Hometown heroes?

Does proximity to one's home affect performance in Ontario university athletics?

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a thesis submitted to the Faculty of Graduate Studies in

partial fulfilment of the requirements of the degree of

Master of Science

Graduate Program in Kinesiology and Health Science

York University

Toronto, ON

April, 2015

Abstract

Every year, university coaches seek to recruit ‘talented’ athletes to add to their rosters with the aim of improving their team. Some coaches take considerable strides to recruit the best athletes from across their region, province and/or across the country. Among many issues to consider, recruited athletes must decide whether to attend schools of closer or farther proximity from their hometown. This study considered whether proximity, defined as the geographic distance between an institution and an individual’s hometown, influences Ontario student-athletes’ university selection and whether this variable influences team and/or individual performance. Data from the Ontario University Athletics (OUA) were collected between 2009 and 2013 (1764 female athletes and 1873 male athletes). Results indicated that athletes were more likely to attend universities greater than 80km from home. However, athletes who attended local universities were more successful and teams comprised of local athletes were more successful as well.

Acknowledgements

This thesis would not be possible without the guidance and support of many people. First, my adviser Joe Baker has been so helpful and patient throughout the entire process. From giving me the freedom to select my own research project, to guiding me through my battles with statistics, to the countless edits he has provided along the way. I also cannot forget my mentors in the Baker lab, Nick Wattie, Srdjan Lemez, Rachael Stone and honorable 'Blabber', Theresa Beesley who all helped me throughout the process. Jin, thank you for the late night pizzas that kept me going strong. Rachael, thank you for your inappropriate jokes that kept me sane. Also, thank you to Alyson Fisher for providing me with any OUA rosters and shaving weeks off of data collection.

Of course, I have to thank my older brother, who has been the type of role model any younger brother would ask for. Thank you for your 'been there, done that' wisdom and always being there when I need you. Finally, I have to thank my parents for their endless support. I could not have done it without you all.

Table of Contents

List of Tables and Figures

General Introduction

Many variables influence athlete development. Baker and Horton (2004) suggested that these factors include primary variables such as genetics, training and psychological factors that are further influenced by secondary variables such as socio-cultural and contextual elements. Beyond the obvious contributions of variables such as quality and quantity of training (Baker, Côté, & Deakin, 2005) or psychological factors such as motivation or resilience (MacNamara, Button, & Collins, 2010), less obvious influences on athlete development include environmental qualities such as the city size of one's birthplace (Baker & Logan, 2007) or place of development (Turnnidge, Hancock, & Côté, 2012) and even which university they attend (Sukup, 2012). In the Canadian sport system, an important component to the athlete development system is competition at the university level with many athletes in high performance team and individual sports continuing their development under the direction of high performance coaches at universities. However to date this phase of athlete development is not well understood.

Athletes graduating from high school have a wide array of universities to select from: for example, there are 20 member universities within Ontario's university sports governing body, the Ontario University Athletics (OUA). University coaches seek to recruit 'talented' athletes to bolster their respective rosters and improve their team. Some coaches take considerable effort to recruit the best athletes from across their region, province or state and/or country with some going as far as recruiting internationally (Popp, Pierce, & Hums, 2011). Recruited athletes must decide which schools provide them the best opportunity to both further their education and excel athletically (Klenosky, Templin, & Troutman, 2001).

To date, there has been a variety of research viewing the selection criteria that student-athletes deem important in determining which university to attend. These criteria include: (a) quality of the degree offered at the school (Goss, Jubenville, & Orejan, 2006; Popp et al., 2011), (b) school reputation (Popp et al., 2011), (c) head coach (Goss et al., 2006; Klenosky et al., 2001; Popp et al., 2011), (d) opportunities to play (Goss et al., 2006; Klenosky et al., 2001), (e) amount of scholarship (Doyle & Gaeth, 1990), and (f) location (Goss et al., 2006; Klenosky et al., 2001; Popp et al., 2011).

In addition to these variables, university proximity - defined as the geographic distance between an institution and an individual's hometown - has been shown to not only influence school selection, but also athlete performance (Barden, Bluhm, Mitchell, & Lee, 2013; Doyle & Gaeth, 1990; Frenette, 2004). In fact, recruits are more likely to choose local universities (Dumond, Lynch, & Platania, 2007) which is hypothesized to result from several influencing factors. First, athletes and teams tend to enjoy a 'home court' advantage during competition (Bray & Martin, 2003) as it increases confidence and motivation and since they are able to perform in front of family and friends (Barden et al., 2013). Second, some athletes may be reluctant to leave home because of their network of family and friends, or be unprepared or unwilling to live independently (Frenette, 2004). Some may even develop strong sentimental and emotional attachments to their homes (McAndrew, 1998). Third, financial costs may act as a deterrent to attending schools further from home (Frenette, 2004). Doyle and Gaeth (1990) reported that student-athletes perceived the amount of scholarship available as the most important attribute in selecting a school to attend, although this finding was dependent upon respondents' financial need. For instance,

respondents with the highest financial need reported the amount of scholarship as more important than respondents with mild to no financial need. This coincides with the finding that students of lower-income families found distance as a stronger deterrent to attending school, by virtue of relocation costs (Frenette, 2004). Finally, it has been shown in several studies that the head coach is influential in determining school choice decisions (Croft, 2008; Gabert, Hale, & Montvalo, 1999; Goss et al., 2006; Klenosky et al., 2001; Popp et al., 2011). Barden and colleagues (2013) noted that proximity facilitates the flow of information between recruits and coaches, which has the potential for a stronger coach-athlete relationship as well as greater trust and commitment. In turn, this may result in a greater potential for the athlete to select that school.

Even less is known regarding the effect of proximity on individual and team performance. However, researchers have hypothesized that performance may be influenced by proximity through the mechanism of social capital (Barden et al., 2013; Clopton, 2011), referring to an individual's level of social embeddedness within a social network (Adler & Kwon, 2002), and support systems such as parents and friends (Baker, Horton, Robertson-Wilson, & Wall, 2003; Côté, 1999; Duffy, Lyons, Moran, Warrington, & MacManus, 2006). It has been hypothesized that social capital is the primary mechanism influencing the association between proximity and performance. Distance between an athlete's university and hometown (subsequently known simply as 'proximity') could influence performance because it strengthens the level of embeddedness of the student-athlete in and around the institution that they join, particularly through learning, trust-building, social commitment (Barden & Mitchell, 2007; Burt, 1992) and team cohesion (Clopton, 2011). With regards to

learning, proximity facilitates the flow of information between coaches and recruits regarding relevant information about the school, coach or athlete. This flow of information helps ensure greater congruence among the abilities, needs and values of teams and recruits, which ultimately helps maximize the recruit's talents (Arthur, Bell, Villado, & Doverspike, 2006). When coaches recruit athletes from greater distance, this flow of communication and information may be hindered and the possibility of recruiting a 'bad fit' increases. Barden and colleagues (2013) suggest this flow of information and earlier socialization leads to greater knowledge, satisfaction, motivation and involvement for the recruits. Closer proximity between coaches and recruits also increases the potential for a greater number of meetings and exchanges, which allows for a relationship to develop before the athlete is made or accepts a recruitment offer (Lewicki, Tomlinson, & Gillespie, 2006). This leads to a well-developed coach-athlete relationship which could facilitate the development of trust. Trust provides the athlete with the confidence to instill maximum effort into completing tasks and developing skills (Barden et al., 2013; Lee, Ashford, Walsh, & Mowday, 1992). Further, closer proximity can establish commitment between the recruit and the coach. Through the recruitment process, local or proximal access to the athlete allows the coach to assess their personal characteristics, expectations and skills, while the athlete can do the same of the coach. This information can influence the commitment of the recruit (Mowday, Porter & Steers, 1982), enhance the career experience and increase feedback between both athlete and coach. Lee and colleagues (1992) suggested that athletes in such conditions may experience greater success. Social capital is also related to team cohesion, which has been shown to impact team effectiveness and performance (Mason & Griffin, 2003; Tekleab, Quigley, & Tesluk, 2009). Gersick (1989) suggested that a cohesive team perceives

themselves as more competent, is more likely to attain goals and have heightened levels of satisfaction. Further, increased cohesion encourages group coordination and communication, manifesting improved performance. It follows that teams that are high in social capital and team cohesion are significantly more likely to be more successful than competitors with relatively lower levels of social capital (Clopton, 2011; Nahapiet & Ghoshal, 1998).

It is also important to consider the role that support stemming from proximal relationships may have on performance as it is well noted that support provided by family and friends is an important attribute throughout athlete development (Baker et al., 2003; Côté, 1999; Duffy et al., 2006). Parents' provision of emotional and financial support is essential and athletes who are unable to access these resources may have a harder time accumulating the high levels of practice necessary for expert performance (Baker et al., 2003). Parental support is also important for helping athletes overcome setbacks such as injuries, pressure and fatigue (Bloom, 1985; Côté, 1999). Social, emotional, and financial support from friends and families has been highlighted as a source of motivation for athletes and help foster confidence and self-efficacy (Baker et al., 2003; Fraser-Thomas & Strachan, 2015). Siekańska (2012) reported that, compared to lower-achieving athletes, high achieving athletes perceived their parents as more involved throughout their participation in sports.

Collectively, the research summarized above presents a case for the relationship between proximity and athlete success in university sport. However, research in this area is limited and includes several limitations. First, to date, no study has quantitatively tested

whether student-athletes in fact attend schools of closer proximity. Further, several qualitative studies use the term 'location' which may be too generic (i.e., it could refer to either the physical environment, or where the school is situated relative to their home, or both) to adequately explain the mechanism(s) at play. This study will provide clarity to the field referring strictly to proximity. Second, the existing research on performance has only viewed one sport (basketball), and one sex (male) (Barden et al., 2013). It is possible that cohesiveness and social capital differ across sports. For instance, a larger team (i.e., soccer) has more 'pieces' than a smaller team (i.e., volleyball) and so developing a cohesive group will involve different challenges. The psychosocial processes that affect performance may also differ between males and females, particularly in regard to the cohesion-performance relationship (Carron, Colman, Wheeler, & Stevens, 2002). It is therefore important to perform analyses on a broader spectrum of sports and include both sexes. Finally, Barden and colleagues' (2013) study, although significant, only considered the NCAA, which is very different in structure to its Canadian counterpart, the CIS (and to other college/university systems worldwide). With differences in team budgets, scholarships, school size, population densities and even media coverage, studying the relationship of proximity in the CIS may be beneficial to sporting organizations' recruitment and athlete development in Canada and other smaller university sport markets.

The current study examines the relationships between proximity and performance in prominent university sports in the province of Ontario to determine a) whether athletes attend schools of closer proximity and whether this varies by sex and/or sport, and b)

whether proximity influences team and/or individual performance. Our specific hypotheses are detailed below.

Hypothesis 1: In general, athletes will attend schools of closer proximity.

Hypothesis 2: Proximity effects will vary by sex and sport.

Hypothesis 3: Closer proximity will improve both team and individual performance

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Hometown Heroes?

Does proximity to one's home affect performance in Ontario university sport?

Karim Khalil & Joseph Baker

For simplicity the manuscript references are included at the end of the thesis

Abstract

In Canada, athletes in team sports like basketball, soccer and volleyball typically continue their development in university-based sports programs. Student-athletes have a considerable range of programs to consider for their varsity careers. Among many issues to consider, recruited athletes must decide how far away from their hometown they wish to attend school. This study considered whether proximity, defined as the geographic distance between an institution and an individual's hometown, influences Ontario student-athletes' university selection and whether this variable influences team and/or individual performance. Data from the Ontario University Athletics (OUA) were collected between 2009 and 2013 (1764 female athletes and 1873 male athletes). Results indicated that athletes were more likely to attend universities greater than 80km from home, however more success was found when athletes stayed within 40km of home. These findings may have important implications for improving talent identification and performance in university sport.

Introduction

In Canada, student-athletes are recruited to university athletics programs for both their athletic talents and academic competency. The challenge for many university programs is to not only recruit talented athletes but to maximize their performance both individually and as part of a team. For the athlete, a limited literature has highlighted many factors influencing university selection, with a high degree of variability in what criteria are most important. These factors range from (a) quality of the degree offered at the school (Goss et al., 2006; Popp et al., 2011), (b) school reputation (Popp et al., 2011), (c) head coach (Goss et al., 2006; Klenosky et al., 2001; Popp et al., 2011), (d) reputation of the head coach (Adler & Adler, 1991), (e) opportunities to play (Goss et al., 2006; Klenosky et al., 2001), (f) amount of scholarship (Doyle & Gaeth, 1990), and (g) location (Goss et al., 2006; Klenosky et al., 2001; Popp et al., 2011). However, athletes note that one key factor in their university decisions is the location of the school in relation to their hometown, also termed 'hometown proximity' (we refer to this simply as 'proximity'; Barden et al., 2013; Doyle & Gaeth, 1990). In fact, recent research has noted that recruits are more likely to choose universities that are closer to their hometowns (Dumond et al., 2007).

While our understanding of selection decisions of university athletes is limited, even less is known regarding the effects of proximity on student-athlete performance. A single study by Barden and colleagues (2013) showed that NCAA Division 1 male basketball recruits who attended schools closer to home had better team performance and were significantly more likely to be drafted into the NBA. Given the existing evidence, a relationship between proximity and performance seems likely; however, current research

has not yet considered the Canadian university sport market. There are many differences in the American and Canadian university landscape. For instance, population densities of provinces versus states, sizes of universities and colleges, ratios of institutions per student and diversity of programs are all factors that differ considerably between the US and Canada and could alter relationships between proximity and university selection and/or performance. Perhaps the most notable difference between the countries relates to athletic scholarships. Within the OUA, student-athletes receive a maximum of $4000 in scholarship which is dependent upon athletic ability. However, any amount can only be attained if the student graduates from high school with a minimum 80% average, and maintains at least a 70% average throughout their undergraduate studies (Ontario University Athletics, 2014). In comparison, the NCAA provides athletic scholarships not on grades but on successful admission into the university (based on a sliding scale requiring a combination of a minimum high school average of 2.0 (equivalent of 70%) and a minimum Scholastic Aptitude Test (SAT) score of 400) and athletic talent (National Collegiate Athletic Association, 2015). These factors highlight that the process of attracting athletes to universities is likely very different between the OUA and NCAA. Examining the relationship between athletes and university selection in Canada might extend our understanding of the relationships between proximity, university selection and team/individual performance.

Further, previous research has yet to account for sports differences and sex differences. Regarding team performance, if social capital and team cohesion are in fact driving forces behind team performance then it is reasonable to assume team cohesion

varies between teams dependent on size. For instance, developing team cohesion with larger teams (i.e., soccer, which often has 22 players or more to allow for in-team scrimmages) versus smaller teams (i.e., volleyball, which is half the size) would presumably be different. Differences in sex may appear as well; for instance, Carron and colleagues (2002) showed female athletes' performance benefits more from team cohesion than performance of male athletes. As it stands, very little is known regarding university selection between either sex and even less regarding performance. It will therefore be an important element to this study to account for differences in sports and sex.

This study examined relationships between proximity, university selection and performance in the province of Ontario for the sports of basketball, volleyball and soccer. These sports were chosen because (a) they are common avenues for pre-professional athletes to continue to play professionally (i.e., unlike ice-hockey, which has a separate development system); (b) they are widely represented across Ontario universities; and (c) they have fairly equal representation among females and males. The purposes of this study were three-fold. First, we aimed to quantitatively analyze whether athletes were attending schools of close proximity. Our hypothesis was that athletes attend universities closer to their hometowns. Second, we considered whether this trend differed by sex and/or sport. We hypothesized that proximity would differ by sex and by sport, but this was largely exploratory. Third, we assessed whether proximity affected team performance, hypothesizing that teams with greater numbers of players of closer proximity will be more successful. Finally, we considered whether proximity affected individual performance. Our hypothesis was that student-athletes of closer proximity would be more likely to receive

All-Star selection honours at the provincial and national level. It should be noted that our analysis only considered Ontario-residing athletes. Out-of-Ontario residents were removed from the data because we could not control for discrepancies between high school development systems, club systems and general approaches to athlete development across the provinces. Further, when considering a group of "out-of-province" athletes, although athletes from Montreal and Vancouver are not from Ontario, their differences in proximity to OUA universities are extremely large, and so it would not be appropriate to include them in the same group.

Methods

Sample

Data for the current study were collected through the official Ontario University Athletics (OUA) website and cross referenced with individual university team sites. Between the years 2009 and 2013, there were 4314 athletes who competed within the OUA over at least one season in the sports of basketball, soccer and volleyball. Of the 4314 athletes, 3.7% (N = 161) reported their hometowns being outside Canada and 12% (N = 516) being outside Ontario. These athletes were removed from the dataset. The remaining 84.3% (N = 3637) of athletes reported residing in Ontario. Of this sample, 51.5% (N = 1873) were male and 48.5% (N = 1764) were female. The largest athlete representation was soccer (Female N = 926; Male N = 982), followed by basketball (Female N = 440; Male N = 545), and then volleyball (Female N = 398; Male N = 346). It should be noted that 8 rosters were not reported to the OUA and did not appear in individual team archives. Assuming all

were residents of Ontario, it is estimated that these 8 rosters are equivalent to approximately 110 athletes (see Appendix A).

Data Organization

Due to the nature of the research questions under examination, two data sets were created to account for each research question. The first data set (N = 6932) contained full roster information of each team for each sport from each season. It included athletes who competed a minimum of one year up to a maximum of five years (i.e., one athlete could appear up to five times). This data set was used to analyze team and individual performance and account for differences in performance (i.e., both good and bad seasons) of players and teams. The second data set (N = 3637) was constructed from the first data set. All data were filtered to contain each athlete only once; however, if an athlete moved hometowns or moved schools, they would be treated as a unique case and remained in the dataset. For athletes who competed for more than one year, only their best team year (team standing) or best individual year (All-Star selection) was considered. In instances where an athlete's best team year did not coincide with their best individual year, the latter took precedence. This dataset was used to analyze average distances of athletes to control for repeated cases.

For each dataset, the following variables were included: First and last name, year played, hometown and province, university, university city, sport, sex, eligibility year, position, team performance through final season standings (i.e., team standings) and win percentage (team win %) as well as individual accolades through OUA and/or Canadian Interuniversity Sport (CIS) All-Star selection (i.e., OUA or CIS all-star respectively). Team standings and win percentages were collected via official recorded regular season matches

(not including playoff or exhibition matches), while All-Star selections were collected through award archives released by the OUA and CIS. In addition, a new variable was created titled "distance between hometown and university (km)". To include this measure, Google Maps© was used to calculate distances between each athlete's hometown and university. Shortest distance route by driving was used as the measure of proximity.

Within each dataset, distance groups and team standings groups were created. Distance groups were based on commuting thresholds proposed by Frenette (2006) and included three groups: Group one (0-40 km; within commuting range), group two (41-80 km; possibly within commuting range) and group three (81+ km; outside of commuting range). The frequency of athletes in each distance group from each university is presented in Appendix B. Team standings were divided into four groups: Group one (standings 1-4), group two (standings 5-8), group three (standings 9-12) and group four (standings 13-18). Note that not all twenty universities represented all three sports.

Data analysis

Analyses were conducted to determine: 1) average distances of male and female athletes between hometown and university and whether they varied by sex or sport; 2) the association between distance and team performance and how sex and/or sport may influence this relation; and 3) the association between distance and individual performance. To determine average distances, the individual athlete data set (N = 3637) was used and a 2 (sex) x 3 (sport) analysis of variance (ANOVA) was performed with distance (km) as the dependent variable using SPSS version 22.0. For this analysis, it was important to only have athletes represented once (unless moving hometowns or schools) to avoid skewing average

distance results, as some athletes were represented more than others. In addition, we compared Frenette-based distance groups using odds ratios. To determine the association between distance and performance, the full athlete data set (N = 6932) was used. This analysis required full representation of the league on a yearly basis to account for variations in performance by year. For the team performance analysis, a 3 (sport) x 2 (sex) x 3 (distance group) ANOVA was performed with Tukey post hoc tests used to identify differences between variables. Chi-square tests using the Frenette-based distance groups were performed to configure the odds of placing in the top four (team standings) rankings. To determine the association between distance and individual performance, a logistic regression analyses was performed separately on OUA All-Star selection (yes/no) and distance groups, and CIS All-Star selection (yes/no) and distance groups. Odds ratios using the Frenette-based distance groups were assessed on both analyses to configure the odds of being selected as an all-star.

Results

Average Distance

The average distance between athletes' hometowns and universities was 161.55 km (SD = 230.96 km), yet it is important to note the distribution of athletes across various distance groups by sex (see Table 1). T-test analyses revealed that females attended universities further away from home than their male counterparts (see Table 2). A chi-square test indicated a significant association among athletes and distance groups χ^2 (1) = 8.17, $p < .05$, and that athletes were 1.3 times more likely to attend schools 80 km and further away from home than schools within 40 km. A 2 (sex) x 3 (sport) ANOVA revealed

significant main effects for sex F (1, 3637) = 5.01, $p < .05$ and for sport F (2, 3637) = 17.12, $p < .05$. Tukey post hoc analyses indicated differences between all three sports. The interaction between sex and sport was not significant.

Table 1. Distribution of male and female athletes across distance groups

			Sex		
			Male	Female	Total
Distance Group	Within Commuting Distance (1-40km)	Count	748	630	1378
		%	54.3%	45.7%	100.0%
	Possibly Within Commuting Distance (41-80km)	Count	209	190	399
		%	52.4%	47.6%	100.0%
	Outside Commuting Distance (81+ km)	Count	916	944	1860
		%	49.2%	50.8%	100.0%
Total		Count	1873	1764	3637
		%	51.5%	48.5%	100.0%

Team Performance

A one-way ANOVA revealed significant effects between distance groups on team performance (team win percentage) $F(2, 6929) = 109.03$, $p < .05$, $\omega = 0.17$. Tukey post hoc tests showed differences between all three distance groups. Comparisons of the distance groups and team standings were considered using odds ratios. It was found that the odds of placing in the top 4 ranks were 1.6 times higher (95% CI: 1.4 – 1.8, $p <. 05$) when attending schools within 40km of home than placing in the top 4 ranks when attending schools 81km or further away from home. There was no significant association between distance group 2 (41-80 km) and team performance.

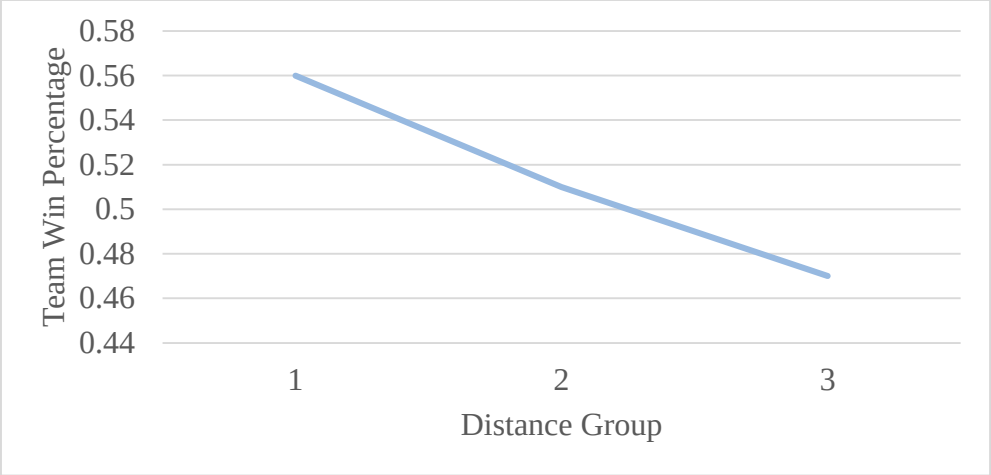

Figure 1. Relationship between team win percentage and distance group

A 3 (sport) x 2 (sex) x 3 (distance group) ANOVA revealed significant effects between sport and distance group in association with team win percentage $F(4, 6932) = 17.3$, $p < .05$. The three-way interaction between sport, sex and distance group on team performance was also significant $F(4, 6932) = 12.1$, $p < .05$ (see Figure 1). Post hoc analyses between sports revealed differences between volleyball and both soccer and basketball, but no differences between basketball and soccer in relation to team win percentage. Based on Figure 1, we also considered each distance group separately to identify differences between sports using one-way ANOVA. The analysis revealed significant main effects for all distance groups [distance group 1 $F(2, 2647) = 5.03$, $p < .05$, $\omega = .05$, distance group 2 $F(2, 754) = 12.724$, $p < .05$, $\omega = .17$, and distance group 3 $F(2, 3522) = 23.43$, $p < .05$, $\omega = .11$]. Tukey post hoc analyses indicated no differences between basketball and soccer, and basketball and volleyball in distance group 1, but significant differences between soccer and volleyball. In distance groups 2 and 3 there were differences across all three sports.

Table 2. Average distance between hometown and university by sex and sport

Sport	Sex	Mean	Std. Deviation	N
Basketball	Male	193.993	294.823	545
	Female	196.114	280.9	440
	Total	194.94	288.543	985
Volleyball	Male	157.251	179.481	346
	Female	176.41	233.709	398
	Total	167.5	210.318	744
Soccer	Male	125.434	178.506	982
	Female	159.561	221.761	926
	Total	141.996	201.338	1908
Total	Male	151.261	220.867	1873
	Female	172.48	240.791	1764
	Total	161.552	230.957	3637

Individual Performance

A logistic regression indicated a significant relationship between distance and selection as an OUA All-Star with the odds of being selected being 23.9% higher when an athlete's hometown was within 40 km of the university being attended (distance group 1) than when attending a university greater than 81 kilometers away (distance group 3) (95% CI: 0.6 – 0.9, p <.05). Further, the odds of being selected were 22.5% higher when living within distance group 1 than when attending university in distance group 2. This value was trending but failed to reach significance (p = 0.08). The odds were not significantly different when comparing distance group 2 and distance group 3. Logistic regression analyses also revealed a significant relationship between distance and selection as a CIS All-Star with the odds of being selected being 46% higher when living in distance group 1

than distance group 3 (95% CI: 0.4 – 0.8, $p < .05$). The odds were not statistically significant between distance group 1 and distance group 2 or distance group 2 and distance group 3.

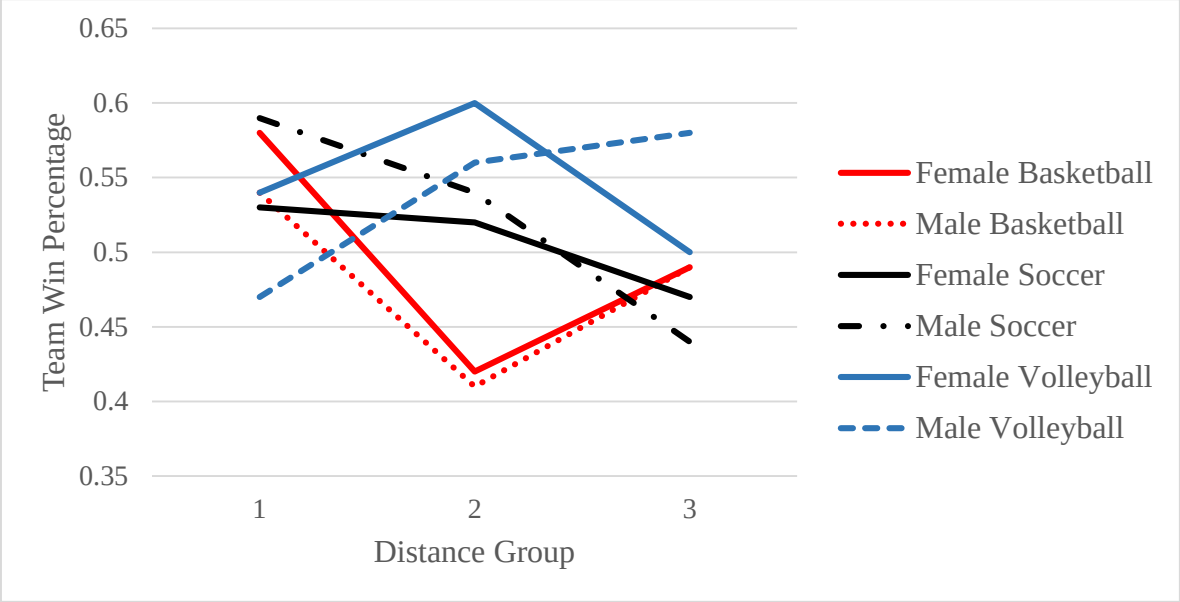

Figure 1. Interaction of sex, sport and distance on team win %

Discussion

This investigation examined the influence of proximity on development and performance of varsity athletes in Ontario universities. Given the relative scarcity of research in this area, our approach was exploratory (i.e., hypothesis generating) rather than confirmatory (i.e., hypothesis testing). When considering the whole sample, athletes lived on average within 160 kilometers of their university, although the standard deviation and range were large (~ 231 kilometers and between one and 2036 kilometers respectively). We

statistically examined whether university athletes disproportionately attended schools that were closer in proximity to their hometowns and divided groups based on Frenette's (2006) assumption of commuting thresholds for students attending schools in Canada.

Contrary to our hypothesis of athletes attending schools close to home, it was found that student-athletes were nearly one-and-a-half times more likely to attend schools 81 kilometers and further away from home, than to attend schools within 40 kilometers from home (i.e., to live away from home). This finding was surprising considering previous literature noting athlete preferences related to the 'home court advantage' and the availability of friends and family to support and cheer at games. It has been suggested that a 'home court advantage' may lead to higher motivation and confidence (Bray & Martin, 2003), and that athletes may seek this. Furthermore, the recruitment of athletes closer to a university would be more likely as coaches and athletes would have easier access to each other and athletes would be able to regularly visit facilities, watch games and meet future potential team members – all factors that have been emphasized as being important to athletes selecting schools of close proximity (Barden et al, 2013).

Further, the costs of relocating to attend schools further away from home may be a deterrent to many athletes, in turn keeping many at home (Frenette, 2004). It is possible that student-athletes prefer to attend schools with close enough proximity to reap the benefits of being able to go home and to enjoy the support of parents and friends, but far enough away to live on campus or closer to the university (i.e., away from home) while still receiving support. However, a limitation to this assumption is that distance group 3 (80+ km) treats student-athletes at both ends of the group (i.e., 80 km versus 1000 km away) identically.

Future research should consider expanding this largest distance group to identify a distance threshold for potential mechanism such as the ability of family and friends to attend games and/or athletes opportunity to go home regularly.

Our analyses also considered differences between sexes. Female athletes attended schools further away from home than their male counterparts. This finding is difficult to explain, although it may relate to the unique geographical distributions of the Ontario population relative to the location of universities. Among the sports of basketball, soccer and volleyball, there is a fairly equal representation of males and females between all twenty member universities of the OUA: however the number of female teams outnumbers males by four (three volleyball teams and one soccer team). Three of these sports programs (Lakehead University volleyball and University of Ottawa volleyball and soccer) belong to universities over 400km outside of the Greater Toronto Area, Ontario's largest urban centre, and presumably where a disproportionate number of athletes originate. This difference may simply reflect the greater opportunity for females to attend universities of greater distance from the Toronto area due to increased availability of sports programs.

Results also showed differences in proximity effects between sports. Post hoc analyses indicated differences between basketball and soccer, and volleyball and soccer in relation to how far athletes travelled to their universities of choice. Similar to our discussion of sex differences, there is no easy explanation of these findings however it may as well relate to 1) having more soccer teams across the OUA and 2) the geographical distribution of universities with soccer programs. Across the OUA over the collected five-year span, soccer was represented by 169 teams, followed by basketball with 141, and then volleyball

with 117. It should also be reiterated that soccer has approximately double the roster size of basketball and volleyball. In addition, soccer has six more programs (male and female) than basketball, two of which are beyond 150 kilometers away (Nipissing University and Trent University) and nine more programs (male and female) than volleyball, seven of which are greater than 150 kilometers away (Carleton University, Laurentian University, University of Ottawa, Trent University). As with sex, these differences may reflect a greater opportunity for male and female soccer players to travel further away from home as student-athletes.

Our main analyses statistically examined whether individual athletes' proximity to their hometown (km) would influence their teams' win percentages or standings across the OUA. Chi-square analyses revealed a significant association between distance groups and standings groups and reported that athletes on university teams within 40 kilometers of their hometown were 1.6 times more likely to place in the top four standings, than athletes attending universities beyond 80 kilometers away from home. As shown in the results, a general decline in performance is associated with increasing distance away from home, however performances did differentiate dependent on sport.

In addition to team performance, our analyses also considered the relationship between proximity and individual performance. Individuals whose hometowns were within 40 kilometers of their university were 24% more likely to be selected as OUA All-Stars and 46% more likely to be selected as CIS All-Stars than their counterparts who attended universities 81 kilometers and further away. This finding leads us to wonder whether local universities, by means of early identification, are more likely to recruit more talented athletes. Early identification would allow the coach to begin a relationship well before

competing universities recognize the athlete's capabilities. Local universities will also have the advantage by easier communication and access, which could allow them to recruit talented athletes more effectively. However, proximity may also promote superior development by means of coach-athlete relationships, supportive resources, and social capital.

The results of this study were somewhat surprising as, on average, athletes attended universities farther away (i.e., > 81 km) from home, but superior performance was found amongst players with hometowns in close proximity (i.e., < 40kms) to the university. If these results are validated in future studies, coaches may consider prioritizing the recruitment of local athletes before targeting athletes from further distances. Moreover, knowledgeable coaches could use the benefits of remaining close to home both individually and as part of a team in their recruitment of local athletes. Alternately, despite not understanding the contributing mechanisms to the results, it might be valuable to consider ways to adjust training and competition environments to promote the same performance outcomes that local athletes experience. Identifying these mechanisms is an important area for future research.

Considering the analyses in this study provide a reasonable first step to understanding proximity effects in Ontario, future research should attempt to include more complex analyses. For instance, researchers might consider advanced designs that consider universities and surrounding communities in 'nested' approaches and/or adding data with population density and university size to further understand recruits' decisions. Doing so may also identify those student-athletes who attend universities but do not have an

opportunity to attend universities within 40 kilometers of their hometowns. Those within large urban centres have a disproportionate opportunity to go to schools within 40 kilometers while those in more remote areas cannot be represented in the same group. Future research should also determine whether Frenette's (2006) distance thresholds are applicable to student-athletes in the same way they are to regular students and account for out-of-province and out-of-country athletes. And perhaps most importantly, as previous literature suggests proximity increases individual task motivation (Barden et al., 2013; Lee et al., 1992) and social capital, which relates to team cohesion (Mason & Griffin, 2003), future research should attempt to include analyses of these measures to provide further insight regarding the mechanisms of proximity effects. For instance, an analysis that includes athlete information such as whether they commute or live on campus could be particularly interesting if assessed with psychosocial variables like team cohesion or social support. Presumably, teams with a greater proportion of athletes who live together or close to each other will score higher on cohesion. Perhaps future studies can include these analyses in accordance with team performance.

The results to the study provide further insight to a relationship between proximity and athlete performance at the university level in Ontario. The mechanisms contributing to this relationship are still widely speculative, in turn supporting the call for further research. However, there is an opportunity for implementation of this study's findings as university sports rosters are faced with constant turn over each year. With our results, university athletics administrators and coaches can begin to target recruiting more effectively and

begin to develop models to further support their athletes and build environments that optimize performance.

General Discussion and Implications

This study was the first to attempt to quantitatively analyze how far Ontario university student-athletes were travelling to attend school and whether this distance influences individual and team performance. The results suggest that the majority of Ontario-based student-athletes tend to live greater than 80 kilometers away from their university. Moreover, female student-athletes were more likely to attend university further away from home than their male counterparts, which may have been due to a greater opportunity for females to compete. Nevertheless, this finding was contrary to the initial hypothesis which was grounded in previous literature suggesting student-athletes are more likely to attend schools of closer proximity (Dumond et al., 2007). Unlike previous work, these results imply that athletes may not prioritize relocation costs (Frenette, 2004), family and friend support (Barden et al., 2013) or competing with a 'home court advantage' (Bray & Martin, 2003) in making their decision about which university to attend. It is possible that many athletes prefer the independence that comes from added distance between their home and university although this assumption needs to be explored in future research. Furthermore, differences were found between sports and sexes. In general, female student athletes travelled further from home to attend university. The OUA offers more opportunity for soccer players and female athletes to compete as soccer and female sports are more widely represented. This results in greater opportunities for soccer players and female athletes, which may have influenced the findings of the current study.

Interestingly, our analyses also found that teams were most successful when mainly comprised of athletes whose hometowns were within 40 kilometers of the university. On

average, teams became less successful when comprised of athletes from further away, which was supportive of our hypothesis. This may reflect greater cohesiveness amongst team members as well as superior selection by coaches who are able to recruit athletes who better fit the unique needs of their team through a more extensive evaluation process (i.e., by being able to spend more time to properly assess them). Sex and sport-type were also influential in effecting the relationship between proximity and team performance; however these findings require more research. Similarly, evaluations of individual performance revealed that athletes were most successful when attending schools within 40 kilometers of their hometown. Specifically, athletes who attended schools that were closer were more likely to be chosen in provincial and national all-star selections. This finding supported our hypothesis and may reflect local athletes' increased social capital, and/or their greater confidence as a result of a well-developed coach-athlete relationship.

Collectively, the pattern of results is surprising. On the one hand, most athletes attend universities farther away (i.e., > 80km) from home, but greater success is found when teams use players from close (i.e., < 40kms) to the university. At the moment, it is unclear what factors related to proximity drive these performance effects. Identifying these mechanisms is an important area for future research.

Practical Implications

The findings of this study have particularly interesting implications. As the main priority for university sports teams is to win, coaches are under immense pressure to deliver a roster that is able to compete each year. As this study shows that teams are more likely to win with local players, perhaps coaches should prioritize and put more emphasis on

recruiting local athletes before targeting athletes of further distance. Coaches may even use the findings of this study as a recruiting tool to further attract local student-athletes. Alternately, it might be valuable to identify the specific mechanisms that underpin these proximity effects so that training and competition environments can be optimized to promote the same performance outcomes.

Given the findings of this study and the direction of future research to further unravel the mechanisms behind proximity, university programs might consider adopting models pertaining to athlete recruitment and team performance. Knowledgeable coaches could inform potential local recruits of the benefits of remaining close to home both individually and as part of a team. In cases where athletes leave home for university, coaches and administrators focus to a greater extent on the tools required to develop strong cohesion within teams and provide opportunities for the athletes to get involved. Further, it may be important for the universities to invest in creating more supportive atmospheres at games to mimic the 'home court advantage' that might benefit local athletes.

Strengths and Limitations of the Current Study and Directions for Future Work

Although this study adds to a relatively limited literature on the relationship between proximity and performance in university sport, there were some limitations to our analyses. As noted earlier, using the Frenette (2006) categories may not have provided a sensitive enough categorization to identify effects at the extreme ends of the distance continuum. Further, the data presented by the OUA is a collection of personal biographies of each student-athlete who records their hometowns. This may be problematic as students can record birthplace, where they spent the majority of their upbringing (i.e., where they

identify as being from), or current place of residence. Likewise, we were unable to assess differences between athletes who commuted versus those who lived on residence. These data could prove interesting particularly among athletes who reported their hometowns being within 40 kilometers of the university. Another limitation was that we only tracked student-athletes from Ontario who attended Ontario universities. Ontario residents who attended out-of-Ontario universities, or non-Ontario residents who attended Ontario universities were not included in the analysis. For example, athletes from Montreal who attended the University of Ottawa and are only 200 kilometers away were not included in our analyses even though Ontario athletes from much greater distances were. Even more notable, athletes from Detroit who attended the University of Windsor (10 kilometers away) were not included in our dataset. Future work should continue to explore different ways to capture proximity effects on sport performance.

Despite these limitations, there were several strengths of this study. Most notably, our study incorporated a large sample that was filtered to include unique cases and multiple cases that lead to two separate analyses. Further, these analyses allowed for comparison of multiple years on multiple outcomes (proximity, team win percentage, team standings, and individual accomplishments) to identify various perspectives of team and individual success. With this, the study was the first to quantitatively measure proximities of student-athletes in Ontario and determine their influence on measures of performance. Our performance measures were reliable and accurate having come from official recorded league matches and awards. Finally, our study considered both sexes and multiple sports for comparison.

The results of this study provide a reasonable 'first step' to further investigations in this area. An important area of future work is determining whether Frenette's (2006) distance thresholds are applicable to student-athletes in the same way they are to regular students. Similarly, determining adequate groups to account for out-of-province and out-of-country athletes may help to further understand this relationship. Even further, qualitative examinations may be useful for understanding the reasons for student-athletes' decisions about which university to attend and how these reasons differ from students who are non-athletes. Perhaps most importantly, future research should attempt to identify the psychosocial mechanisms that underpin these performance effects. For instance, previous research suggests that proximity increases individual task motivation (Barden et al., 2013; Lee et al., 1992) and social capital, which relates to team cohesion (Mason & Griffin, 2003). Thus, analyses including these measures could provide further insight regarding the mechanisms of these proximity effects.

Concluding Thoughts

The goal of this study was to further understand the development of university student-athletes. Through our analyses, we were able to show an association between student-athletes' proximity to their hometown and their performance, yet we do not understand why. There are several areas for future investigation in this field; every year marks a new cycle of coaches recruiting athletes and a new cycle of prospective student-athletes determining where they will attend school to further their education and develop as athletes. By understanding these mechanisms, varsity programs can begin to enhance

recruitment strategies, develop models to further support student-athletes and educate coaches on how to further improve performance beyond “x’s and o’s”.

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Appendix A

Number of teams by sex and year, including missing teams.

FEMALE

Year	Basketball Roster size: 14	Soccer Roster size: 22	Volleyball Roster size: 14
2013-2014	16	18	14
2012-2013	15	18	13
2011-2012	15 – No RMC Roster	17	12 – No RMC Roster
2010-2011	16	17	13 – No RMC Roster
2009-2010	15 – No Laurentian Roster	16 – No Laurentian Roster	13 – No Laurentian Roster

MALE

Year	Basketball Roster size: 14	Soccer Roster size: 22	Volleyball Roster size: 14
2013-2014	16	17	11
2012-2013	15	17	10
2011-2012	16	17	10
2010-2011	16	17	10 – No RMC Roster
2009-2010	16	15 – No Laurentian Roster	11

Appendix B

Distribution of athletes by university and distance groups

	Distance Group			
University	Within Commuting Distance (1-40km)	Possibly Within Commuting Distance (41-80km)	Outside Commuting Distance (81+ km)	**Total**
Algoma	3	0	18	21
Brock	77	25	136	238
Carleton	78	8	62	148
Guelph	53	76	133	262
Lakehead	22	1	37	60
Laurentian	25	2	76	103
Laurier	67	27	149	243
McMaster	119	46	85	250
Nipissing	35	4	110	149
Ottawa	52	8	61	121
Queen's	38	7	167	212
RMC	31	2	86	119
Ryerson	120	46	78	244
Toronto	105	35	54	194
Trent	36	9	65	110
UOIT	48	7	32	87
Waterloo	83	34	159	276
Western	78	13	148	239
Windsor	98	15	130	243
York	210	34	74	318
Total	**1378**	**399**	**1860**	**3637**

Appendix C

Results of 2 (sex) x 3 (sport) ANOVA by distance to university (km)

Dependent Variable: Distance to University (km)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2478110.409[a]	5	495622.082	9.399	.000
Intercept	87659372.532	1	87659372.532	1662.351	.000
Sex	264442.282	1	264442.282	5.015	.025
Sport	1805721.058	2	902860.529	17.122	.000
Sex * Sport	167597.162	2	83798.581	1.589	.204
Error	191470544.968	3631	52732.180		
Total	288871017.000	3637			
Corrected Total	193948655.376	3636			

Appendix D

Tukey post hoc test from 2 (sex) x 3 (sport) ANOVA

Dependent Variable: Distance to University (km)

		Mean Difference	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	Upper Bound
Basketball	Volleyball	27.4401*	11.15400	.037	1.2877	53.5925
	Soccer	52.9438*	9.00958	.000	31.8193	74.0682
Volleyball	Basketball	-27.4401*	11.15400	.037	-53.5925	-1.2877
	Soccer	25.5037*	9.92542	.028	2.2319	48.7754
Soccer	Basketball	-52.9438*	9.00958	.000	-74.0682	-31.8193
	Volleyball	-25.5037*	9.92542	.028	-48.7754	-2.2319

Appendix E

Cross-tabulation of distance groups and team standings

			Standing Group				Total
			1-4	**5-8**	**9-12**	**13-18**	
Distance Group	Within Commuting Range (0-40km)	Count	925_a	718_b	597_b	410_c	2650
		Expected Count	722.9	711.1	631.2	584.9	2650.0
		% of Total	13.3%	10.4%	8.6%	5.9%	38.2%
	Possibly Within Commuting Range (41-80km)	Count	192_a	212_a	184_a	169_a	757
		Expected Count	206.5	203.1	180.3	167.1	757.0
		% of Total	2.8%	3.1%	2.7%	2.4%	10.9%
	Outside Commuting Range (81+ km)	Count	774_a	930_b	870_b	951_c	3525
		Expected Count	961.6	945.8	839.6	778.0	3525.0
		% of Total	11.2%	13.4%	12.6%	13.7%	50.9%
Total		Count	1891	1860	1651	1530	6932
		Expected Count	1891.0	1860.0	1651.0	1530.0	6932.0
		% of Total	27.3%	26.8%	23.8%	22.1%	100.0%

Appendix F

Results of 3 (sport) x 2 (sex) x 3 (distance group) ANOVA by win %

Dependent Variable: Win %

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	19.414[a]	17	1.142	21.306	.000
Intercept	1075.148	1	1075.148	20058.283	0.000
Sex	.069	1	.069	1.280	.258
Sport	1.023	2	.512	9.545	.000
Distance Group	6.482	2	3.241	60.465	.000
Sex * Sport	.147	2	.073	1.370	.254
Sex * Distance Group	.248	2	.124	2.309	.099
Sport * Distance Group	3.706	4	.927	17.286	.000
Sex * Sport * Distance Group	2.586	4	.646	12.060	.000
Error	370.599	6914	.054		
Total	2210.663	6932			
Corrected Total	390.013	6931			

Appendix G

Tukey post hoc test from 3 (sport) x 2 (sex) x 3 (distance group) ANOVA by win %

Sport:		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	Upper Bound
Basketball	Soccer	-.0028	.00661	.903	-.0183	.0126
	Volleyball	-.0263*	.00813	.004	-.0453	-.0072
Soccer	Basketball	.0028	.00661	.903	-.0126	.0183
	Volleyball	-.0234*	.00720	.003	-.0403	-.0065
Volleyball	Basketball	.0263*	.00813	.004	.0072	.0453
	Soccer	.0234*	.00720	.003	.0065	.0403

Distance Group		**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	Upper Bound
0-40km	41-80km	.0572*	.00954	.000	.0349	.0796
	81+ km	.0886*	.00595	.000	.0746	.1025
41-80km	0-40km	-.0572*	.00954	.000	-.0796	-.0349
	81+ km	.0314*	.00927	.002	.0096	.0531
81+ km	0-40km	-.0886*	.00595	.000	-.1025	-.0746
	41-80km	-.0314*	.00927	.002	-.0531	-.0096

Appendix H

Cross-tabulation of distance group by OUA All-Star Selection

			OUA All-Star Selection		Total
			YES	NO	
Distance Group	Within Commuting Range (0-40km)	Count	282$_a$	2368$_b$	2650
		Expected Count	244.3	2405.7	2650.0
		% of Total	4.1%	34.2%	38.2%
	Possibly Within Commuting Range (41-80km)	Count	64$_a$	693$_a$	757
		Expected Count	69.8	687.2	757.0
		% of Total	.9%	10.0%	10.9%
	Outside Commuting Range (80+ km)	Count	293$_a$	3232$_b$	3525
		Expected Count	324.9	3200.1	3525.0
		% of Total	4.2%	46.6%	50.9%
Total		Count	639	6293	6932
		Expected Count	639.0	6293.0	6932.0
		% of Total	9.2%	90.8%	100.0%

Appendix I

Cross-tabulation of distance group by CIS All-Star Selection

			CIS All-Star Selection		Total
			YES	NO	
Distance Group	Within Commuting Range (0-40km)	Count	51$_a$	2599$_b$	2650
		Expected Count	37.5	2612.5	2650.0
		% of Total	.7%	37.5%	38.2%
	Possibly Within Commuting Range (41-80km)	Count	10$_a$	747$_a$	757
		Expected Count	10.7	746.3	757.0
		% of Total	.1%	10.8%	10.9%
	Outside Commuting Range (80+ km)	Count	37$_a$	3488$_b$	3525
		Expected Count	49.8	3475.2	3525.0
		% of Total	.5%	50.3%	50.9%
Total		Count	98	6834	6932
		Expected Count	98.0	6834.0	6932.0
		% of Total	1.4%	98.6%	100.0%