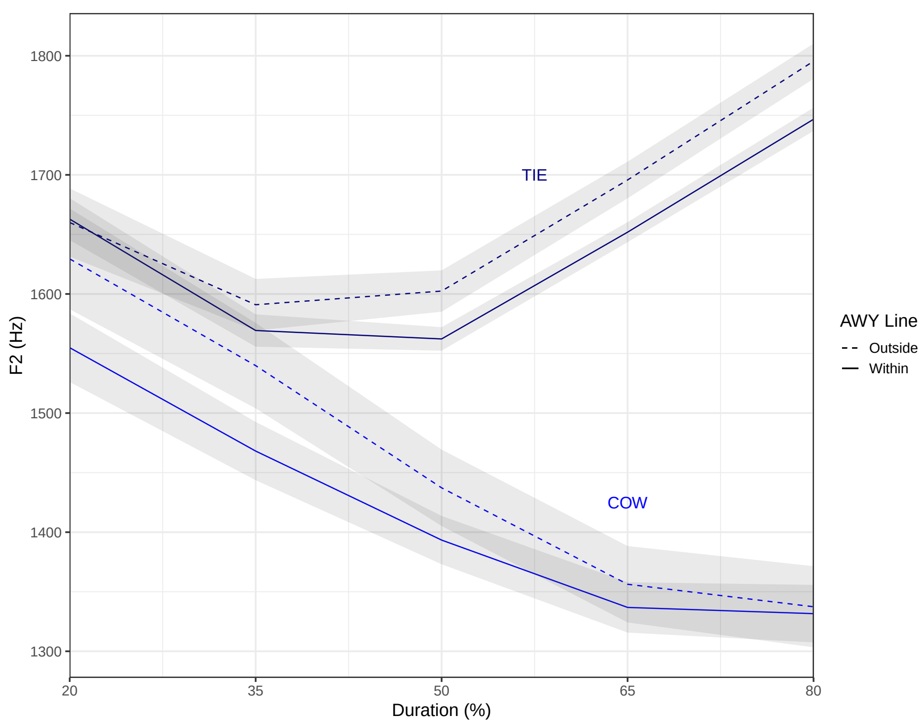

Figure 9.6: Mean TIE and COW F2 values with 95% confidence intervals throughout the trajectory of the vowel grouped by the AWY line

Looking at the breakdown of players from regions outside of the AWY line isogloss, it was clear that COW was produced in a more retracted position than TIE throughout the duration of the vowel. Although the difference between

TIE and COW F2 values, specifically at 20%, is less for those outside the isogloss, COW F2 values were still less than corresponding TIE F2 values. This initial drop can be accounted for by two players, Bell and King, who both produced a single COW F2 value which was larger than their corresponding TIE value and both did so at 20% duration. This duration was also the only instance where the players from regions outside the AWY line isogloss produced a mean COW F2 value which was larger than that seen in SCE. The remaining four duration percentage, and all five percentages for the players from regions within the isogloss, displayed that absence of COW fronting, as the values remained low. At no duration percentage did the players' COW F2 values surpass their corresponding TIE values as would be expected in SCE. This uniformity suggests something about placement of COW and TIE, with respect to tongue advancement, specifically the lack thereof in the latter, as potentially indexing the hockey persona. However, this is divergent from SCE, as the opposite results would be expected if the players were attempting to emulate SCE COW. Although raising was not uniform, the frontedness of the vowels was, and this effect superseded region, just as raising did.

9.4 Monophthongal FACE and GOAT

Unlike the LBMS Index score and the extent of raising in CR, there is no well-defined expectations for the degree of monophthongization of FACE and GOAT in SCE. Consequently, Bark conversion was necessary to capture the monophthongal element of FACE and GOAT in the data of the players as it captured the degree of movement for both F1 and F2. While monophthongal mid vowels are one of the variables which establish SCE and differentiate it from other regional dialects in the United States, these variants have been historically attested in the UM. Because of this, it is important to establish not only if players produced monophthongal variant but also if this was occurring uniformly across players from regions other than the UM.

9.4.1 FACE Trajectory Lengths

The players' average trajectory length for FACE was only 0.58 Bark, indicative of very little movement throughout the duration of the vowel. Even the most extreme trajectory length, seen in the speech of Collins was only 0.81 Bark. Furthermore, 13 players produced trajectory lengths below 0.60 Bark, and 18 produced lengths below 0.70 Bark. Overall, this strongly suggests that the players produced monophthongal FACE variants. However, the results from players outside of the UM must also be compared to those from the region to see if this was uniform. Table 9.9 presents FACE trajectory lengths categorized by players' region.

Table 9.9: FACE trajectory lengths by region

Region	*Trajectory Length*
Eastern New England	0.46
West	0.48
Mid-Atlantic	0.52
Western Pennsylvania	0.57
Upper Midwest	0.58
Inland North	0.62
Average	**0.58**

When analyzed by region, the players from the UM did not produce the lowest FACE trajectory lengths, as they were surpassed by every other region besides the IN. The players from ENE and the West produced trajectory lengths below 0.50 Bark at 0.46 Bark and 0.48 Bark, respectively. WPA was incredibly close to the UM differing by only 0.01 Bark, at 0.57 and 0.58 Bark, respectively. The trajectory length for players from the MA were between these two groups at 0.52 bark. Even the largest trajectory lengths seen in the IN were relatively low at 0.62 Bark. All the regions were below 0.70 Bark. Thus, while the players from the UM did produce monophthongal FACE tokens, so did the players from every other region.

Although these trajectory lengths were all very small, it is important to look at the directionality of movement to see if there was more upgliding or backgliding across each region. In Table 9.10 I provide Bark-convert F1 and F2 values, as Z1 and Z2, for FACE at the three duration percentages which were used to calculate trajectory lengths groups by region.

Turning first to Z1 movement, the pattern for each region except the West was a slight increase at each subsequent percentage. Players from the West saw a slight drop from 20% to 50% which suggested that the tongue height decreased to the midpoint before raising through the remainder of the vowel. The greatest Z1 movement occurred for ENE, the region with the smallest trajectory lengths, but this entire movement was only 0.33 Bark. Each other region displayed even less upgliding movement ranging from only 0.16 Bark in WPA to the 0.33 Bark seen in ENE. Due to this, it is safe to say that minimal to no upgliding occurred in the data. Similar uniformity was seen in Z2 movement, with every region except the MA having a pattern of increasing from 20% to 50% duration to slightly decrease after the midpoint through the duration. The MA showed an

Table 9.10: Bark-converted degree of movement in Z1 and Z2 for FACE at three duration percentages by region

Region	*20%*		*50%*		*80%*	
	Z1	*Z2*	*Z1*	*Z2*	*Z1*	*Z2*
Eastern New England	4.77	12.29	4.69	12.53	4.44	12.50
West	4.89	12.28	4.94	12.62	4.81	12.58
Mid-Atlantic	4.95	12.30	4.94	12.55	4.68	12.59
Western Pennsylvania	5.08	12.12	5.03	12.55	4.92	12.46
Upper Midwest	5.12	12.15	5.05	12.51	4.90	12.50
Inland North	5.08	11.89	4.93	12.31	4.81	12.30
Average	**5.05**	**12.06**	**4.96**	**12.44**	**4.85**	**12.42**

increase in Z2 at each percentage. Again, these movements were very small. The greatest increase in Z2 from 20% to 50% was seen in the players from the UM. This region had an increase of 0.43 Bark between 20% and 50%, but remained virtually the same from 50% to 80% only decreasing by 0.01 Bark. Every other region displayed less forward movement with Z2 values increasing by less than 0.43 Bark throughout the vowel duration. While this showed there was slightly more movement in the forward rather than upward direction, these values are still very small and indicative of monophthongal FACE variants.

As these results can only be regionally attributed to the players from the UM, I propose that monophthongal FACE has gained indexical value outside of SCE or Upper Midwestern English. Since there is no regional effect, this variable was uniformly adopted by all the players and therefore indicative of an indexical value associated with hockey. However, this monophthongal realization still was distinct from SCE as the players larger failed to reach the high F2 values seen in SCE. Only one of the 20 players, Collins, produced a mean F2 value greater than 2200 Hz at any point during the duration of the FACE.

I had initially hypothesized that all the players would produce monophthongal FACE variants and the data demonstrated that this was accurate. However, my hypothesis was not entirely accurate as I also predicted that these. variants would be more peripheral like those attested in SCE. The players' FACE F2 values failed to reach this peripheral state and instead were more centralized than would be expected for SCE speakers. Due to this, I would classify my hypothesis as only partially accurate. The players' FACE variants were more monophthongal, but also occupied a more centralized place within the vowel space and would potentially be perceived as distinct from SCE.

It must be noted that these variants still were quite different than what would be expected based on regional dialect alone. Furthermore, the variants were very uniform throughout all the players. Because of this, monophthongal FACE presents an ideal variable which would gain indexical value linked to hockey. The variant which the players produced was also slightly different than the one expected in SCE, meaning they might not have to re-interpret the indexical value linked to the variant and would rather simply be able to establish a hockey-specific indexical value.

9.4.2 GOAT Trajectory Lengths

The mean trajectory length of Bark-normalized GOAT F1 and F2 values for all players was 0.96, much larger than the mean trajectory length of GOAT. There was also an increase in the range of trajectory length among the players. Jackman had the smallest mean GOAT trajectory length of 0.51, while Carter had the largest length of 1.51, almost tripling Jackman's trajectory length. In fact, there was a roughly even split of players with trajectory lengths greater than 1.0 and those with a length less than 1.0. Nine players ranged from 1.01 to 1.51, and 11 ranged from 0.51 to 0.97. To see if this range of lengths can be attributed to regional dialect, trajectory length divided by region is provided in Table 9.11.

Table 9.11: GOAT trajectory lengths by region

Region	*Trajectory Length*
Mid-Atlantic	0.88
West	0.89
Inland North	0.92
Western Pennsylvania	0.92
Upper Midwest	1.05
Eastern New England	1.29
Average	**0.96**

The regional results for GOAT are far different from FACE. The players from the UM produced some of the most monophthongal FACE tokens, but they also produced some of the largest trajectory lengths for GOAT. Again, the MA had the smallest trajectory length of 0.88 Bark with the West producing a nearly identical value of 0.89 Bark. The IN and WPA were identical with a value of 0.92 Bark. After this point, there was a rather large increase in value of 1.05 Bark for the UM followed by an even larger increase to 1.29 for ENE. When compared to the results for FACE, it is hard to classify any of these regions as producing a monophthongal GOAT variant. However, the directionality of movement here might offer some insight into the increased trajectory lengths.

Given in Table 9.12 are Bark-convert F1 and F2 values, as Z1 and Z2, for GOAT at the three duration percentages which were used to calculate trajectory lengths groups by region.

Table 9.12: Bark-converted degree of movement in Z1 and Z2 for GOAT at three duration percentages by region

Region	*20%*		*50%*		*80%*	
	Z1	*Z2*	*Z1*	*Z2*	*Z1*	*Z2*
Mid-Atlantic	5.31	9.65	5.47	9.02	5.25	8.96
West	5.24	10.12	5.42	9.50	5.40	9.45
Inland North	5.38	9.97	5.45	9.43	5.29	8.44
Western Pennsylvania	5.35	10.29	5.50	9.56	5.38	9.22
Upper Midwest	5.36	9.90	5.56	9.10	5.38	9.19
Eastern New England	5.21	9.61	5.37	8.59	5.11	8.64
Average	**5.36**	**9.82**	**5.50**	**9.06**	**5.35**	**9.09**

Once again, Z1 trajectory patterned together with each region dropping from 20% to 50% only to see an increase from 50% to 80%. The largest degree of Z1 movement was seen in ENE where the drop and subsequent increase resulted in a movement of 0.42 Bark. Every other region saw less movement ranging from 0.20 Bark in the West to the 0.42 Bark seen in New England. While these values were slightly larger than the corresponding FACE Z1 values, there were all still minimal. These results suggest that the players were doing very little upgliding throughout the vowel duration. The reason for the increased trajectory lengths then can be largely traced to the backward movement of the tongue. Movement of Z2 appeared to be even split with three regions (MA, the West, And WPA) seeing a decrease in value at each percentage, and three regions (ENE, the IN, and the UM) seeing a decrease from 20% to 50% followed by a slight increase in Z2 value by 80% duration. No matter which pattern was followed, every region displayed greater movement in GOAT Z2 than in either FACE Z1 or Z2 or GOAT Z1. Players from two regions, ENE and the MA, managed to produce Z2 movements of 1.07 Bark. The smallest backward movement, 0.55 Bark, occurred in the speech of the players from the IN. These large movements are indicative of rapid backing, or backgliding, throughout the vowel. Thus, while the Z1 movements were minimal, this backgliding is what produced the increased GOAT trajectory lengths.

Due to the trajectory lengths seen in the data, it is likely that the players' GOAT tokens were not monophthongal, but still unique as almost all the movement was backwards, meaning there was little to no upgliding. There is a potential explanation for why the players seemed to back GOAT but maintain a level vowel with respect to height and it is related to the expected pronunciation of this vowel in SCE. According to Labov et al., SCE GOAT is expected to have an F2 value of less than 1,100 Hz. Boberg's PCE data failed to hit this benchmark with a mean value of 1,291 Hz. Looking at the players' *ANAE*-normalized formant values for GOAT, it becomes apparent that this backing is in an attempt to reach this far back position. Given in Table 9.13 are the average GOAT F2 values throughout the duration of the vowel.

Table 9.13: *ANAE*-normalized mean GOAT F2 values throughout the duration

Vowel	*Duration Percentage (Hz)*				
	20%	*35%*	*50%*	*65%*	*80%*
GOAT	1,415	1,313	1,228	1,199	1,227

Although the players never reached the peripheral status established by *ANAE* benchmark of 1,100 Hz, there is obvious movement to achieve that back position. The large trajectory lengths can be explained by the necessity to move from the centralized position where the vowel begins at 1,415 Hz. Between 20% and 35%, the players' average F2 value decrease by 102 Hz. Another large decrease occurred from 35% to 50%, where the average F2 decreased by 85 Hz. This movement towards the expected SCE position of GOAT explains why the players produced variants which were not monophthongal. A large degree of backward movement was required to hit this peripheral state. Furthermore, from 50% through 80%, the players' average F2 value was less than that seen by Boberg in the PCE participants. This backward movement was also incredibly uniform across the players.

As I mentioned in the previous section, monophthongal GOAT has not been commonly attested in the United States outside of the UM. Although the players did not produce monophthongal GOAT variants, they did produce uniformly backing non-upgliding variants. This suggests that GOAT realization has also potentially gained indexical value linked to hockey, but, just like CR, this is not entirely Canadian, as it differs from SCE.

9.5 Sounding Like a Hockey Player

> "I don't think I technically sound Canadian. I think I maybe sound like a hockey player because you can talk to somebody and if they know hockey players, they're like 'Oh do you play hockey?'."
> — Jones

Throughout the interview process, many of the players made statements similar to the one above produced by Jones. There was a belief that the accent adopted by the Americans in the locker room was not specifically Canadian but rather something more closely tied to the sport. To test this assumption, it was important to establish what each player knew about SCE and how it differed from American English dialects, their own and others included. The hypotheses of this dissertation posited that the American-born players' speech was, at minimal, being influenced by SCE, but it is important to entertain the notion that the speech is distinct, and therefore not entirely a reproduction of SCE variables.

9.5.1 Indexicality and the Hockey Persona

Due to the lack of uniformity in the players' Pillai scores and LBMS Index scores, I do not believe these variables are indexically linked to a hockey-based persona. Regional dialect is likely a better indicator for if a player will exhibit the LBMS; however, even this is not entirely predictable. Considerable variation in the LBMS Index scores were still present in players from not just the same region, but the same state, highlighted in the data of players from Michigan. Even though region might not be entirely sufficient to explain what is occurring in the speech of players outside of the West, it seems clear that the LBMS has not been been adopted as an indexical variable marking inclusion within the hockey-community. As many of the players corresponded with their regional complements in other studies, I suspect that Canadian players would have larger LBMS Index scores more in line with the data seen in Swan (2019).

While these results suggested that the LBMS did not function as an index of the hockey persona, in analyzing the LBM, indexical value did become apparent. The players uniformly produced *hockey* tokens as a distinct vowel which I have classified as HOCKEY. Pillai scores measuring the overlap of BOT/BOUGHT versus BOT/HOCKEY demonstrated that most player had less overlap in the latter than the former. Only five players, Campbell, Collins, Jackman, Johnson, and Vasquez, had smaller Pillai scores for BOT/BOUGHT than BOT/HOCKEY. Furthermore, four of these five, all but Vasquez, still had relatively large Pillai scores for BOT/HOCKEY. Carter and Jackman both had values greater than or equal to 0.2. Johnson fell just short of this at 0.15. These results suggest that HOCKEY has become a distinct vowel for hockey players. Additionally, there is a level of aware of this which was addressed by some of the players. The uniformity of pronunciation, paired with this metalinguistic awareness, leads me to argue that this variable has gained a strong indexical value linked to hockey.

In Chapter 6, I provided a quotation from Jones which suggested that HOCKEY has risen to the level of a shibboleth within the community. Here is that quotation again. The transcriptions of each *hockey* token are to accurately capture the distinction between what Jones views as correct and incorrect pronunciations of *hockey* tokens.

> "Well I heard like [ˈhɑ̞ki], like a lot of like [ˈhɑ̞ki] players say [ˈhɑ̞ki] but like- not like [ˈhɑki]. You know what I mean? Like I don't know I- I- just know it as [ˈhɑ̞ki] but I guess like if you play [ˈhɑ̞ki] you say [ˈhɑ̞ki], not like 'Oh, do you play [hæ]- [hɑ]- do you play [ˈhɑki]?' Like no I don't play [ˈhɔki]. I play [ˈhɑ̞ki]." – Jones

The data corroborated Jones' assertation correct, as most players did produce a distinct HOCKEY vowel. His understanding of the role this vowel plays in identifying hockey players, would mean that it has gained value as a shibboleth. This hockey-specific shibboleth would be instrumental in the construction of a hockey-based linguistic persona, as it helps the players quickly convey the persona to the community.

The players' results show that CR, or at least aspects of it, are likely part of the hockey persona which this dissertation is attempting to establish. TIGHT raising was entirely uniform across all players no matter their regional dialect. While TIGHT raising has been attested across many different regions in the United States, the extreme raising captured in the speech of most players is not. As extreme TIGHT raising has only been linked to ENE and as only one player in this study is from that region while most players produced extremely raised TIGHT variants, this cannot be attributed to the influence of region. I propose that this is the first variable likely to have gained indexical value tied to the sport. However, I do not believe that the TIGHT raising evident in the players' data would sound identical to the patterns observed in SCE, as they produced both variants higher in the vowel space. In fact, the players' average TIE F1 value was within 30 Hz of Boberg's PCE speakers raised TIGHT value. This finding, I believe, offers further evidence that this variable functions as an index of a hockey persona instead of one linked specifically to SCE.

The same status of indexing hockey is not proposed for HOUSE raising, at least when it is compared to COW. When measured against COW, only five players, or 25%, surpassed the *ANAE* benchmark for raising, although an additional three produced variants which differed to a statically significant degree. Even with both categories of raising combined, that still only represented 40% of the players. Furthermore, of the five that did raise HOUSE against COW, all were from the IN and UM, where, although uncommon, this feature has been historically attested. It is possible that the strong Canadian stereotype associated with HOUSE raising, as in *oot* and *aboot*, impacted the players speech. Nearly half of the players overtly mentioned their knowledge of this stereotype, and it is probably that the ones who did not are still aware of its existence. It seems like HOUSE raising against COW did not function as a index of a hockey persona, as it was not common or uniform throughout the data.

When comparing HOUSE raising against DOWN, the results suggest something entirely different. Half of the players surpassed the *ANAE* benchmark for raising when DOWN was treated as the unraised variant. The number of near-raisers increased from three to six as well. Overall, 80% of the players displayed some form of raising when comparing HOUSE and DOWN. Furthermore, this was not confined to just the IN and the UM. The players' average F1 values for HOUSE and DOWN were fairly similar to Boberg's PCE speakers. Since HOUSE raising against COW is stereotyped as Canadian, it is possible that players did not raise these two variants differently. Niedzielski's (1996, 1997, 1999) research on perception of raising demonstrates that it is possible for a speaker to be aware of raising in the speech of others while largely missing it in their own speech. If the players believed that HOUSE raising causes *out* and *about* to sound like *oot* and *aboot*, they likely would not notice that they also have HOUSE tokens which were largely raised. What differentiated this from SCE, was that the players' COW tokens were more raised as well. DOWN appeared to represent the true unraised token for the players, which lead to most of them producing distinct variants and half surpassing the raising benchmark. Because of this, I argue that HOUSE raising against DOWN has gained indexical value linked specifically to hockey.

Additionally, this analysis suggests that the advancement of COW with respect to TIGHT has gained hockey indexical value as well. This was the more uniform than raising for all players regardless of their region. However, the results were in direct opposition to SCE, meaning players did not use this variable due to Canadian influence. Thus, I maintain that this variable represents a purely hockey index which is not Canadian. Players did not need to reinterpret this as indexing SCE, as it was already attested in American regional dialects. The AWY line provides a non-Canadian variable which has been reinterpreted as indexing hockey, suggesting that American dialects, at least those from ENE, the IN, and the UM, have also provided regional variables for reinterpretation.

Neither FACE nor GOAT production seemed to correspond directly to what is expected in SCE. While FACE was more monophthongal, the players were more likely to produce these tokens in a more centralized position within the vowel space. Additionally, GOAT tokens were not entirely monophthongal, as there was a large degree of movement in mean Z2 values, which rapidly backed from 20% duration to 65% duration, although the players did manage to produce F2 values similar to those expected in SCE.

As these variants were not entirely Canadian, this presents evidence for the plausibility of a hockey-based variant, one which could be part of this hockey-dialect many players mentioned throughout their interviews. The uniformity observed throughout all 20 players further corroborates this proposal. Although the players did not conform to SCE-based expectations, they produced remarkably similar tokens. Furthermore, these tokens showed at least some influence of SCE even though they remained distinct from SCE variants. The results of this study show that these players utilize SCE variables, even though they did not adopt all three variables that were analyzed.

9.5.2 Perceived Indexical Value of the Hockey Persona

To conclude this chapter, I need to address the perceived indexical value of the variables present in the players' speech. Many of the players mentioned that they had been told that they 'sound Canadian,' or had been asked if they were from Canada. Below are a few of the quotes from players who had mentioned this had happened to them. These quotes suggest that the social perception of the variables present in their speech are linked to SCE to those outside of the sport. For non-hockey players it is easy to hear their speech and immediately think that it sounds Canadian.

> "Yeah, people outside the sport, they're like 'You have an accent' or like 'What's your accent?' I'm like 'I'm from Colorado' and then yeah some have said like 'You kind of have a Canadian accent'." — Johnson

> "Like people tell me sometimes 'Are you from Canada?' and I'm like 'No.' I don't even try to sound like that." — Phillips

> "We were on the plane on Sunday and there was a couple people sitting behind us like oh what do you do and uh we play the hockey team here and then I think I said I said about and they're like 'oh *aboot* are you from Canada?' and I was like 'No, I'm from from Green Bay, Wisconsin' and she's like 'oh you sound like you're from Canada'." — Taylor

> "People might think I sound Canadian, but I- I don't think I do." — Vasquez

Phillips and Vasquez both mentioned how they do not believe they sound Canadian, nor that they want to sound Canadian. All four players do their best to demonstrate that they are not Canadian even though they have been incorrectly characterized as such. Johnson and Taylor both attempt to correct the assertation by mentioning their hometown or state, while Phillips and Vasquez explicit state they do not believe they have a "Canadian" accent. The reason for the incorrect categorization of their speech by those outside of hockey is likely due to the Canadian indexical value linked to the variables which they have incorporated in their speech.

These quotes demonstrate two important issues. First, American hockey players do not believe that they sound Canadian; rather, they sound like hockey players. Second, the divergence in usage of the SCE variables offers some credibility to the theory that they do use speech distinct from SCE as they did not directly mimic SCE speech, with both patterns of convergence and divergence with this variety of English. Since hockey players have a great deal of exposure to SCE due to this prevalence of Canadian teammates and coaches, it is likely they are aware of how their speech differs from SCE. I'm inclined to take these players at face value when they say they do not think they sound Canadian. However, those outside of the sport who likely have less interaction with SCE, likely do not perceive this speech as distinct from SCE. This demonstrates that the reinterpretation of the indexical value of these variables has only occurred within the hockey community. To non-hockey players, this speech potentially indexes Canada, but to hockey players, the indexical field (Eckert, 2008a) has expanded. When players exhibit these variables, it is to outwardly display a hockey persona.

The uniformed adoption of CR and monophthongal FACE and non-upgliding GOAT and usage of the new vowel HOCKEY suggests that there is a hockey-based linguistic persona. This persona appears to exist, dialectally, somewhere in between SCE and other varieties of regional American English. The players' pronunciations were not in line with expected SCE speech but still differed from their expected regional dialects. Within the community, these variables have gained indexical value linked to the sport and offer American players a linguistic persona with they can use to outwardly display their affiliation with the sport. As many of the players stated, they want to sound like hockey players, and these variables allow them the tools to do so.

Chapter 10

Conclusion

In this chapter, I briefly summarize the results presented in this dissertation. I then address the limitations and shortcomings of this present study. Many of these limitations have influenced my plans of future research. I continue the chapter outlining a few possibilities for future studies.

10.1 Summary of Results

This dissertation attempts to establish if a hockey-based linguistic persona has been developed by American-born professional hockey players by analyzing their speech for the presence of SCE variables. My results demonstrated the presence of two of the three SCE variables in some form, while also capturing elements differentiating the players form SCE. In doing so, I argue that this dissertation offers some credibility to the notion expressed by many of the players in the study, namely that they do not sound Canadian but rather that they sound like hockey players.

The variable which was not uniformly occurring throughout the speech of the players was the Low-Back-Merger Shift (LBMS), as I established in Chapter 6. This shift of the short front vowels BIT, BET, and BAT, triggered by the Low-Back Merger (LBM) of BOT and BOUGHT is prevalent throughout Canada, with the possible exception of the Atlantic provinces. If the players were merely adopting SCE variables, it would have been more stable across the data. I hypothesized that this variable would be the least likely to occur in the players' speech due to the variant status of the LBM, and also the presence of rival shifts such as the Northern Cities Vowel Shift. This hypothesis proved to be accurate as very few players exhibited the LBMS as captured by LBMS Index scores. It is possible that the lack of shift can be attributed to the absence of the LBM for many of the players, but even this was not uniform. Overall, only two players form the West, where this shift has been historically attested, produced Index scores comparable to those attested in SCE. Therefore, I conclude that this variable has gained no indexical value linked to hockey and that the players have not adopted this feature as part of a hockey persona, but rather are more likely to produce these vowels more in-line with their own regional dialect.

A distinct vowel for tokens of *hockey*, which i have classified as HOCKEY, was lower in the vowel space than BOT despite the fact that these tokens would traditionally be classified as belonging to that vowel. This lower production of HOCKEY was nearly universal, as only one of the 20 players produced HOCKEY higher in the vowel space than BOT. Consequently, I argue that this variable has likely gained indexical value linked to hockey as a sport. Furthermore, the metalingusitic awareness of this indexical value suggests that HOCKEY has potentially risen above Silverstein's (2003) level of first-order index towards a third-order index, or Labov's (1971) stereotype. According to Jones, HOCKEY functions as a shibboleth for these players and the larger community. He spoke of being able to identify other hockey players just by how they say *hockey*. The data corroborated this suspicions, as players did produce HOCKEY distinct from BOT. This, paired with the metalinguistic awareness of the indexical value linking this variant with the sport, establish HOCKEY as a hockey-specific shibboleth which is vital to the larger linguistic persona.

The Canadian raising (CR) results, outlined in Chapter 7, presented further challenges to the notion that hockey players were simply adopting SCE variables. I initially had hypothesized that CR would be present in the speech of all players, but that TIGHT raising might be more prevalent than HOUSE raising. Although all the players in the study exhibited TIE/TIGHT raising, and the degree of raising between variants was quite comparable, the position of both variants was higher in the vowel space for the players than has been observed in SCE. Thus, while I classified each of the players as TIGHT raisers, the results suggested the variation they were exhibiting was unique to the group. This demonstrated that aspects of my hypothesis were accurate, specifically that TIGHT raising would be occurring and uniform, but also disproved that the raising was occurring in a similar manner to that seen in SCE.

COW/HOUSE raising was relatively uncommon in the players' speech, although nearly half were classified as raisers or near-raisers. This did seem to corroborate my initial hypothesis that HOUSE raising would be present in the players' speech, and also to a lesser extent than TIGHT raising, but was also problematic, as the lack of uniformity would suggest that this raising is not indexically linked with hockey-based linguistic persona which i hypothesized it was. This also suggested further divergence from SCE with respect to raising.

However, when HOUSE was measured against DOWN, the degree of raising increased for nearly all the players. These results suggested that many of the players were actually raising COW towards HOUSE, while DOWN remained in the unraised position. I believe that this is a novel variation of raising and one that contradicts SCE expectations. It is quite possible that this novel raising of HOUSE vs. DOWN, and also TIE/TIGHT raising, have also gained indexical value linked to hockey and are also not entirely Canadian.

The players also exhibited non-SCE vowel placement of TIE and COW based on their relative position in the vowel space. SCE data suggest that Canadian produce COW with larger F2 values than TIE, a more forward position in the vowel space. The players COW F2 values were uniformly less than their TIE values. This position is more in line with the Inland North and Upper Midwest. As many of the players were not from either of those regions, these results still suggest potential indexical value linked to hockey, although SCE is clearly not acting as the influence for this variable.

Finally, monophthongal FACE and GOAT results, given in Chapter 8, provided evidence of SCE influence, while also creating more points of distinction for the players. I hypothesized that both vowels would be monophthongal and in the peripheral state attested in SCE. This hypothesis was proven to be only partially correct. All the players in this study produced FACE trajectory lengths which were very short indicative of more a monophthongal production of these tokens. However, the players' position of FACE was not nearly as fronted as is generally observed in SCE, meaning that these players produced a more centralized monophthongal variant. The players diverged to a greater extent in their production of GOAT, which was not nearly as monophthongal. Only two players had GOAT trajectory lengths less than or equal to their FACE trajectory lengths. This indicated that GOAT was more diphthongal for the players. However, this can be explained by the directionality of movement. Both FACE and GOAT trajectory lengths had minimal to no upgliding present. The players' GOAT trajectory lengths did contain a great deal of backward movement, likely in an attempt to hit the backed position seen in SCE. The players' position of GOAT was far more comparable to SCE, at least after the considerable backward movement. Both FACE and GOAT were uniform across all the players being studied. Therefore, I maintain that this variation has also gained potential indexical value linked to hockey.

Overall, TIGHT raising, HOUSE/DOWN raising, back positioning of COW, monophthongal FACE, and non-upgliding GOAT occurred throughout most players' speech and could not be adequately explained by any American regional dialect. Furthermore, each of these variables did not entirely align with the expected SCE variation. Because of this, it seems likely that the presence of these variables is not simply an adoption of SCE variables. Instead, I argue that these players have reinterpreted variation which occurs in SCE but also in some of the northern American English dialects like the Inland North and Upper Midwest. By reinterpreting the indexical value to include hockey-based value, the players can utilize these variables in the construction of a hockey persona. Because their realization was neither entirely Canadian nor uniquely attributable to the influence of other American regional dialects, it is plausible that an indexical value on these variables, one that is specifically linked to the sport, has developed among these players.

10.2 Limitations of This Study

Although this study has produced compelling findings, it is not without its limitations. These limitations include aspects directly related to the design of the study, but also others which arose throughout the interview process.

One of the goals of this study was to minimally impact the players who participated due to the limited free time they had outside of their career as a professional athlete. I knew that players would likely only be able to speak to me for around 30 minutes and attempted to create a sociolinguistic interview that would prompt large stretches of uninterrupted speech. Furthermore, I knew that I would probably be unable to conduct follow-up interviews with each player. While I did my best to maximize each interview to gather as much data as possible, this interview style led to a smaller overall corpus than I would have liked for this study. Additionally, I would have liked to conduct more interviews but was limited by team availability and the number of American players on each team.

A second issue with each interview was that it only included a single type of speech, spontaneous. In future studies, I will include reading passages or word lists to test the players speech across various styles. However, as I outlined above, interview time was going to be minimal, and I subsequently chose to focus on collecting spontaneous speech. I do believe that there are certain words which would have been likely to show greater SCE, or rather hockey-based, influence. I will address this in greater detail in the next section, as this is one of the avenues which I would like to research further in the future.

Although I attempted to diversify the players with respect to region, only six American regions were included in the analysis presenting a third limitation of this study. The regional make-up of American hockey players does offer an explanation for the over-representation of the Inland North and Upper Midwest, as these two regions produce more hockey players than any other. Nevertheless, future research will incorporate players from a broader selection of regions. Furthermore, two of the regions in this study were represented by a single player. Ideally, the study would have included more players from these regions to ensure that the results were representative of players and patterns from that region, as each of these players may not align with their regional counterparts.

Additionally, this study derived from the lack of diversity present within the players included in the analysis. The AHL and ECHL are entirely comprised of male athletes and because of this, gender was not a factor that could be analyzed here. As I am trying to make that claim that a hockey-based persona exists, this in theory should be available for use by all hockey players regardless of their gender. Furthermore, although there was a single Asian player included in this study, the overwhelming majority of players were white. Further research will be needed to address the potential variation which gender and ethnicity will bring to the hockey-based persona.

Regarding the acoustic analysis, I relied on the *ANAE* Benchmarks and Boberg's PCE data to make impressionistic comparisons between the players and SCE. As language is always changing, and the *ANAE* and *ELC* are now both over a decade old, it is possible that SCE does not exactly correspond to their research in its present state. Labov et al. uses data collected from 1992-1997 and Boberg's Phonetics of Canadian English data is from interviews between 1999-2005. For this reason, I only used these values for this impressionistic comparison and relied on other metrics to categorize the players speech. However, Canadian Raising and monophthongal FACE and GOAT did not have the same metric as the LBMS for this categorization process. While the *ANAE* CR benchmark of 60 Hz was still used to test for raising, I chose to test for statically significant difference between raised and unraised variants in tandem with this benchmark in case the benchmark was insufficient in establishing raising. The user of trajectory length was needed for monophthongization as well, as the *ANAE* benchmark values seemed to only suggest a place within the vowel space and not the amount of movement present within the vowel. Moving forward, I would like to find additional methodology and data sets to compare the players' corpus to establish if the variation present within the data aligns more with SCE, the Inland North, or the Upper Midwest.

Finally, I want to acknowledge the degree of variation present in the different dialects of Canada. The purpose of this study was to compare American players speech to what is expected in Canada, and I therefore needed some sort of standard dialect target to make this comparison. It is possible that the players' results align with a Canadian regional dialect which was not considered as part of this analysis. As more work is conducted on the different regional dialects of Canada, it will be worth re-evaluating my results to see how the players' compare to each region. This hockey persona is quite possibly more Canadian than these results suggest, perhaps being linked more closely to a regional variety that is distinct from SCE.

10.3 Future Study

In (Bray, 2015), I compiled a list of hockey-specific slang and analyzed the creation and usage of this slang. It was that research which sparked this current study. While the focus of this research has been on vowel production, there were numerous instances of players addressing the slang which I had outlined in my thesis. The importance of hockey slang in the construction of this hockey persona cannot be downplayed. Nelson outlines the value of slang to hockey players in the quote below.

> "You see all the slang and stuff- it's just there's definitely like a huge culture to hockey and there's, you know, something about like the camaraderie of, you know, being on a hockey team and I think, you know, as much as any way- any way you can find to kind of be a part of that, you know, you kind of- you kind of cling to it."
> — Nelson

As Nelson suggests, hockey slang functions as indexing members of the sport and building a community, or as he puts it "camaraderie", between the players. I maintain that hockey slang provides another set of indexed variables for players to utilize in constructing their persona. However, this current study did not collect many hockey slang tokens, as that was not the focus of the analysis. In the future, an acoustic analysis of hockey slang could shed further light into distinct vowel production. Although it is difficult to predict whether an analysis of these tokens would offer evidence that American players sound more Canadian, I do believe that it would provide interesting results on production.

My rationale for this hypothesis is rooted in the players' distinct production of HOCKEY. While this is obviously not a slang term, it is obviously deeply connected to the sport. The data in this study showed that the players produced this vowel lower in the vowel space than expected, and there was additional metalinguistic awareness of this fact. This leads me to believe that other hockey-related terms, specifically the hockey slang outlined in Bray (2015), might also produce distinct vowels, or show variation from expected regional dialects. Furthermore, it could be the usage of that hockey slang that accounts for at least some of the variation observed in this study.

Hockey slang also presents a rationale for how SCE might come to influence American players' speech through the process of lexical diffusion. Labov (1994) describes lexical diffusion as,

> Lexical diffusion is the result of the abrupt substitution of one phoneme for another in words that contain that phoneme. The older and newer forms of the word will usually differ by several phonetic features. This process is most characteristic of the late stages of an internal change that has been differentiated by lexical and grammatical conditions, or has developed a high degree of social awareness or of borrowings from other systems ("change from above"). (p. 542)

The final element Labov includes in this definition might be the most important if lexical diffusion is leading to sound change in the speech of hockey players. He suggests that high degree social awareness can lead to sound change through lexical diffusion. This social awareness seems to be present across the hockey community when hockey slang is being discussed. During the interviews conducted for (Bray, 2015), multiple players suggested that hockey slang is more likely to originate from Canadian sources. This notion was corroborated by additional players in the current study. A quote from one of those players, Campbell, can be seen below.

> "My Canadian friends they are the ones that come up with like the hockey slang terms like they say start saying it before like I've ever heard it." — Campbell

If it is true that slang terminology is being introduced by Canadian players, then their SCE production of the vowels in these terms could potentially bleed into American players speech as they adopt and use the slang. Campbell suggests that most of the new slang that he hears is said by Canadian teammates. Assuming these Canadian players utilize the variation expected for SCE, then it is likely the first time players hear new hockey slang it is produced with SCE vowel. If players adopt the slang and attempt to mimic the production, then it is possible they will utilize SCE vowels when using the slang terms. If it is the case that American hockey players are producing hockey slang with SCE style variation, it will be important to compare the results of an acoustic analysis for slang against non-hockey related words. One possibility is that the SCE variation would be restricted to the hockey slang, but lexical diffusion could also lead to a change in vowel production in non-hockey words.

To address this, a study of the production of hockey slang would help to better understand the influence of SCE on American, or even European, players.

For future research, I propose a study that will elicit hockey slang tokens, as well as filler tokens for the vowels involved in the LBMS, CR, and FACE and GOAT, to see if slang terms align more with SCE production. This study could be done on a larger scale than the current study as it would only require players to read the word list and record themselves doing so. This would also provide a large corpus of spoken data and would potentially provide answers to some of the unanswered questions raised throughout this study.

Another aspect which requires further research is the age when this persona construction occurs. One player, Jackman, mentioned the impact of age specifically on slang usage, when constructing the hockey persona I have described throughout this dissertation. Specifically, he observed that:

> "I think it's worse when you're younger when you're playing juniors and stuff people really hockey players really want to sound like hockey players when you get older you kind of mature a little bit to stop talking like an idiot." — Jackman

I agree with the assessment that players younger than the ones interviewed in this study are more likely to use hockey slang in their speech. While I cannot speak to the transition away from hockey slang as an attempt to avoid sounding like an "idiot," a study examining usage of hockey slang by age could return intriguing results. The age group that Jackman is likely referring to is the Junior level of hockey, 16-21 years old. A study focused on these groups would provide more insight into both the usage of hockey slang as well as the process of adoption of variant vowel production like that observed in this study.

Analyzing the speech of younger players would allow for a longitudinal view of speech as the sport becomes more important to their lives and persona. This type of study would involve interviewing players multiple times throughout a season to establish their vowel space, and then returning each year as they age. If this is the period where the hockey persona construction begins, then as players get older, their vowel space should reflect the variation captured in the speech of the older players in this study.

These approaches would help to answer many of the questions that remain at the conclusion of this dissertation. An acoustic analysis of hockey slang, paired with the findings of this dissertation, will provide a better picture of the linguistic hockey persona. Through these studies, through process through which variant vowel production is introduced to hockey players through slang could be better understood. The increased use of this slang at a younger age could presumably lead to a change in vowel production in non-hockey related words, ultimately shaping players vowels spaces. The following quote from Clark best sums up these proposals:

> "I think it's expanded just past the hockey slang. I think it's kinda like deeply rooted into us at this point and if we were to- if the three hockey players were to sit down at a table with some people, I think we wouldn't have to tell them that we play hockey in order for them to- if they sat and listened to us have a conversation for ten minutes I think they'd be able to pick up on that." — Clark

What was abundantly clear throughout all my interviews was the notion that hockey players can identify each other based on speech. Whether that is more attributable to hockey slang or vowel production is something that should be the focus of future study.

As I mentioned while discussion the limitations of this study, gender and ethnicity could provide version interesting points of variation occurring within the hockey community. In the future, I plan to conduct similar interviews with female hockey players to analyze their speech in the same manner that has been done here. With the rise of professional women's hockey in North America, I hope that this research will be able to begin sooner rather than later. The interaction of ethnically based dialects and this hockey persona present a fascinating area for intersection. Although I do not know if there is ethnically based hockey-specific speech, research into how this hockey persona is utilized by different ethnicities needs to be the focus of future research.

10.4 Final Remarks

> "I do think that hockey players do have an accent. I think it's influenced both by Americans and Canadians. Um- but I mean I do get the question like like 'Oh you sound Canadian,' but I think it's more of you sound like hockey player." — Jones

Jones's quote above corresponds with the findings of this dissertation. While there was a great deal of uniformity in the data, suggesting that the payers did speak with a similar accent or utilizing the same dialect, categorizing this speech as Canadian or American is somewhat challenging. There was no doubt SCE influences in the players' speech, but there were also aspects of Canadian Raising specifically, which could be attributed to American regional dialects. I believe this is what Jones was attempting to say in this quote. While the language of hockey is influenced by SCE, these American players are crafting their own persona, influenced but distinct from SCE. It is this speech which indexes the hockey persona, and I believe is the accent that Jones is addressing in this quote.

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Appendix A

Semi-structure interview script

Canadian variables in the speech of American-born professional hockey players

Andrew Bray
University of Georgia
Semi-structured interview script

The following is a semi- structured interview script that will be used throughout the data collection process. While this script should cover the majority of questions asked, follow-up questions will likely occur naturally throughout the interview when players provides answers which either inspire or require further questioning.

Part 1: General Background information

To start this interview, I would like to know a little bit about your personal background. Where and when were you born and how long did you live in your hometown?

Did you ever move to a city in a different region growing up, if so, at what age and how long did you live in that city?

When and why did you start playing hockey?

Please briefly describe your hockey career for me including all the teams you have played for and where they were.

Have you ever played for a team in Canada, if so, how long were you on that team?

Did you ever play in Canada in tournaments or for leagues that were international?

Did you play college or major junior hockey? Why did you pick that route?

When did you turn pro? Have you played for any other professional teams, if so what team?
How much time do you currently spend in Canada during the season?
Who many players do you know throughout the league? How many do you know in the NHL?
Who do you hang out with most on the team? Do you know their nationalities, or what state they are from?
Please describe a practice day for me. What do you normally do before and after? How is practice normally run?
How does this differ from a game day?
What do you think of [current city]? Is it a good hockey town?

Part 2: Analysis of Canadian variables in American-born players' speech

Do you believe that American players speak adopt a "Canadian accent?" If so, what elements of Canadian speech do they attempt to adopt.
If you answered yes to the last question, do you think these players actually sound Canadian? If not, what are they getting incorrect?
Do you think these players actually want to sound Canadian?
Do you believe any of your American teammates are speaking with a Canadian accent?
Do you think that you are speaking with a Canadian accent?
Why do you think an American player would speak with a Canadian accent? What do they gain by doing so? What are the social motivations?
If this is simply assimilation, who is assimilating and why?
Is there a accent that you think is specific to hockey players but is not necessarily Canadian, if so, what does it sound like?
If you answered yes to the last question, do you know of a regional American accent that you believe is being used?
What is the motivation for utilizing this accent?
Are there any dialectal variables you can think of that all American players share? If so, what are they?

Appendix B

The Low-Back Merger Shift

Table B.1: *ANAE*-normalized F1 and F2 values of the low back vowels at 50% duration

	BOT		BOUGHT	
Player	*F1*	*F2*	*F1*	*F2*
Allen	795	1,305	769	1,232
Anderson	742	1,324	725	1,339
Bell	756	1,242	760	1,175
Campbell	801	1,311	755	1,185
Carter	892	1,313	895	1,298
Clark	759	1,289	776	1,294
Collins	858	1,342	773	1,101
Cook	738	1,242	714	1,122
Hall	760	1,323	795	1,287
Jackman	777	1,337	758	1,254
Johnson	764	1,282	732	1,299
Jones	760	1,261	745	1,216
King	734	1,339	756	1,358
Martin	780	1,241	760	1,130
Mitchell	739	1,342	777	1,348
Nelson	767	1,358	745	1,287
Phillips	753	1,212	746	1,125
Taylor	759	1,325	750	1,247
Thomas	773	1,162	778	1,155
Vasquez	781	1,207	752	1,178
Average	**775**	**1,288**	**763**	**1,232**

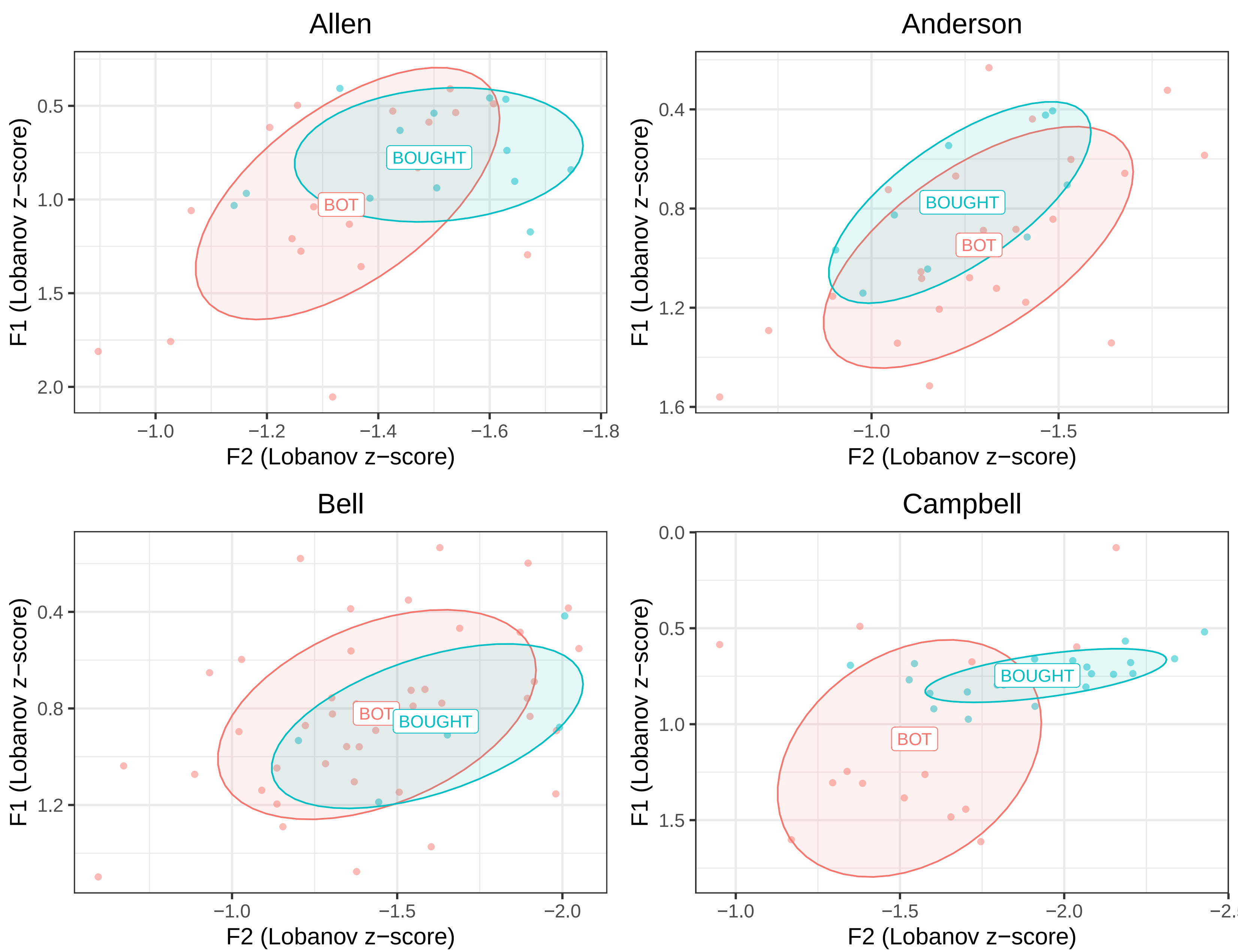

Figure B.1: Allen - Campbell: Low-Back Merger Shift back vowels

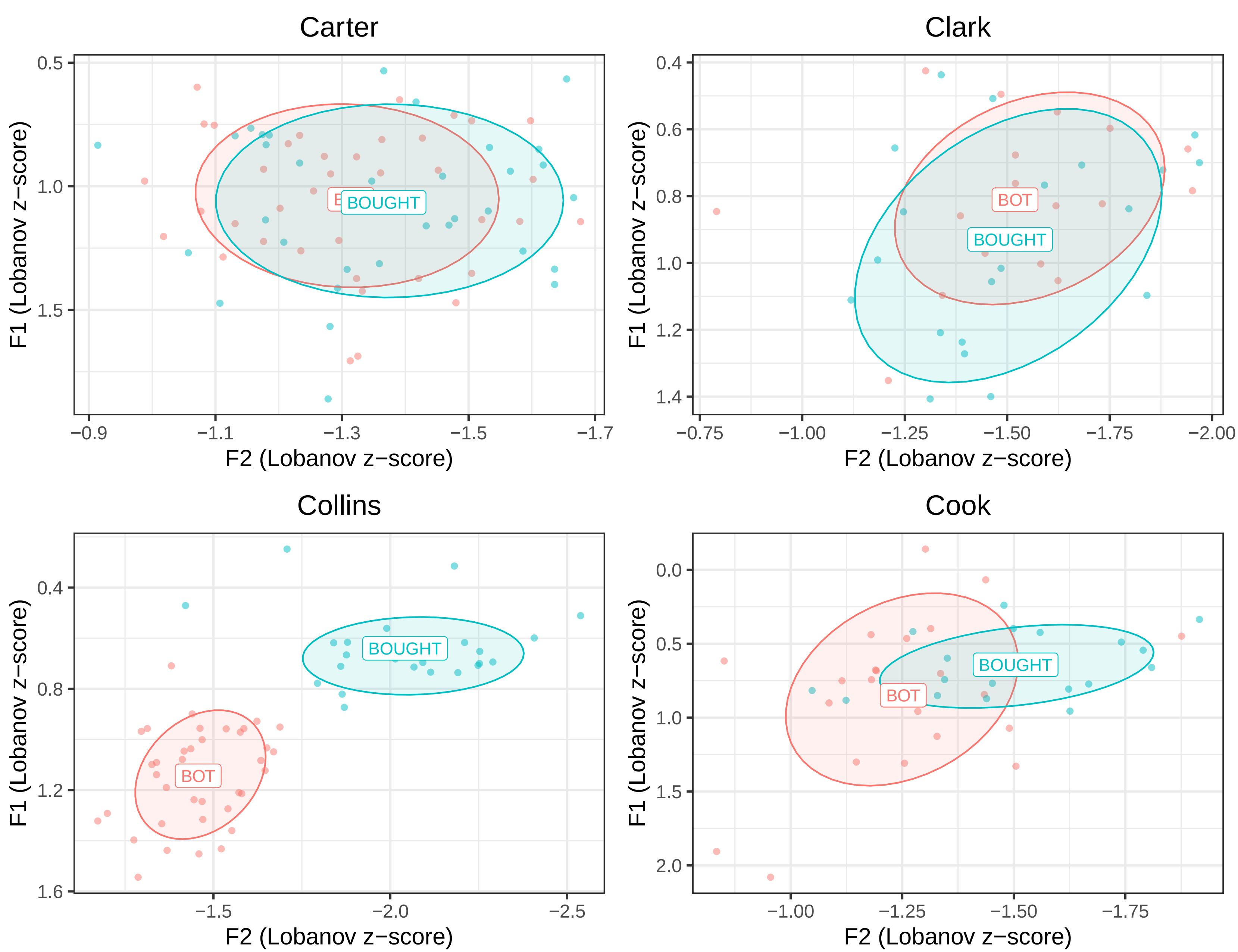

Figure B.2: Carter - Cook: Low-Back Merger Shift back vowels

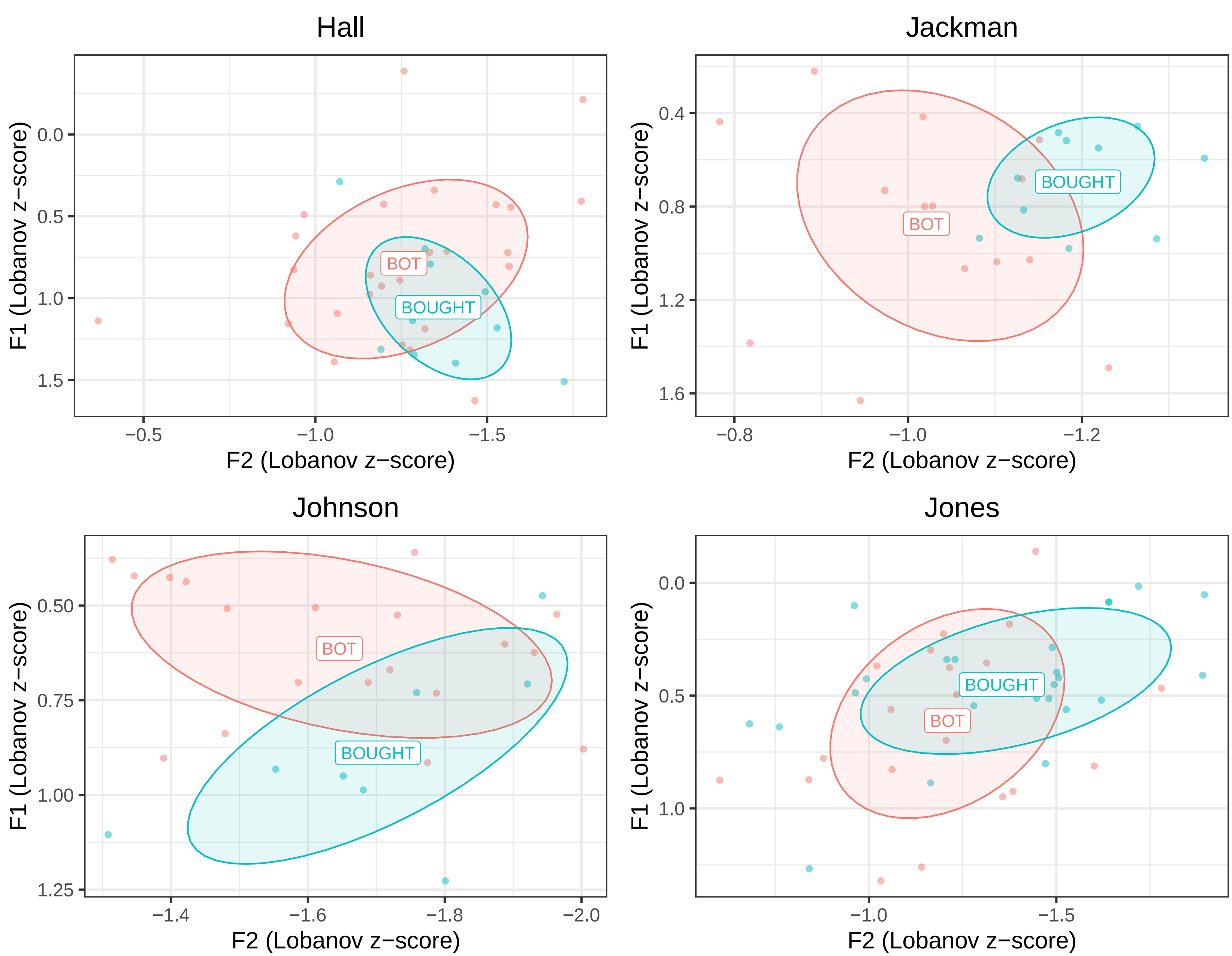

Figure B.3: Hall - Jones: Low-Back Merger Shift back vowels

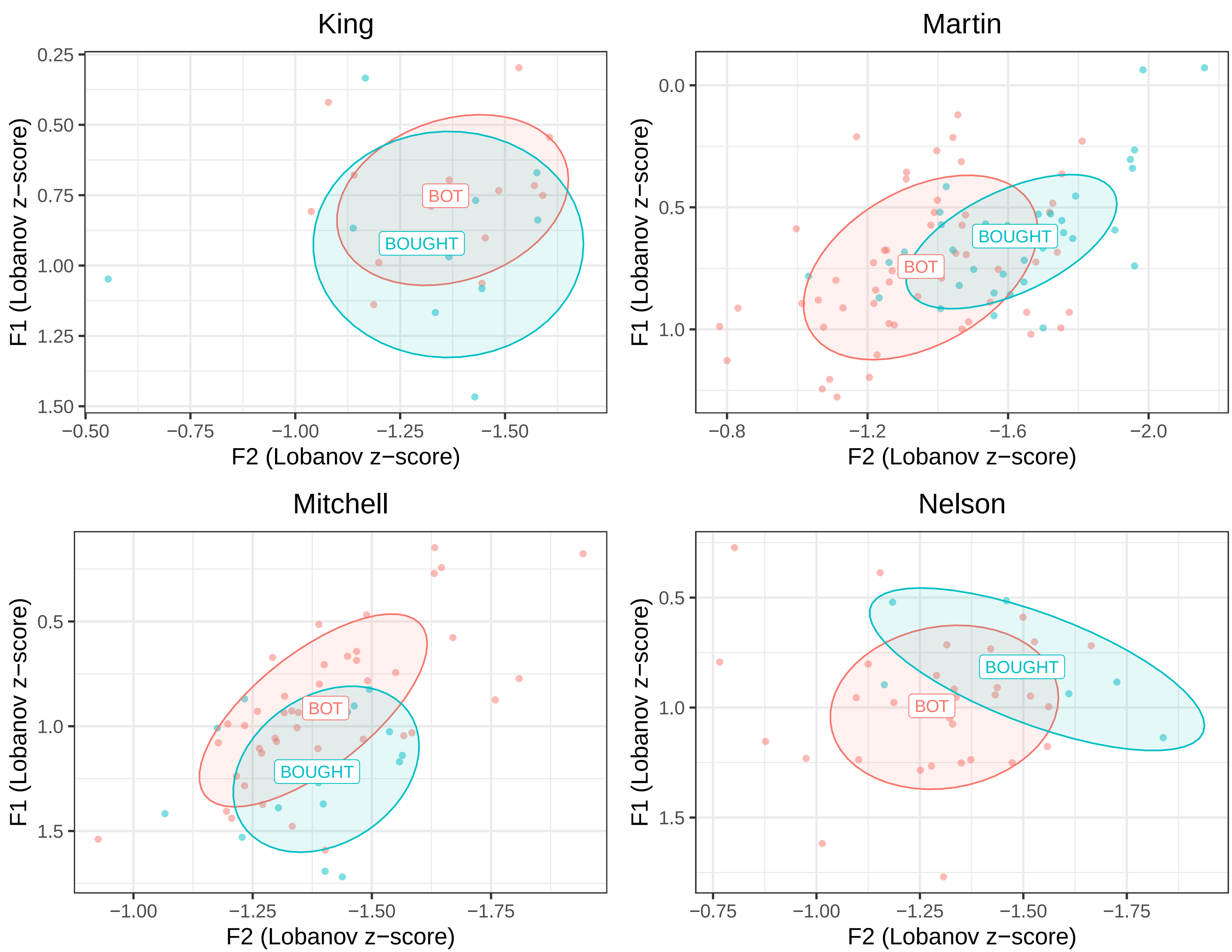

Figure B.4: King - Nelson: Low-Back Merger Shift back vowels

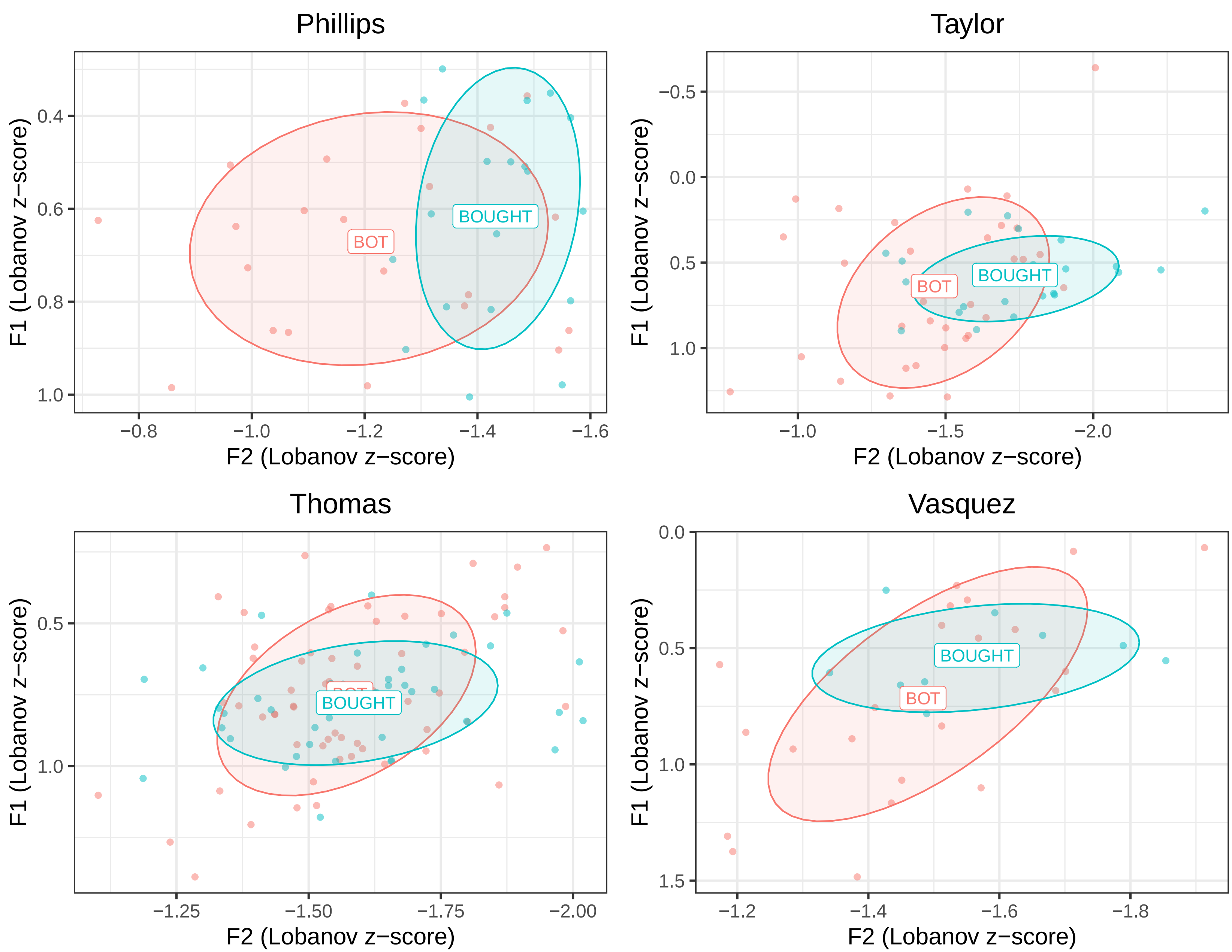

Figure B.5: Phillips - Vasquez: Low-Back Merger Shift back vowels

Table B.2: *ANAE*-normalized F1 and F2 values for front vowels at 50% duration

	BEET		BIT		BET		BAT	
Player	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
Allen	539	2,223	553	1,858	692	1,692	800	1,666
Anderson	505	2,175	555	1,854	664	1,772	732	1,851
Bell	549	2,169	578	1,846	665	1,706	803	1,819
Campbell	450	2,312	552	1,975	695	1,785	770	1,776
Carter	424	2,379	549	1,966	724	1,716	930	1,732
Clark	452	2,277	545	2,029	689	1,862	766	1,788
Collins	442	2,379	565	1,996	756	1,847	812	2,017
Cook	491	2,264	550	2,061	653	1,925	807	1,914
Hall	522	2,221	564	1,869	677	1,725	793	1,839
Jackman	519	2,031	574	1,735	712	1,532	779	1,671
Johnson	454	2,295	562	1,921	687	1,849	758	1,738
Jones	521	2,191	562	1,755	678	1,627	764	1,625
King	446	2,300	556	1,939	646	1,795	772	1,665
Martin	430	2,207	552	1,951	696	1,860	864	1,957
Mitchell	468	2,211	507	1,911	656	1,769	750	1,748
Nelson	514	2,176	549	1,807	637	1,750	730	1,784
Phillips	568	2,241	543	1,776	685	1,700	771	1,598
Taylor	474	2,073	571	1,846	680	1,720	764	1,728
Thomas	410	2,198	550	1,996	720	2,033	888	1,992
Vasquez	469	1,993	569	1,730	725	1,756	791	1,919
Average	**482**	**2,211**	**555**	**1,891**	**687**	**1,771**	**792**	**1,791**

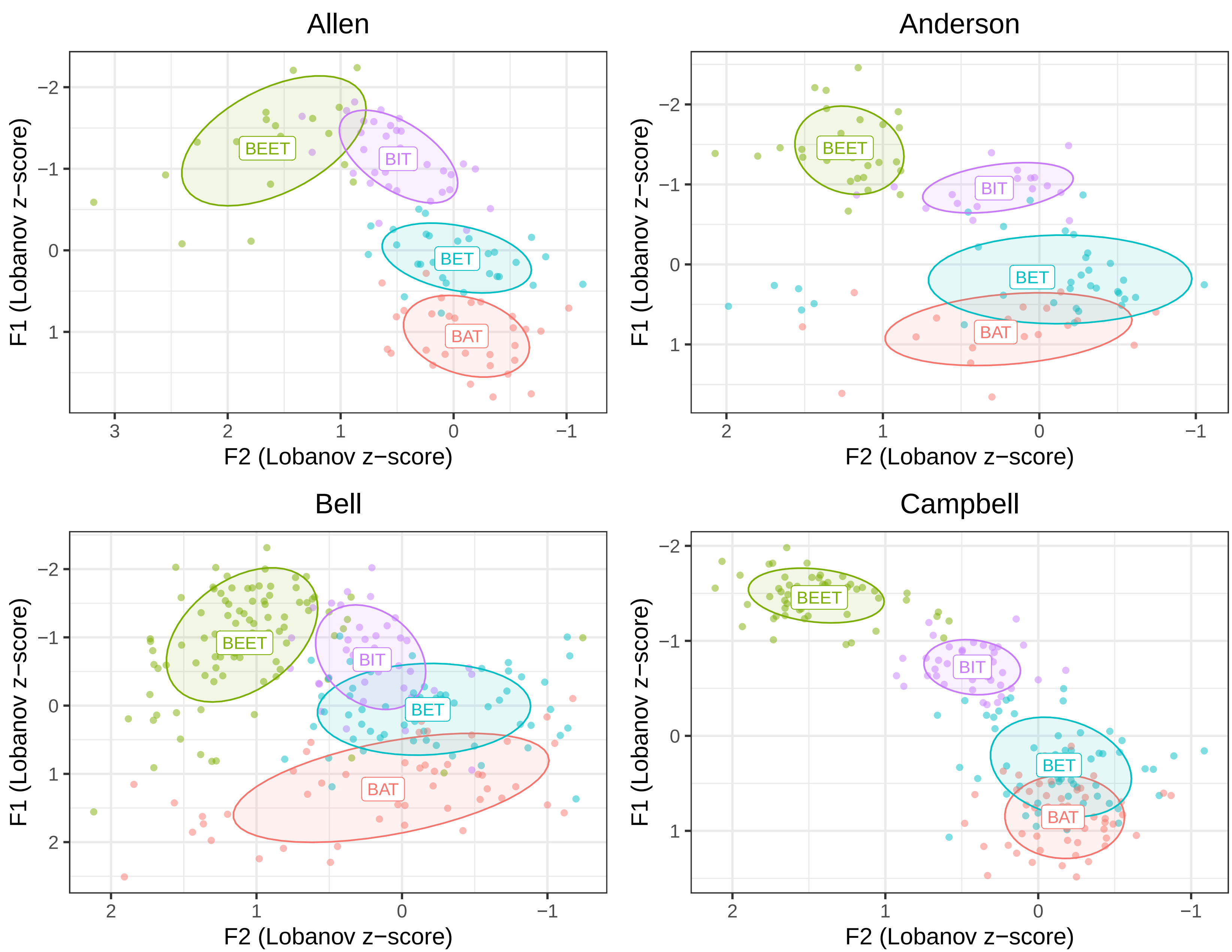

Figure B.6: Allen - Campbell: Low-Back Merger Shift front vowels

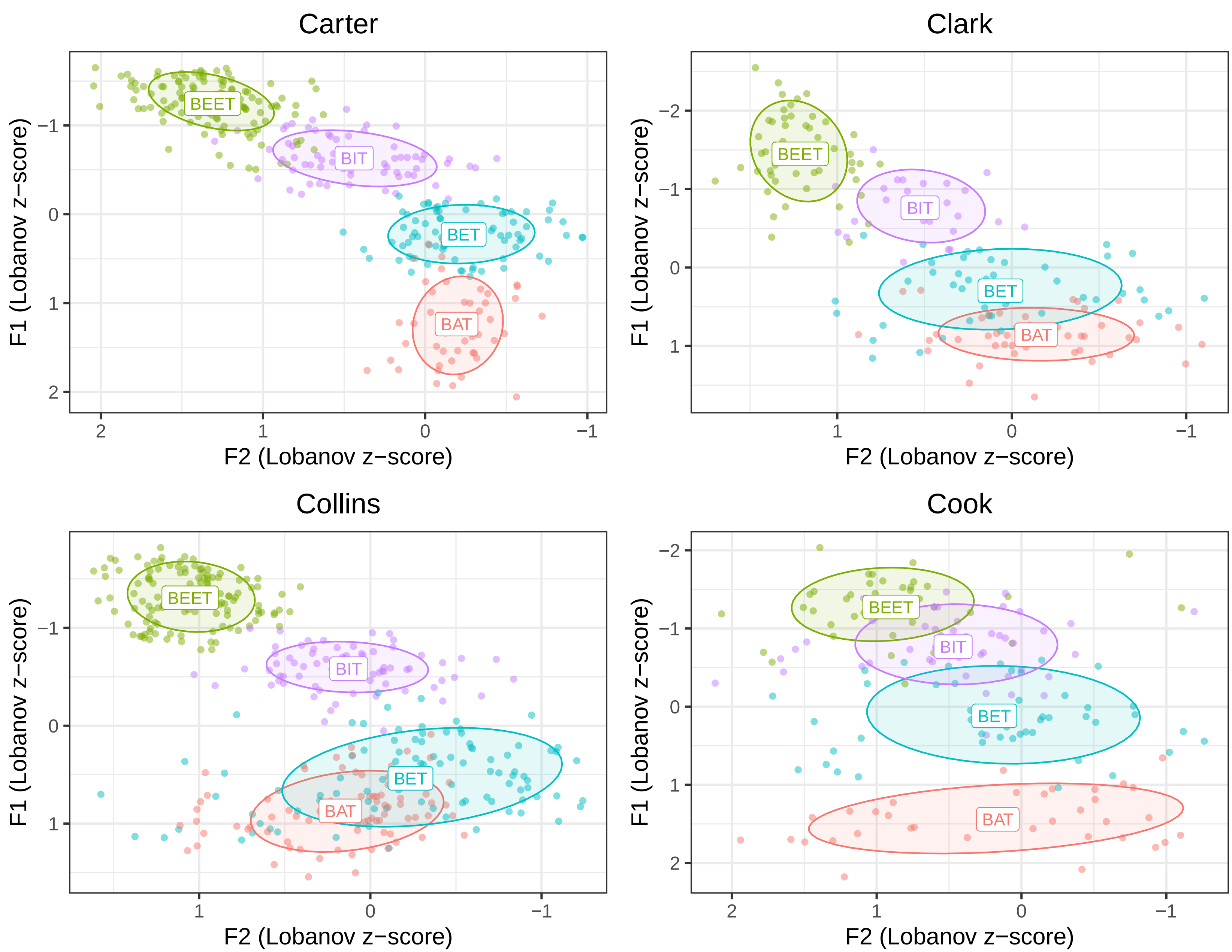

Figure B.7: Carter - Cook: Low-Back Merger Shift front vowels

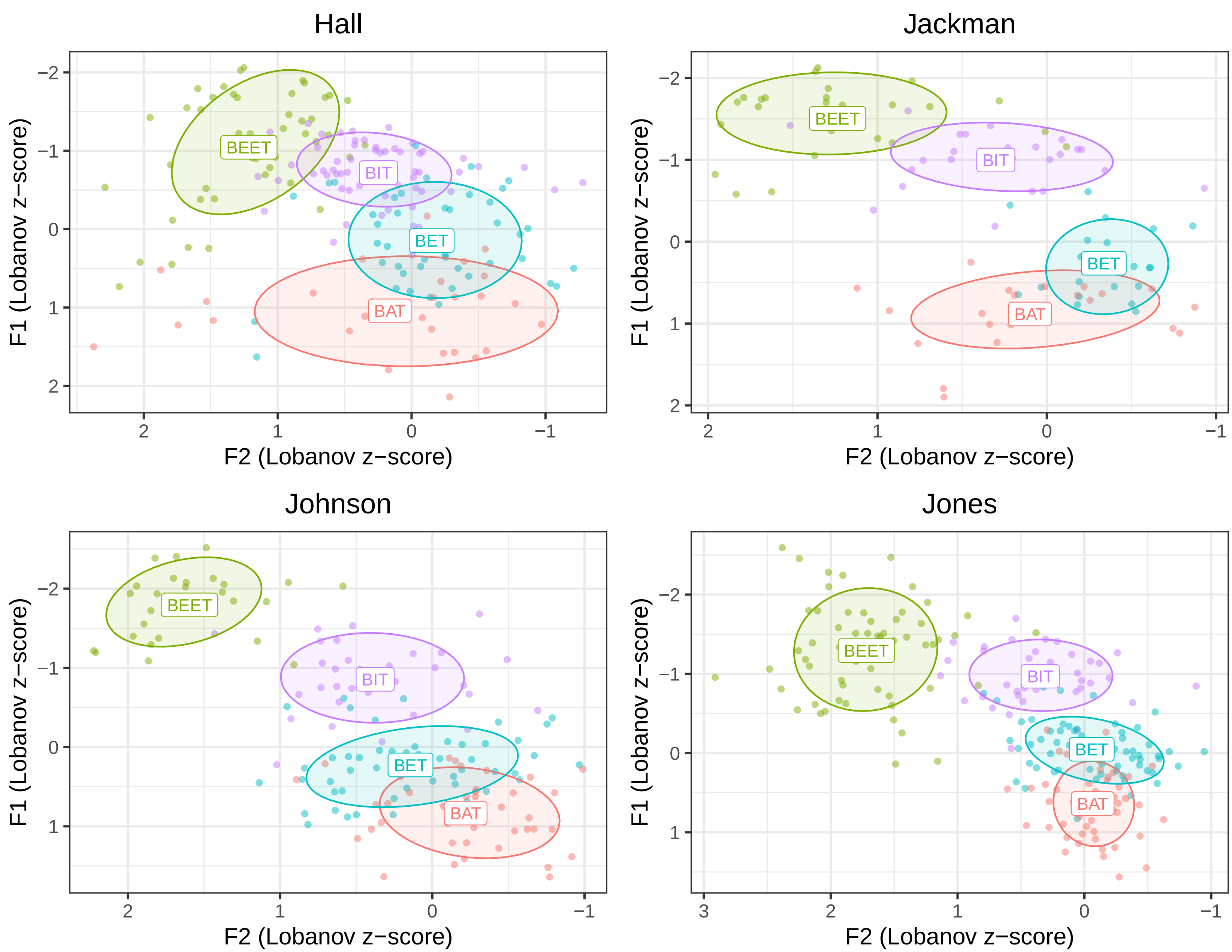

Figure B.8: Hall - Jones: Low-Back Merger Shift front vowels

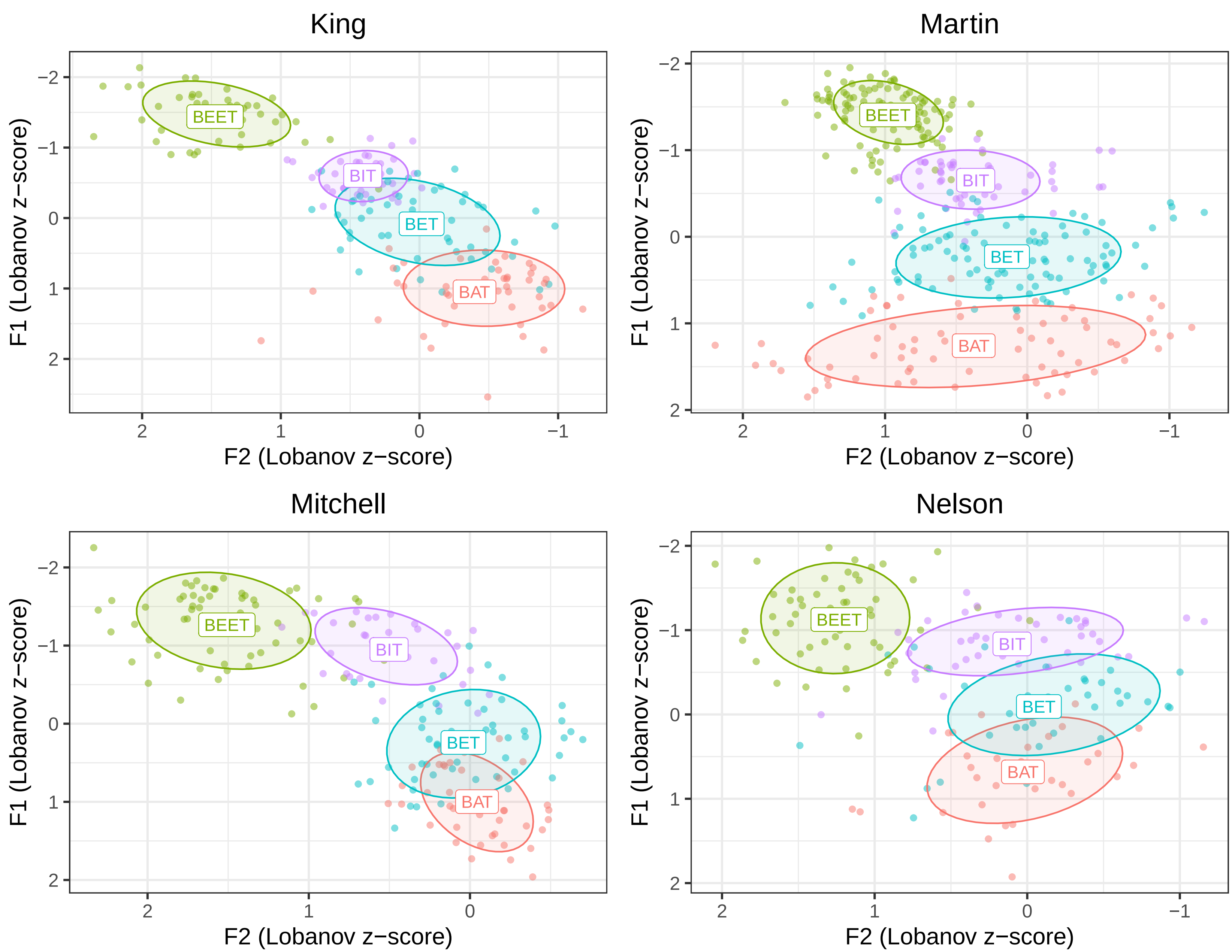

Figure B.9: King - Nelson: Low-Back Merger Shift front vowels

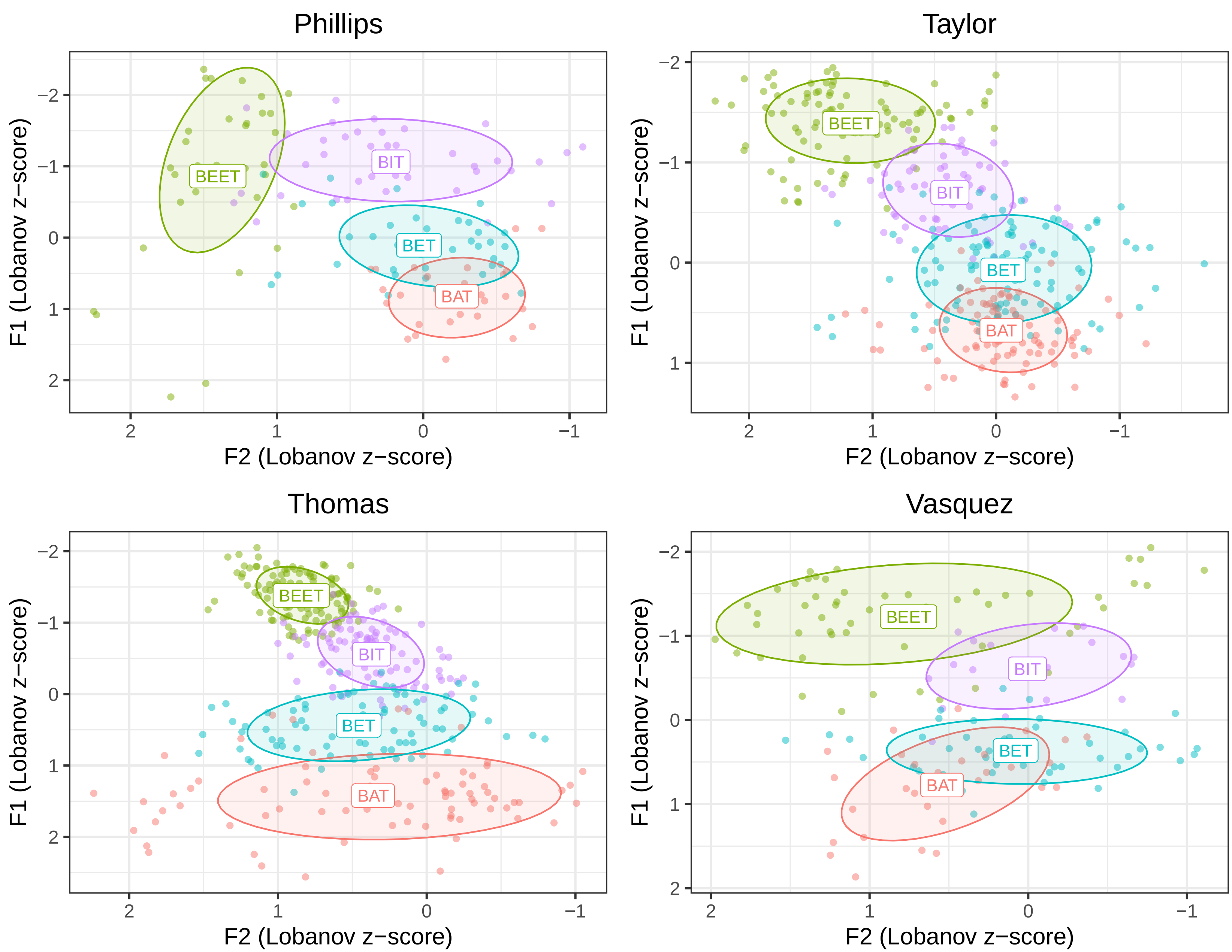

Figure B.10: Phillips - Vasquez: Low-Back Merger Shift front vowels

Table B.3: Linear mixed models of Euclidean distance from BEET to BIT at 50% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	1.14	17.64	<0.001
	21-22	0.02	0.14	0.892
	23-24	0.04	0.38	0.707
	27+	0.10	0.82	0.425
Development	(Intercept)	1.17	24.93	<0.001
	Major Junior	-0.01	-0.16	0.873
League	(Intercept)	1.21	22.4	<0.001
	ECHL	-0.09	-1.14	0.271
Region	(Intercept)	0.99	10.54	<0.001***
	Mid-Atlantic	0.04	0.30	0.773
	Upper Midwest	0.06	0.54	0.601
	W. Pennsylvania	0.10	0.81	0.439
	Inland North	0.25	2.51	0.034*
	West	0.50	4.16	0.002**
Status	(Intercept)	1.14	18.56	<0.001
	Veteran	0.04	0.54	0.595

Table B.4: Linear mixed models of Euclidean distance from BEET to BET at 50% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	2.01	21.50	$<0.001^{***}$
	25-26	0.03	0.12	0.903
	21-22	0.06	0.33	0.747
	23-24	0.11	0.80	0.439
Development	(Intercept)	2.07	30.33	$<0.001^{***}$
	Major Junior	-0.03	-0.20	0.843
League	(Intercept)	2.02	25.2	$<0.001^{***}$
	ECHL	0.08	0.72	0.481
Region	(Intercept)	1.92	9.83	$<0.001^{***}$
	Mid-Atlantic	0.01	0.03	0.977
	E. New England	0.02	0.06	0.950
	Upper Midwest	0.16	0.69	0.500
	Inland North	0.19	0.87	0.397
	West	0.25	0.73	0.480
Status	(Intercept)	2.03	22.65	$<0.001^{***}$
	Veteran	0.05	0.43	0.675

Table B.5: Linear mixed models of Euclidean distance from BEET to BAT at 50% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	2.51	13.94	$<0.001^{***}$
	25-26	0.17	0.82	0.427
	21-22	0.20	0.69	0.503
	23-24	0.24	1.11	0.286
Development	(Intercept)	2.71	33.07	$<0.001^{***}$
	Major Junior	-0.08	-0.51	0.620
League	(Intercept)	2.66	27.26	$<0.001^{***}$
	ECHL	0.04	0.31	0.760
Region	(Intercept)	2.53	30.19	$<0.001^{***}$
	W. Pennsylvania	0.10	0.54	0.599
	Upper Midwest	0.17	1.24	0.236
	Mid-Atlantic	0.33	1.27	0.225
	E. New England	0.44	1.68	0.117
	West	0.66	3.37	0.005^{**}
Status	(Intercept)	2.76	25.93	$<0.001^{***}$
	Veteran	-0.12	-0.89	0.388

Appendix C

Canadian Raising

Table C.1: *ANAE*-normalized mean TIE F1 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	672	731	765	737	679
Anderson	626	682	706	686	644
Bell	661	723	762	742	681
Campbell	624	713	763	744	681
Carter	673	803	876	846	723
Clark	691	740	780	769	708
Collins	675	771	809	762	653
Cook	640	679	720	705	665
Hall	646	710	736	718	679
Jackman	670	721	758	750	708
Johnson	663	698	715	705	661
Jones	692	719	749	744	697
King	614	694	716	697	636
Martin	664	746	789	778	696
Mitchell	610	688	740	734	690
Nelson	691	715	754	748	725
Phillips	657	728	770	759	693
Taylor	697	702	732	726	671
Thomas	650	739	802	778	694
Vasquez	707	725	756	731	655
Average	**661**	**721**	**760**	**743**	**682**

Table C.2: *ANAE*-normalized mean TIGHT F1 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	617	643	645	598	575
Anderson	599	617	618	590	555
Bell	633	673	676	615	592
Campbell	626	650	638	586	536
Carter	626	687	695	636	578
Clark	662	696	689	622	563
Collins	641	686	670	593	540
Cook	595	639	633	590	564
Hall	613	635	632	598	589
Jackman	631	666	664	620	589
Johnson	617	648	651	606	561
Jones	632	670	668	604	577
King	596	624	638	601	563
Martin	624	663	660	601	554
Mitchell	575	605	610	564	533
Nelson	590	605	595	558	545
Phillips	637	668	663	621	757
Taylor	628	638	647	609	573
Thomas	624	674	681	623	569
Vasquez	658	649	631	578	541
Average	**621**	**652**	**650**	**601**	**564**

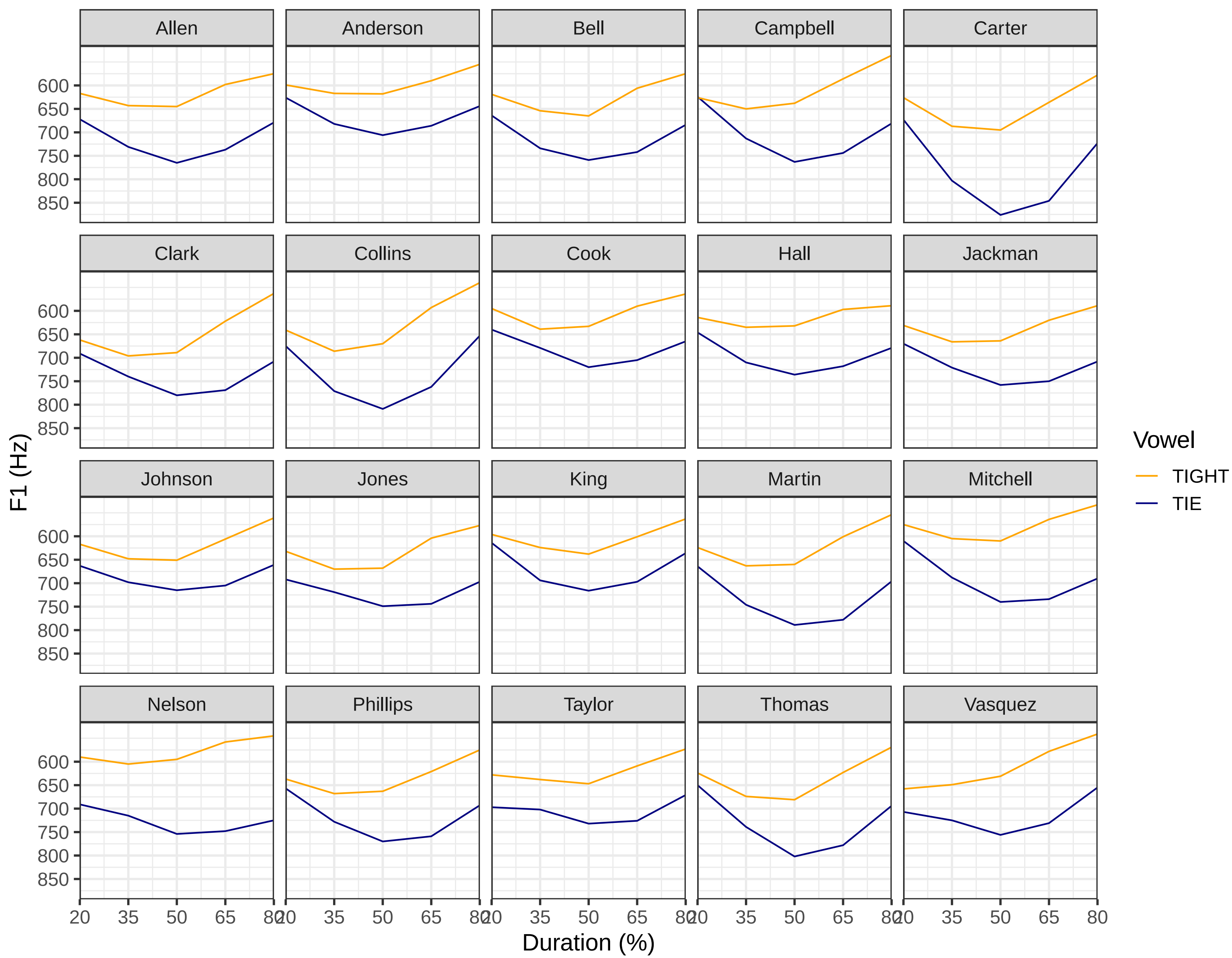

Figure C.1: F1 trajectories for TIE and TIGHT by player

Table C.3: Linear mixed models of TIE-TIGHT F1 differential at 20% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-39.94	-4.29	<0.001***
	27+	-7.55	-0.39	0.701
	21-22	-3.66	-0.19	0.855
	25-26	1.43	0.11	0.912
Development	(Intercept)	-36.44	-5.83	<0.001***
	Major Junior	-12.64	-1.16	0.264
League	(Intercept)	-47.82	-6.40	<0.001***
	ECHL	13.41	1.32	0.204
Region	(Intercept)	-31.42	-1.69	0.113
	Upper Midwest	-13.67	-0.63	0.541
	Inland North	-10.97	-0.53	0.601
	E. New England	4.95	0.16	0.876
	Mid-Atlantic	-7.89	-0.25	0.805
	W. Pennsylvania	-3.44	-0.11	0.914
Status	(Intercept)	-44.19	-5.46	<0.001***
	Veteran	6.30	0.59	0.562

Table C.4: Linear mixed models of TIE-TIGHT F1 differential at 35% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-65.65	-7.94	<0.001***
	27+	-1.02	-0.06	0.954
	23-24	-15.55	-0.89	0.387
	25-26	-8.42	-0.75	0.467
Development	(Intercept)	-64.57	-9.13	<0.001***
	Major Junior	-6.04	-0.47	0.643
League	(Intercept)	-64.51	-7.68	<0.001***
	ECHL	-3.76	-0.32	0.754
Region	(Intercept)	-60.86	-3.61	0.003**
	Upper Midwest	-7.35	-0.37	0.716
	Inland North	-11.66	-0.63	0.540
	E. New England	-3.97	0.14	0.890
	Mid-Atlantic	-21.85	-0.77	0.456
	W. Pennsylvania	-22.33	-0.79	0.446
Status	(Intercept)	-61.71	-6.68	<0.001***
	Veteran	-7.85	-0.67	0.519

Table C.5: Linear mixed models of TIE-TIGHT F1 differential at 50% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-106.64	-8.68	<0.001***
	27+	-3.53	-0.14	0.893
	21-22	-5.54	-0.21	0.834
	25-26	-8.51	-0.51	0.620
Development	(Intercept)	-111.65	-13.08	<0.001***
	Major Junior	1.40	0.09	0.928
League	(Intercept)	-100.67	-10.41	<0.001***
	ECHL	-19.88	-1.50	0.152
Region	(Intercept)	-71.14	-3.27	0.006**
	Upper Midwest	-38.54	-1.50	0.156
	Inland North	-44.43	-1.85	0.086
	E. New England	-49.68	-1.34	0.204
	Mid-Atlantic	-57.64	-1.55	0.145
	W. Pennsylvania	-59.13	-1.59	0.136
Status	(Intercept)	-109.24	-10.09	<0.001***
	Veteran	-3.39	-0.24	0.815

Table C.6: Linear mixed models of TIE-TIGHT F1 differential at 65% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-139.93	-10.78	<0.001***
	27+	-14.44	-0.53	0.605
	21-22	10.34	0.38	0.712
	25-26	-7.24	-0.41	0.689
Development	(Intercept)	-142.48	-15.58	<0.001***
	Major Junior	-3.03	-0.19	0.854
League	(Intercept)	-129.91	-12.90	<0.001***
	ECHL	-25.55	-1.85	0.082
Region	(Intercept)	-97.58	-4.43	<0.001***
	Upper Midwest	-44.37	-1.71	0.110
	Inland North	-48.57	-2.00	0.066
	E. New England	-57.43	-1.53	0.150
	Mid-Atlantic	-79.44	-2.11	0.055
	W. Pennsylvania	-72.78	-1.94	0.075
Status	(Intercept)	-142.55	-12.27	<0.001***
	Veteran	-1.54	-0.10	0.921

Table C.7: Linear mixed models of TIE-TIGHT F1 differential at 80% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-131.76	-12.89	<0.001***
	27+	15.15	0.71	0.490
	21-22	34.67	1.60	0.130
	25-26	14.85	1.06	0.305
Development	(Intercept)	-120.29	-15.59	<0.001***
	Major Junior	0.23	0.02	0.987
League	(Intercept)	-113.76	-12.60	<0.001***
	ECHL	-12.13	-0.98	0.342
Region	(Intercept)	-86.23	-4.63	<0.001***
	Upper Midwest	-29.34	-1.34	0.202
	Inland North	-36.62	-1.78	0.096
	E. New England	-38.75	-1.23	0.241
	Mid-Atlantic	-55.82	-1.77	0.101
	W. Pennsylvania	-71.52	-2.27	0.041*
Status	(Intercept)	-123.83	-12.74	<0.001***
	Veteran	6.24	0.49	0.632

Table C.8: Mean COW F1 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	726	786	768	747	716
Anderson	682	696	687	680	663
Bell	742	792	788	736	677
Campbell	704	774	780	745	690
Carter	811	858	858	772	704
Clark	719	784	771	728	680
Collins	755	810	783	715	676
Cook	718	756	745	707	651
Hall	712	752	763	759	731
Jackman	734	757	748	720	676
Johnson	717	746	764	713	660
Jones	723	758	754	741	715
King	667	722	709	714	689
Martin	768	823	816	773	713
Mitchell	713	770	784	753	711
Nelson	784	771	752	737	695
Phillips	741	742	750	722	660
Taylor	733	764	756	728	662
Thomas	779	814	802	767	717
Vasquez	672	723	749	731	709
Average	**730**	**770**	**766**	**734**	**690**

Table C.9: Mean HOUSE F1 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	709	787	763	729	697
Anderson	681	726	734	722	686
Bell	676	744	747	730	699
Campbell	664	730	760	724	670
Carter	726	790	775	743	682
Clark	664	705	700	675	653
Collins	731	811	798	751	669
Cook	670	716	725	706	687
Hall	660	701	703	670	667
Jackman	654	699	696	678	665
Johnson	686	724	737	707	685
Jones	714	748	735	723	698
King	611	682	700	686	642
Martin	715	780	793	774	730
Mitchell	666	708	741	728	698
Nelson	660	684	679	649	632
Phillips	660	732	754	725	693
Taylor	680	711	711	685	646
Thomas	680	723	721	686	636
Vasquez	702	759	778	760	703
Average	**680**	**733**	**738**	**712**	**677**

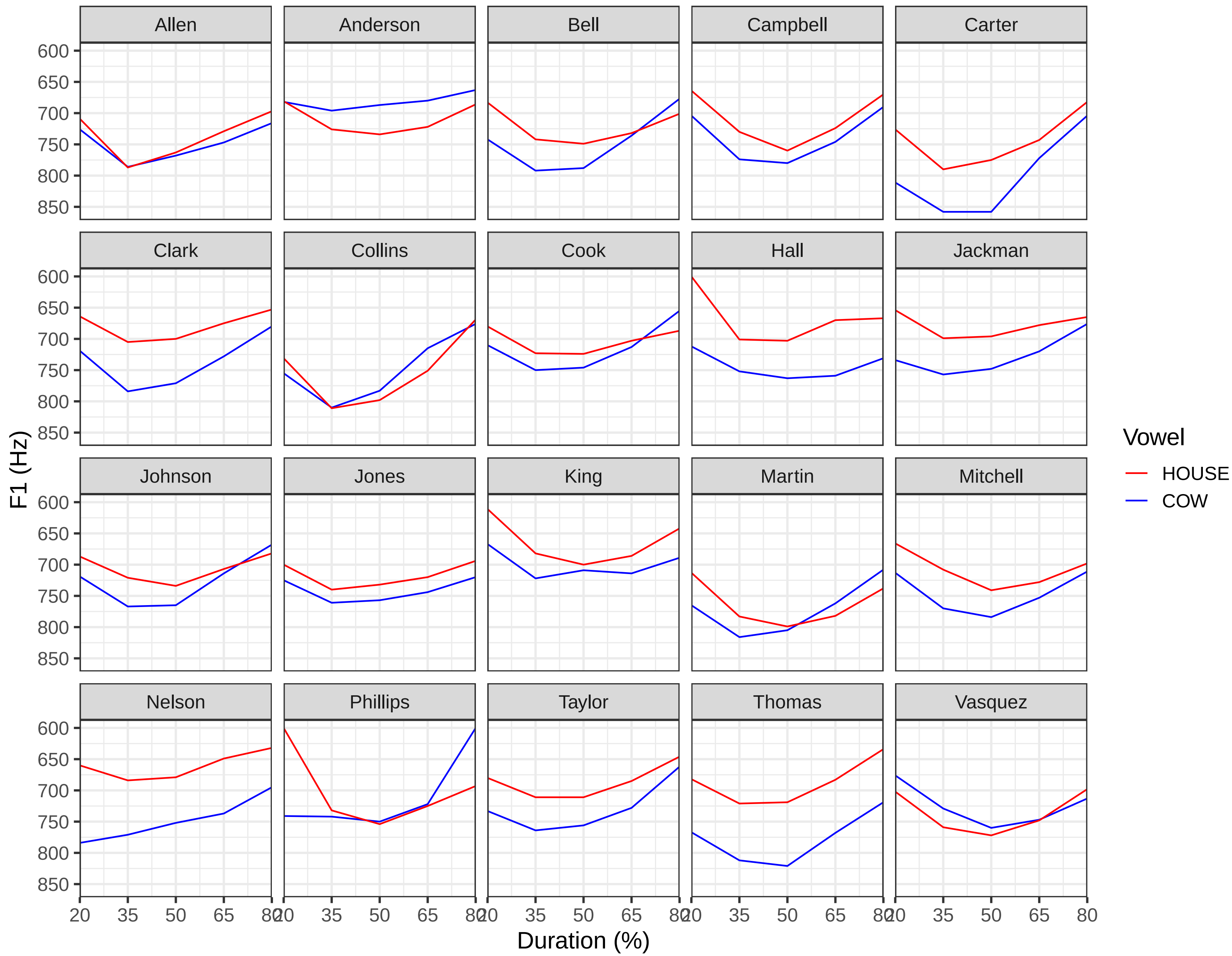

Figure C.2: F1 trajectories for COW and HOUSE by player

Table C.10: Linear mixed models of COW-HOUSE F1 differential at 20% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-48.84	-3.49	0.003**
	25-26	-10.79	-0.59	0.564
	21-22	13.99	0.50	0.621
	27+	7.87	0.37	0.717
Development	(Intercept)	-56.32	-6.58	<0.001***
	Major Junior	19.56	1.28	0.220
League	(Intercept)	-52.12	-4.93	<0.001***
	ECHL	3.81	0.26	0.799
Region	(Intercept)	-51.42	-1.53	0.156
	Inland North	8.82	0.25	0.810
	West	8.80	0.20	0.842
	W. Pennsylvania	-1.70	-0.04	0.968
	Upper Midwest	-3.95	-0.11	0.917
	E. New England	-33.15	-0.70	0.500
Status	(Intercept)	-53.55	-4.65	<0.001***
	Veteran	5.74	0.38	0.706

Table C.11: Linear mixed models of COW-HOUSE F1 differential at 35% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-42.27	-2.83	0.012*
	25-26	0.70	0.04	0.972
	21-22	17.21	0.58	0.570
	27+	5.00	0.22	0.831
Development	(Intercept)	-41.14	-4.46	<0.001***
	Major Junior	5.81	0.35	0.731
League	(Intercept)	-33.46	-3.09	0.006**
	ECHL	-11.57	-0.77	0.454
Region	(Intercept)	-32.70	-1.17	0.271
	Inland North	13.27	0.45	0.666
	West	-10.53	-0.29	0.777
	W. Pennsylvania	-22.96	-0.66	0.524
	Upper Midwest	-23.04	-0.75	0.473
	E. New England	-58.23	-1.47	0.173
Status	(Intercept)	-45.82	-3.84	0.001**
	Veteran	10.83	0.70	0.493

Table C.12: Linear mixed models of COW-HOUSE F1 differential at 50% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-25.85	-1.59	0.132
	25-26	-10.30	-0.48	0.638
	21-22	-6.70	-0.21	0.839
	27+	-4.18	-0.17	0.871
Development	(Intercept)	-29.71	-2.97	0.008**
	Major Junior	-6.23	-0.34	0.735
League	(Intercept)	-27.85	-2.27	0.036*
	ECHL	-9.41	-0.57	0.578
Region	(Intercept)	-6.83	-0.25	0.809
	Inland North	-5.37	-0.18	0.858
	West	-14.52	-0.41	0.688
	W. Pennsylvania	-34.32	-1.00	0.337
	Upper Midwest	-49.33	-1.62	0.133
	E. New England	-94.84	-2.43	0.035*
Status	(Intercept)	-32.34	-2.45	0.025*
	Veteran	1.22	0.07	0.944

Table C.13: Linear mixed models of COW-HOUSE F1 differential at 65% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-20.44	-1.30	0.210
	25-26	-5.30	-0.26	0.800
	21-22	-33.48	-1.07	0.299
	27+	9.33	0.38	0.706
Development	(Intercept)	-19.82	-1.99	0.062
	Major Junior	-13.51	-0.75	0.463
League	(Intercept)	-24.88	-2.07	0.053
	ECHL	1.86	0.11	0.913
Region	(Intercept)	19.11	0.60	0.563
	Inland North	-32.52	-0.96	0.359
	West	-35.86	-0.88	0.395
	W. Pennsylvania	-33.58	-0.85	0.415
	Upper Midwest	-63.69	-1.80	0.097
	E. New England	-104.01	-2.29	0.042*
Status	(Intercept)	-30.05	-2.28	0.035*
	Veteran	10.23	0.60	0.556

Table C.14: Linear mixed models of COW-HOUSE F1 differential at 80% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-5.68	-0.38	0.706
	25-26	-10.30	-0.53	0.800
	21-22	-35.86	-1.22	0.299
	27+	-3.27	-0.14	0.706
Development	(Intercept)	-6.89	-0.77	0.450
	Major Junior	-23.14	-1.44	0.167
League	(Intercept)	-6.09	-0.55	0.586
	ECHL	-15.48	-1.01	0.327
Region	(Intercept)	29.90	1.06	0.312
	Inland North	-42.76	-1.43	0.182
	West	-41.91	-1.15	0.272
	W. Pennsylvania	-23.97	-0.68	0.508
	Upper Midwest	-48.62	-1.57	0.147
	E. New England	-114.93	-2.89	0.016*
Status	(Intercept)	-14.53	-1.17	0.255
	Veteran	0.84	0.05	0.959

Table C.15: Mean DOWN F1 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	718	761	759	744	712
Anderson	689	692	691	675	651
Bell	673	738	784	753	705
Campbell	717	773	758	741	698
Carter	824	912	938	893	769
Clark	652	734	781	770	752
Collins	703	777	789	749	687
Cook	627	726	819	859	827
Hall	689	772	801	801	751
Jackman	689	733	758	763	739
Johnson	690	728	751	748	725
Jones	701	740	774	771	751
King	649	711	733	711	682
Martin	694	771	821	805	780
Mitchell	694	752	791	782	759
Nelson	695	764	798	796	776
Phillips	691	766	803	805	778
Taylor	673	740	783	778	747
Thomas	791	817	809	781	787
Vasquez	706	797	827	833	776
Average	**698**	**760**	**788**	**778**	**743**

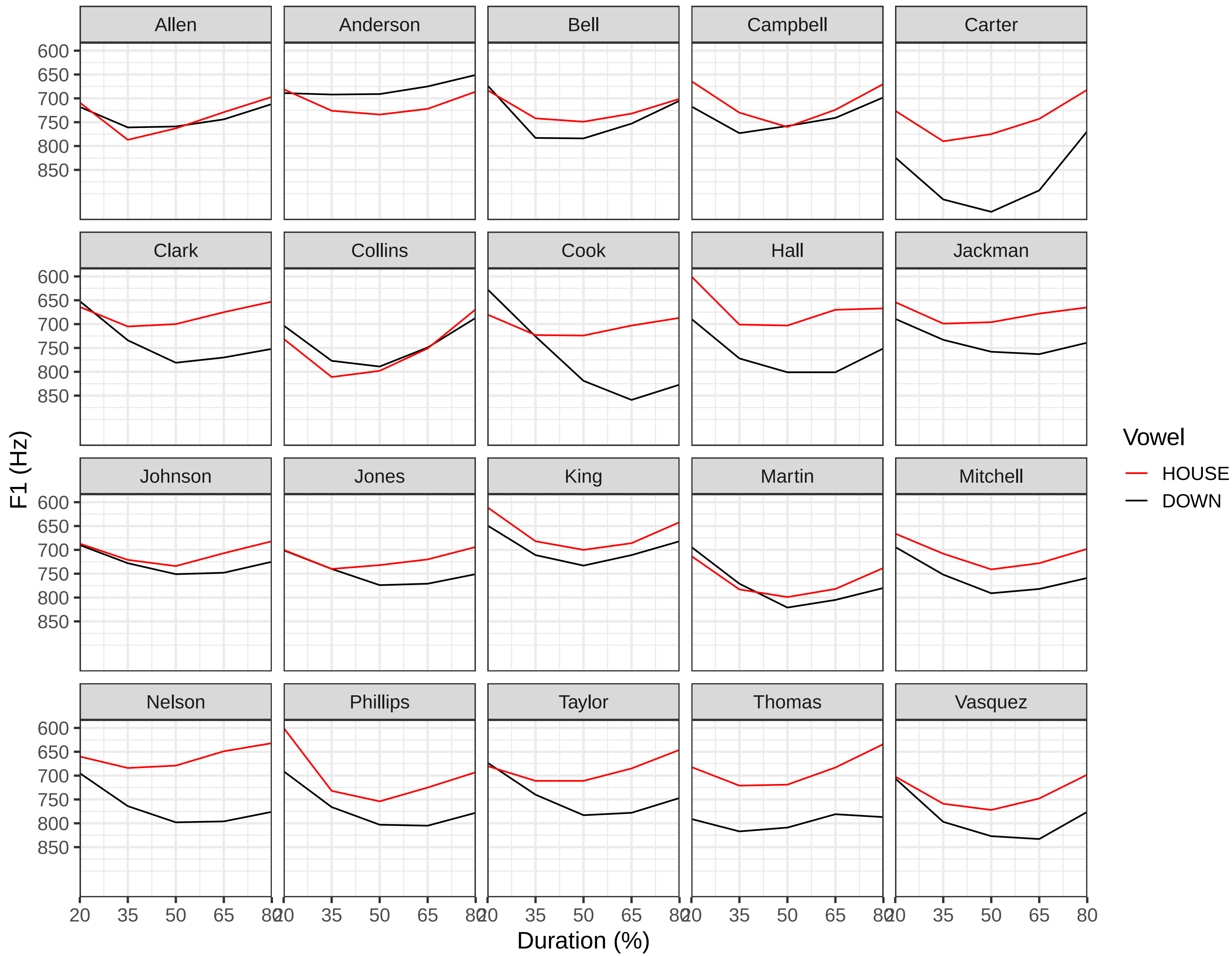

Figure C.3: F1 trajectories for DOWN and HOUSE by player

Table C.16: Linear mixed models of DOWN-HOUSE F1 differential at 20% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	12.47	0.55	0.588
	25-26	-21.03	-0.77	0.451
	21-22	-31.08	-0.85	0.405
	27+	-48.54	-1.82	0.087
Development	(Intercept)	-13.84	-1.24	0.230
	Major Junior	-11.18	-0.56	0.586
League	(Intercept)	-8.46	-0.64	0.527
	ECHL	-17.22	-0.94	0.361
Region	(Intercept)	19.85	0.56	0.5896
	Inland North	-38.12	-0.83	0.420
	West	-36.20	-0.95	0.360
	W. Pennsylvania	-28.30	-0.64	0.535
	Upper Midwest	-128.10	-2.53	0.027*
	E. New England	-30.14	-0.77	0.459
Status	(Intercept)	-3.68	-0.26	0.797
	Veteran	-22.81	-1.25	0.228

Table C.17: Linear mixed models of DOWN-HOUSE F1 differential at 35% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	12.71	0.56	0.584
	25-26	-38.97	-1.42	0.175
	21-22	-35.83	-0.98	0.341
	27+	-59.37	-2.22	0.042*
Development	(Intercept)	-26.61	-2.29	0.034*
	Major Junior	-4.43	-0.21	0.836
League	(Intercept)	-17.58	-1.31	0.207
	ECHL	-20.50	-1.09	0.292
Region	(Intercept)	12.47	0.32	0.7547
	Inland North	-29.56	-0.60	0.558
	West	-28.41	-0.69	0.505
	W. Pennsylvania	-31.97	-0.66	0.519
	Upper Midwest	-108.39	-1.97	0.073
	E. New England	-62.50	-1.46	0.170
Status	(Intercept)	-21.45	-1.42	0.174
	Veteran	-10.94	-0.56	0.584

Table C.18: Linear mixed models of DOWN-HOUSE F1 differential at 50% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-22.37	-0.79	0.440
	25-26	-24.60	-0.73	0.478
	21-22	-24.74	-0.55	0.589
	27+	-46.60	-1.41	0.180
Development	(Intercept)	-52.25	-3.94	<0.001***
	Major Junior	0.78	0.03	0.975
League	(Intercept)	-47.99	-3.06	0.007**
	ECHL	-8.00	-0.36	0.722
Region	(Intercept)	-22.78	-0.57	0.579
	Inland North	-1.80	-0.04	0.972
	West	-8.08	-0.19	0.851
	W. Pennsylvania	-19.99	-0.41	0.691
	Upper Midwest	-67.35	-1.19	0.256
	E. New England	-78.65	-1.80	0.097
Status	(Intercept)	-52.64	-3.01	0.008**
	Veteran	1.04	0.05	0.964

Table C.19: Linear mixed models of DOWN-HOUSE F1 differential at 65% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-22.36	-0.74	0.473
	25-26	-44.52	-1.17	0.260
	21-22	-50.38	-1.00	0.334
	27+	-57.10	-1.53	0.146
Development	(Intercept)	-66.85	-4.44	<0.001***
	Major Junior	0.54	0.02	0.984
League	(Intercept)	-69.43	-3.90	0.001**
	ECHL	5.45	0.22	0.830
Region	(Intercept)	-23.69	-0.53	0.607
	Inland North	-9.84	-0.18	0.863
	West	-25.31	-0.53	0.604
	W. Pennsylvania	-13.70	-0.25	0.808
	Upper Midwest	-64.16	-1.17	0.265
	E. New England	-101.08	-2.05	0.062
Status	(Intercept)	-72.03	-3.65	0.002**
	Veteran	8.93	0.35	0.731

Table C.20: Linear mixed models of DOWN-HOUSE F1 differential at 80% duration with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	-25.95	-0.97	0.347
	25-26	-45.56	-1.41	0.177
	21-22	-24.07	-0.56	0.581
	27+	-57.69	-1.84	0.087
Development	(Intercept)	-62.07	-4.74	<0.001***
	Major Junior	-16.49	-0.70	0.496
League	(Intercept)	-62.59	-3.99	<0.001***
	ECHL	-8.86	-0.40	0.693
Region	(Intercept)	-40.41	-1.09	0.309
	Inland North	-0.11	-0.00	0.998
	West	-11.99	-0.29	0.776
	W. Pennsylvania	9.55	0.20	0.846
	Upper Midwest	-111.77	-2.04	0.066
	E. New England	-60.97	-1.43	0.180
Status	(Intercept)	-77.00	-4.48	<0.001***
	Veteran	16.59	0.75	0.466

Appendix D

Monophthongal FACE and GOAT by player

Table D.1: *ANAE*-normalized mean FACE F1 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	577	580	565	557	571
Anderson	569	571	560	545	539
Bell	588	585	574	562	567
Campbell	582	583	570	548	538
Carter	568	573	561	540	526
Clark	590	588	565	539	542
Collins	584	577	545	515	507
Cook	581	572	558	548	552
Hall	587	579	572	564	572
Jackman	605	598	584	574	573
Johnson	563	567	560	543	534
Jones	585	575	555	540	538
King	547	553	554	547	543
Martin	569	571	561	541	526
Mitchell	560	556	549	538	531
Nelson	584	576	555	542	549
Phillips	573	567	551	542	544
Taylor	589	593	585	574	562
Thomas	560	561	547	524	510
Vasquez	606	596	577	570	561
Average	**578**	**576**	**562**	**548**	**544**

Table D.2: *ANAE*-normalized mean FACE F2 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	1,911	2,003	2,099	2,105	2,039
Anderson	1,864	1,931	1,993	2,024	1,996
Bell	1,833	1,932	1,999	2,030	1,999
Campbell	1,951	2,004	2,062	2,096	2,079
Carter	1,995	2,052	2,111	2,135	2,120
Clark	1,951	2,017	2,117	2,144	2,145
Collins	2,014	2,106	2,197	2,254	2,221
Cook	1,947	2,034	2,076	2,069	2,003
Hall	1,911	1,980	2,029	2,043	1,999
Jackman	1,844	1,888	1,937	1,998	1,957
Johnson	1,944	2,027	2,096	2,126	2,098
Jones	1,819	1,912	1,967	1,984	1,939
King	1,982	2,055	2,123	2,142	2,103
Martin	1,979	2,054	2,109	2,127	2,112
Mitchell	1,980	2,048	2,095	2,095	2,053
Nelson	1,860	1,940	2,000	2,022	2,993
Phillips	1,917	2,002	2,057	2,067	2,014
Taylor	1,826	1,902	1,979	2,012	1,998
Thomas	2,066	2,093	2,136	2,153	2,138
Vasquez	1,825	1,912	1,983	2,004	1,966
Average	**1,920**	**1,995**	**2,058**	**2,082**	**2,049**

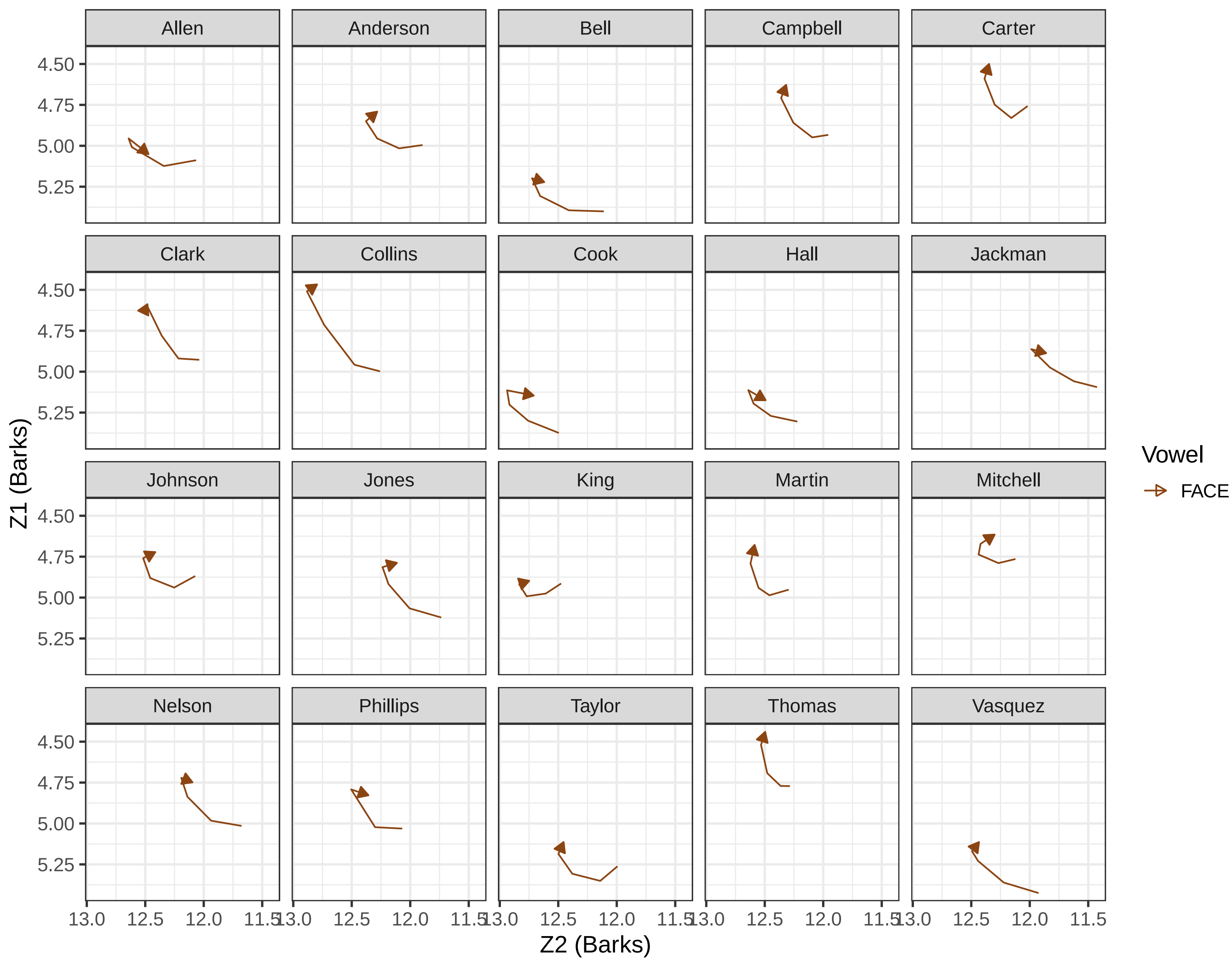

Figure D.1: Bark converted FACE trajectories by player

Table D.3: Linear mixed models of FACE trajectory lengths with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	1.32	11.14	<0.001***
	21-22	-0.05	-0.39	0.705
	25-26	-0.19	-1.81	0.090
	23-24	-0.21	-1.96	0.070
Development	(Intercept)	1.17	26.06	<0.001***
	Major Junior	-0.00	-0.01	0.99
League	(Intercept)	1.25	26.50	<0.001***
	ECHL	-0.15	-2.29	0.035*
Region	(Intercept)	1.22	21.31	<0.001***
	W. Pennsylvania	-0.01	-0.09	0.932
	Upper Midwest	-0.05	-0.57	0.580
	Mid-Atlantic	-0.07	-0.40	0.697
	West	-0.14	-1.03	0.321
	E. New England	-0.90	-1.62	0.130
Status	(Intercept)	1.18	19.90	<0.001***
	Veteran	-0.01	-0.18	0.863

Table D.4: *ANAE*-normalized mean GOAT F1 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	604	617	615	603	604
Anderson	598	621	633	630	623
Bell	604	619	619	611	602
Campbell	606	637	639	626	610
Carter	597	642	645	629	602
Clark	622	641	629	609	602
Collins	605	630	616	592	581
Cook	592	618	616	605	595
Hall	611	631	638	630	616
Jackman	650	654	654	647	636
Johnson	603	630	636	635	629
Jones	618	627	629	622	614
King	579	597	607	607	603
Martin	606	629	629	617	601
Mitchell	591	616	621	613	602
Nelson	624	645	641	622	616
Phillips	600	629	635	620	601
Taylor	597	629	635	620	601
Thomas	602	637	634	610	598
Vasquez	615	637	649	645	634
Average	**606**	**629**	**631**	**621**	**610**

Table D.5: *ANAE*-normalized mean GOAT F2 values throughout the duration of the vowel

Player	Duration Percentage (Hz)				
	20%	35%	50%	65%	80%
Allen	1,297	1,242	1,167	1,147	1,169
Anderson	1,433	1,364	1,308	1,259	1,252
Bell	1,396	1,270	1,192	1,148	1,174
Campbell	1,483	1,376	1,273	1,215	1,223
Carter	1,447	1,304	1,210	1,203	1,270
Clark	1,381	1,293	1,206	1,164	1,203
Collins	1,355	1,191	1,091	1,050	1,109
Cook	1,441	1,295	1,211	1,179	1,222
Hall	1,377	1,294	1,226	1,210	1,245
Jackman	1,354	1,305	1,239	1,234	1,243
Johnson	1,453	1,344	1,257	1,230	1,248
Jones	1,376	1,260	1,177	1,169	1,200
King	1,524	1,442	1,354	1,330	1,344
Martin	1,390	1,303	1,221	1,176	1,199
Mitchell	1,548	1,489	1,408	1,369	1,385
Nelson	1,464	1,371	1,269	1,231	1,253
Phillips	1,371	1,266	1,177	1,157	1,182
Taylor	1,426	1,318	1,240	1,213	1,252
Thomas	1,446	1,289	1,150	1,122	1,172
Vasquez	1,338	1,251	1,186	1,171	1,197
Average	**1,415**	**1,313**	**1,228**	**1,199**	**1,227**

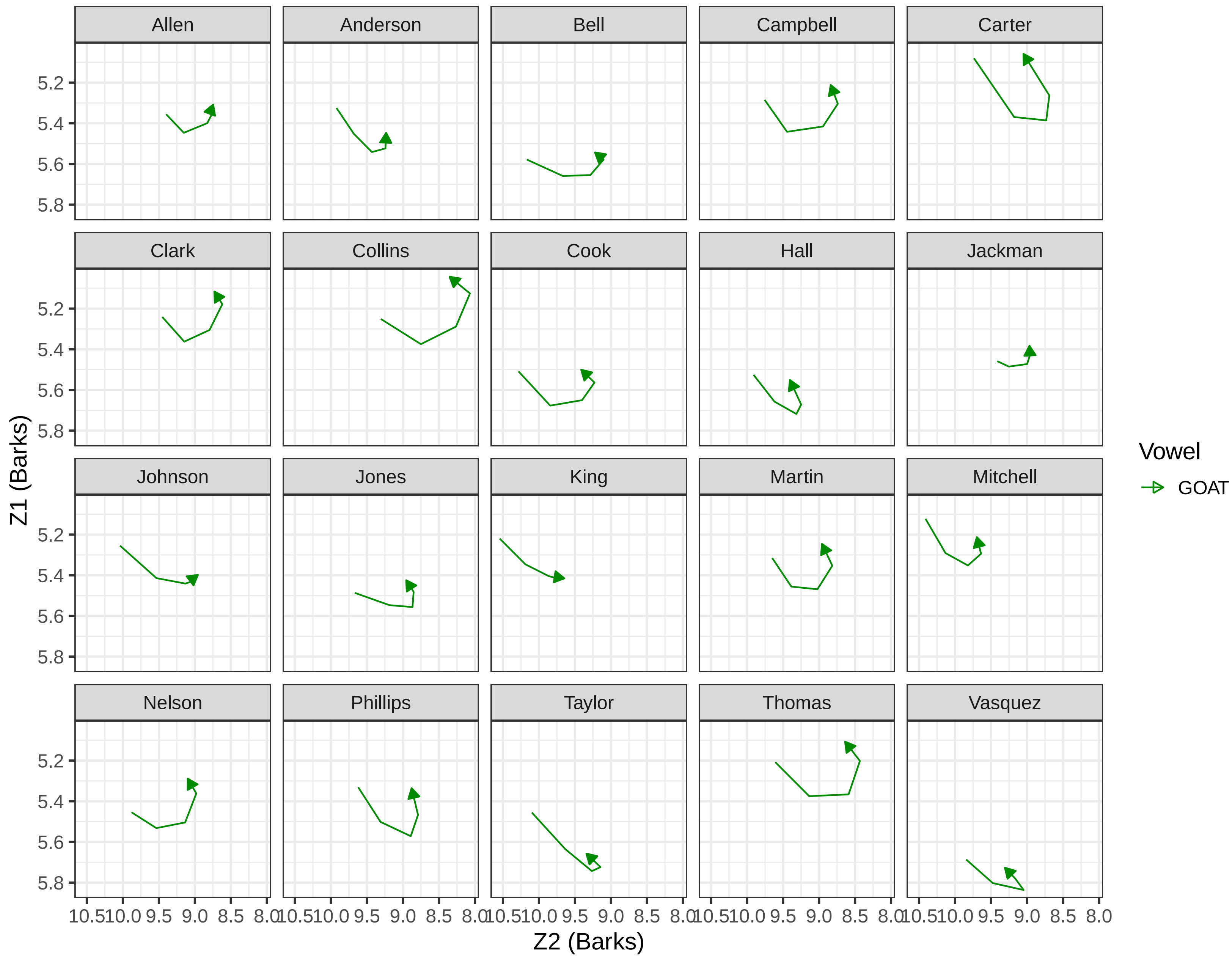

Figure D.2: Bark converted GOAT trajectories by player

Table D.6: Linear mixed models of GOAT trajectory lengths with player as a random effect

Fixed Effect		*Estimate*	*t-Value*	*p-Value*
Age	(Intercept)	1.91	11.54	<0.001***
	25-26	-0.19	-0.97	0.344
	23-24	-0.39	-1.95	0.070
	21-22	-0.52	-1.96	0.068
Development	(Intercept)	1.63	19.24	<0.001***
	Major Junior	0.06	0.37	0.715
League	(Intercept)	1.54	16.25	<0.001***
	ECHL	0.22	1.66	0.113
Region	(Intercept)	2.30	8.06	<0.001***
	Upper Midwest	-0.59	-1.87	0.085
	Mid-Atlantic	-0.62	-1.53	0.151
	Inland North	-0.70	-2.30	0.039*
	W. Pennsylvania	-0.76	-2.15	0.050
	West	-0.90	-2.55	0.024*
Status	(Intercept)	1.58	14.29	<0.001***
	Veteran	0.12	0.87	0.398