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Influenza a Vaccination Knowledge, Attitude, Practice of Athletes Competing in Canadian Interuniversity Sport in Calgary, Alberta

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Abstract
Objective: To assess the knowledge, attitude and practice (KAP) of Canadian Interuniversity Sport (CIS) athletes regarding influenza A vaccination. **Design:** Cross-sectional survey. Setting: University of Calgary. Participants: The CIS athlete (N=450) population was sampled by convenience (n=177, mean age 20.4 ± 2.2 years) and compared to non-athlete kinesiology students (n=34, 21.06 ± 2.7 years of age). Independent variable: Vaccination history. **Main outcome measures:** A frequency analysis was employed to describe the KAP of each group. Groups were compared by χ^2 or Kruskal-Wallis analysis. **Results:** Over half of athletes were aware of influenza vaccination safety, effectiveness and side effects. Athletes were significantly more concerned about contracting the virus due to potential consequences, such as an interruption of training and infection of teammates, compared to non-athletes ($p<0.05$). Nearly one third (29.2%) of athletes reported vaccination participation. **Conclusion:** The vaccination participation of CIS athletes is low when requirements for herd immunity are considered.
Keywords*:* Athletes, university students, influenza, influenza A, knowledge, attitude, practice

1. Introduction

Influenza is a widespread acute respiratory ailment that affects the lives of millions of Canadians each year (Health Canada, 2013). The severity of the illness ranges from an asymptomatic infection to death in the most extreme cases (World Health Organization [WHO], 2011). However, most commonly, influenza infection results in an acute illness that persists for approximately one week, with malaise and cough lingering for an additional week (WHO, 2011). The World Health Organization (WHO) indicates that people at any age with immunocompromised conditions are at a higher risk for hospitalization associated with infection of the flu (WHO, 2011).

Influenza A is a known subtype of influenza and has been reported to be responsible for causing several respiratory epidemics including the recent H1N1 flu outbreak in 2009, which was highly contagious in nature (WHO, 2011). According to the WHO (2011), these recent increases in rates of influenza infection have resulted in rises in respiratory infirmity, physician appointments, hospitalizations and even deaths leading to escalating estimates in the virus's overall health burden. The influenza vaccine is associated with a decrease in respiratory symptoms, physician appointments across all age groups, hospitalizations and deaths among people at high risk, and missed work days in adults (WHO, 2011). Influenza vaccination is currently considered the most effective preventive measure available against influenza infection (Daly & Gustafson, 2011; Valenciano, Kissling & Cohen, 2011).

Athletes are a population that is under studied yet may be at an elevated risk for infection with influenza including the potential for severe outcomes of infection as a result of their increased susceptibility to immunocompromised conditions (WHO, 2011; Daly & Gustafson, 2011). Many athletes believe that physical training enhances immunity and helps prevent upper respiratory tract infection such as the common cold or "flu" (influenza) (Eichner, 1995). However, athletes are likely at an increased risk for transmission and contraction of influenza due to more frequent air travel than non-athletes, increased close contact with others through sport and are more likely to share surfaces such as workout equipment or water bottles which can act as disease vectors (Young, Fricker, Maughan & MacAuley, 1998). They are also susceptible to immunocompromised conditions as the result of high intensity training (Neiman, 1997). This acute immune suppression can be measured from 3 to 72 hours following high intensity exercise (Neiman, 1994). Due to the increased risk of contraction as a result an athlete's daily activities and immunocompromised conditions, it is recommended that athletes receive the influenza vaccine (Daly & Gustafson, 2011; Eichner, 1995; Young et al. 1998).

The researchers undertook a comprehensive literature search and found no articles that specifically explored the knowledge, practice and attitudes around the issue of influenza vaccination in the university athlete population. As a proxy measure, the literature on general university undergraduate students reports 8.0 – 44.19% engagement in the vaccine (Author, 2013). To achieve herd immunity 80% vaccination rate in healthy persons or 90% vaccination rate in high-risk groups is necessary (Plans-Rubió, 2012). Based on this information, vaccination participation is low in this university population. The purpose of this study was to investigate the knowledge, attitudes and practice of Canadian Interuniversity Sport (CIS) athletes concerning influenza A immunization. In addition, due to an increase in time allowance for the study, the responses of athletes were compared with kinesiology students to identify differences in knowledge, attitude and practice between athletes and non-athletes. It was hypothesized that there would be no difference between knowledge, attitude and practice among Canadian Interuniversity Sport (CIS) athletes and Kinesiology students with regards to influenza A immunization.

2. Methods

2.1 Participants

For the purposes of this study, an athlete was defined as an individual currently competing in the Canada Interuniversity Sport (CIS) competition. The University of Calgary CIS population was sampled by convenience. The expected response rate based on previous online survey distribution by email to university students regarding influenza vaccination was 41% (Milunic, Quilty, Super & Noritz, 2010). Therefore, the expected athlete response rate was approximately 185 (N=450). The survey was distributed using SurveyMonkey (SurveyMonkey.com) during January and February of 2014 at the University of Calgary, Alberta. The survey distribution occurred following considerable media attention regarding the Alberta Health Services influenza vaccination campaign as well as publicized deaths as a result of the H1N1 strain.

The non-athlete kinesiology students were also recruited by convenience and received the survey as a result of enrollment in an upper level Kinesiology course focusing on health (N=34). The researchers used the same online survey with wording tailored to student daily activities and therefore the expected response rate was also 41% (n=14).

2.2 Questionnaire

The questionnaire was developed according to the Ajzen framework for survey design (2002) using the Integrated Behaviour Model (IBM) which has been demonstrated in the published literature to be efficacious when applied to health behaviours (Ajzen, 2002; Godin & Kok, 1996). The survey was 19 questions (6 demographic, 13 Section 3-A, 5-B, & 5-C) and was validated through distribution to club status rowing and baseball teams at the University of Calgary (n=17) before dissemination to the survey population of varsity status teams and kinesiology students.

The study aim was to describe the proportion of CIS athletes that participate in the Alberta seasonal influenza vaccination program and the researchers used the term practice as engagement in a specific behaviour regularly. Participation was self-reported for a lifetime vaccination history in the demographic section (question 6), history of vaccination participation during their degree or athletic career in Section B (question 4) and future intentions to be vaccinated in Section B (question 5) and Section C (question 4). Appendix A provides the athlete specific survey. Non-athletes were given the same questions with language tailored to general student behavior.

A common definition of knowledge was employed, i.e. the information, understanding or awareness derived from education or experience of an individual (Merriam-Webster's Collegiate Dictionary, 2012). Section A (question 1, 2, 3) of the survey observes the participant's knowledge of the safety and effectiveness of the influenza A vaccine, awareness of potential side effects, as well as their primary source for learning about the influenza A vaccination.

Attitude is a feeling or thought process that influences an individual's behaviour (Merriam-Webster's Collegiate Dictionary, 2012). Section B (question 1, 2, 3) assesses the respondent's attitude towards the effects of the vaccine, past experience or expectation of experience of influenza vaccination, as well as intrinsic value for receiving the influenza vaccine.

Section C (question 1, 2, 3) of the survey was designed to better understand the respondent's attitude towards their risk as a result of daily behaviours, the potential individual consequences of infection with influenza and their concern for infection of others.

2.3 Outcome Measures

This cross-sectional study examined the three dependent variables of knowledge, attitude and practice as measured by responses to the survey questionnaire.

2.4 Analysis

A descriptive analysis (means and percentages) was employed to identify trends in knowledge, attitude and practice of CIS athletes regarding influenza A vaccination. The responses to each question were expressed as a percent. Using the added comparison group of non-athlete kinesiology students, a χ^2 test statistic was employed to detect differences in the responses of athletes and non-athlete kinesiology students regarding their knowledge and lifetime vaccination history. A Kruskal-Wallis test was used to show the differences in responses of athletes and non-athlete kinesiology students across the questions with a Likert scale rating. A greater mean rank was used to indicate a higher, more positive or agreeable rating on the Likert scale. The significance level for the comparison of athletes to non-athlete kinesiology students was set at $p<0.05$.

2.5 Ethical Consideration

The study received ethical approval by the Conjoint Health Research Ethics Board (REB13-1276) on January 8, 2014.

3. Results

The mean age of athletes was 20.4 ± 2.2 years and the overall response rate was 39.3%. The survey completion rate of 95.5% was based on the number of athletes (n=177) who accessed the survey. The mean age of non-athletes was 21.06 ± 2.7 years. Respondents were dropped from the analysis if questions were left blank (Athletes n=8, Non-athletes n=1). Participant characteristics are in Table 1.

Table 1. Comparison of Athlete and Non-Athlete Participant Characteristics

	Athletes		**Non-Athlete Students**	
Characteristic	n	%	n	%
Sex				
Male	76	42.9	7	20.6
Female	101	57.1	27	79.4
Age (years)				
18	36	20.3	5	14.7
19	37	20.9	4	11.8
20	29	16.4	7	20.6
21	26	14.7	8	23.5
22	26	14.7	4	11.8
23	7	4.0	1	2.9
24	9	5.1	2	5.9
25	5	2.8	0	0.0
26	0	0.0	1	2.9
27	0	0.0	1	2.9
28	0	0.0	0	0.0
29	0	0.0	0	0.0
30	1	1.1	1	1.1
Mean Age	21.06 ± 2.7		20.4 ± 2.2	
Degree				
Undergraduate	174	98.3	34	100.0
Graduate	3	1.7	0	0.0
Faculty				
Arts	60	33.9	1	2.9
Business	19	10.7	0	0.0
Education	5	2.8	0	0.0
Engineering	13	7.3	0	0.0
Environmental Design	1	0.6	0	0.0
Kinesiology	28	15.8	31	92.1
Medicine	9	5.1	1	2.9
Nursing	8	4.5	0	0.0
Science	34	19.2	1	2.9
Years of Education Completed at the University Level				
Less than 1	42	23.7	7	20.6
1-2	49	27.7	7	20.6
2-3	29	16.4	6	17.6
3-4	26	14.7	11	32.4
4-5	27	15.3	3	8.8
Greater than 5	4	2.3	0	0.0

Over half of the athletes (54.9%) knew that the effectiveness and safety of the present influenza A vaccine had been demonstrated through scientific research and (58.3%) were aware of the potential side effects of the vaccination (Table 2). The greatest percentage of athletes (46.3%) stated media as their primary source for learning about the influenza vaccination. Slightly less athletes (41.7%) selected family physician, nurse or other health care provider as their primary

source for information and 12.0% said that they had not been informed that the influenza A vaccination might be important. Kinesiology students exhibited a smaller percentage of uninformed individuals (3.0%), and a greater percentage of respondents selecting the media (60.6%) as their primary source of information. Approximately one third (36.4%) of kinesiology students indicated that their main source of information was a health care provider.

Table 2. Response Frequency Comparison by Grouping of Athletes and Kinesiology Students for Vaccination Participation History and Current Knowledge.

Question	**Response**	**Response by Group (%)**			**Test Statistic**		
	Yes/No	Athletes	Kinesiology Students	Total	χ^2	Degrees of Freedom (df)	p-value
In your lifetime that you can recall have you ever had the flu shot?	Yes	78.0	74.3	n = 164	0.226	1	0.635
	No	22.0	25.7	n = 48			
The effectiveness and the safety of the present influenza vaccine has been demonstrated through scientific research.	Yes	54.9	73.5	n = 121	4.505	2	0.105
	No	9.7	8.8	n = 20			
	I don't know	35.4	17.6	n = 68			
Are you aware of potential side effects, i.e. beyond the typical soreness associated with a needle, from being vaccinated with the influenza A vaccine?	Yes	58.3	73.5	n = 127	4.195	2	0.123
	No	27.4	23.5	n = 56			
	I don't know	14.3	2.9	n = 26			

*Significant at $p<0.05$

The χ^2 analysis comparing athletes (78.0%) to non-athlete kinesiology students (74.3%) revealed no significant difference in the self-reported previous lifetime history of vaccination participation ($p>0.05$) (Table 2). There were also no significant differences in the level of knowledge on the effectiveness, safety and side effects of the vaccine ($p>0.05$) (Table 2). The survey revealed that 54.9% of athletes and 73.5% of students stated that 'the effectiveness and safety of the present influenza A vaccine had been demonstrated through scientific research' (Table 2). Similar proportions were seen regarding awareness of the potential side effects of the vaccine.

The percentage of athletes that report to have received the vaccine more than once during their university degree/athletic career, and that intend to receive the vaccine for the remainder of their university degree/athletic career was 29.2% and 29.4%, respectively (Figure 1).

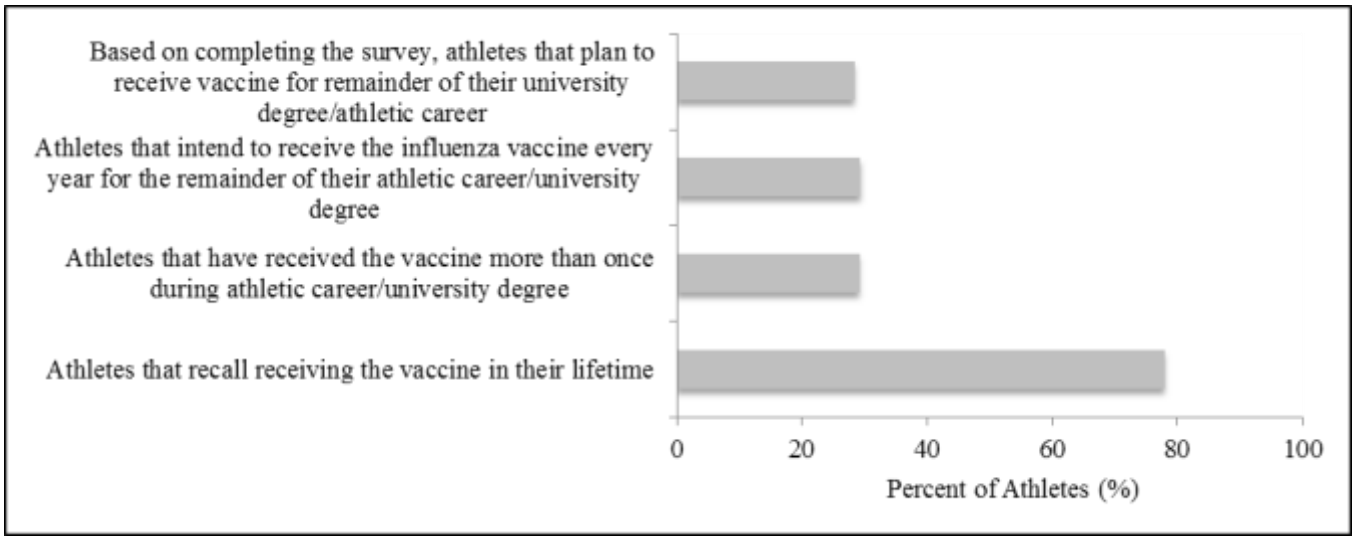

Figure 1. Comparison of history and intention of vaccination participation percentage of athletes

The percentage of Likert scaled responses for questions regarding the attitude and practice of athletes are presented in Table 3. Just over half (54.0%) of athletes reported to have never received the influenza A vaccine throughout their university degree/athletic career.

Table 3. Frequency and Percent of Likert Scaled Responses Regarding Attitude and Practice of the Influenza A Vaccination

Survey Question	Percentage of Likert Scale Rating					Total Sample
	1	2	3	4	5	
How would you rate the effects of receiving the influenza vaccine?	Harmful 2.4%	Somewhat harmful 12.4%	Neutral 32.4%	Somewhat beneficial 26.5%	Beneficial 26.5%	N=170
Based on past experience or expectation of receiving the influenza vaccine, how would you rate the experience? (Includes accessing the vaccine and receiving the vaccination.)	Unpleasant 8.2%	Somewhat unpleasant 13.5%	Neutral 52.4%	Somewhat pleasant 13.5%	Pleasant 12.4%	N=170
In terms of intrinsic value to you for the influenza vaccine, how would you rate receiving the influenza vaccine?	Worthless 8.8%	Somewhat worthless 13.5%	Neutral 30.0%	Somewhat valuable 30.0%	Valuable 17.6%	N=170
How many times have you received the influenza vaccine since the beginning of your university degree/athletic career?	Never 54.0%	Once 16.8%	I don't know 5.3%	More than once, but not every year 2.4%	Every year 16.8%	N=170
I intend to receive the influenza vaccine every year for the remainder of my university degree/athletic career.	Extremely unlikely 28.8%	Unlikely 22.4%	Undecided 19.4%	Likely 15.3%	Extremely likely 14.1%	N=170
As an athlete, my daily activities put me at an elevated risk for contraction of the influenza A virus.	Strongly disagree 5.3%	Disagree 27.8%	I don't know 24.9%	Agree 34.3%	Strongly agree 7.7%	N=169
As an athlete, I am concerned about the potential consequences, such as an interruption in training and competition, due to contraction of the influenza A virus.	Strongly disagree 4.7%	Disagree 14.8%	I don't know 8.9%	Agree 50.3%	Strongly agree 21.3%	N=169
As an athlete, I worry about transmitting the influenza A illness to my teammates.	Strongly disagree 6.5%	Disagree 14.8%	I don't know 13.0%	Agree 49.1%	Strongly agree 16.6%	N=169
After completion of this survey, I plan to receive the influenza vaccine every year for the remainder of my university degree/athletic career.	Strongly disagree 20.1%	Disagree 20.7%	I don't know 30.8%	Agree 16.0%	Strongly agree 12.4%	N=169

The Kruskal-Wallis analysis revealed a significant difference between the ratings of athletes and kinesiology students on the effects of receiving the influenza vaccine ($p<0.05$) (Table 4). Kinesiology students presented a higher, more positive, mean rank (120.40) compared to the athletes (98.92) (Table 4).

Significant differences between athletes and non-athlete students were found concerning the consequences of infection and transmission of the virus ($p<0.05$) (Table 4). The athlete group yielded a higher mean rank in accordance with higher agreeableness with statements expressing a concern for consequences such as an interruption in training or studies as well as worry for transmitting the infection to teammates and or others (Table 4). The remaining Likert scale questions explored the intrinsic value for the vaccine, experience of receiving the vaccine as well as current and past participation throughout university attendance yielded non-significant values in the comparison of athletes and non-athletes.

Table 4. Kruskal-Wallis Analysis by Group of Likert Scaled Responses Regarding Attitude and Practice of the Influenza A Vaccination

Question	Likert Scale Response Range	Kruskal-Wallis Mean Rank by Group		Test Statistic		
	1-5	Athletes	Non-Athlete Students	χ^2	df	p-value
How would you rate the effects of receiving the influenza vaccine?	Harmful to Beneficial	98.92	120.40	4.045	1	0.044*
		n = 170	n = 34			
Based on past experience or expectation of receiving the influenza vaccine, how would you rate the experience? (Includes accessing the vaccine and receiving the vaccination)	Unpleasant to Pleasant	103.62	96.91	0.433	1	0.510
		n =170	n = 34			
In terms of intrinsic value to you for the influenza vaccine, how would you rate receiving the influenza vaccine?	Worthless to Valuable	101.70	106.49	0.197	1	0.657
		n = 170	n = 34			
How many times have you received the influenza vaccine since the beginning of your university degree/athletic career?	Never to Every Year	96.73	104.01	0.560	1	0.454
		n =161	n = 34			
I intend to receive the influenza vaccine every year for the remainder of my university degree/athletic career.	Extremely Unlikely to Extremely Likely	101.93	105.37	0.101	1	0.750
		n = 170	n = 34			
As an athlete, my daily activities put me at an elevated risk for contraction of the influenza A virus.	Strongly Disagree to Strongly Agree	101.84	102.79	0.008	1	0.928
		n = 169	n = 34			
As an athlete, I am concerned about the potential consequences, such as an interruption in training and competition, due to the contraction of the influenza A virus.	Strongly Disagree to Strongly Agree	105.57	84.26	4.262	1	0.039*
		n = 169	n = 34			
As an athlete, I worry about transmitting the influenza A virus to my teammates.	Strongly Disagree to Strongly Agree	105.96	82.32	5.150	1	0.023*
		n = 169	n = 34			
After completion of this survey, I plan to receive the influenza vaccine every year for the remainder of my university degree/athletic career.	Strongly Disagree to Strongly Agree	101.01	106.94	0.304	1	0.581
		n = 169	n = 34			

4. Discussion

This study investigated the knowledge, attitude and practice of CIS athletes concerning the influenza vaccination utilizing a cross-sectional survey design. Information regarding the knowledge of effectiveness, safety and side effects of the vaccine, attitudes towards the effects, intrinsic values, and personal risk as well as past vaccination participation and future intentions of vaccination reception was collected. The published literature to the best of the researchers' knowledge has not yet explored these factors in an athletic population. However, CIS athletes are by definition university students in addition to their athletic roles and therefore the current literature reporting on university students is expected to be an appropriate proxy and comparison for the trends identified in this study. The results of this study are limited by the cross-sectional survey design as well as the infancy of research in this specific population.

The questions assessing the current knowledge of athletes found that approximately half of the athletes knew that the influenza A vaccine was effective and safe and these individuals were informed of the potential side effects beyond the soreness of a needle prick. This was not found to be significantly different from the knowledge level of kinesiology students ($p>0.05$) (Table 2). The percentages of athletes and kinesiology students understanding the effectiveness and safety (see Table 2) were greater than the 39.1% found in first year university students by Akan et al (2010). The greater percentage of athletes and kinesiology students demonstrating knowledge of the safety and effectiveness of the vaccine in this study could be the result of a bias in the positive direction presented by the affirmative wording of the statement

'The effectiveness and safety of the present influenza A vaccine has been demonstrated through scientific research'. The percentage of athletes (35.4%) that reported that they did not know if the vaccine had been demonstrated scientifically to be safe and effective is consistent with the findings of Naing & Tan (2011). Based on written comments provided in the comment box at the conclusion of the survey, further research is required to determine the knowledge of athletes surrounding the mechanism of the vaccine as well as the limitations of its protection in order to provide a more detailed description of the current knowledge standard.

Both the athletes (46.3%) and the kinesiology students (60.6%) reported the media as their primary source for learning about the influenza vaccination in the past year. This variation is also found in the literature with reports of 72.1% and 45% of university students stating media as their primary source for vaccine education (Akan et al., 2010; Merrill, Kelly & Cox, 2010). The variation across the literature is likely the result of the context of the survey distribution such as seasonal or pandemic outbreaks as in the case of the study by Akan et al (2010). However, this does not explain the variation between athletes and kinesiology students within this study. This is particularly interesting given that both groups were exposed to the increased media attention surrounding the availability of the flu vaccine in the city of Calgary throughout the month of January 2014. It is possible that due to the limited time of student-athletes, less attention is paid to television, the newspaper, etc.

The published research that investigated university students indicated that students who receive advice on the influenza vaccine from health care professionals were more likely to receive the vaccine (Merrill, Kelly & Cox. 2010; Rodas et al., 2012; Ramsey & Marczinski, 2011). Just under half of the athletes (41.7%), lower than the 52% reported in the literature, indicated that a family physician, nurse or other health care provider was their main source for knowledge surrounding the vaccine (Mavros et al., 2011). An important factor to consider in the future is the patient and health care provider's relationship, which could affect the individuals' reception of the vaccine. Vaccinations have been reported to occur at multiple types of patient encounter sites (Levy, Ambrose, Oleka & Lewin, 2009). Perhaps implementing changes within the system of care for athletes could improve vaccine adherence and ultimately overall health. Further studies should consider the response of athletes to education from athletic therapists and or physiotherapists, as they are often involved in the care of athletes throughout their careers.

The only significant difference found between athletes and non-athlete kinesiology students in attitude was the rating of the effects of the vaccine, with kinesiology students yielding a higher rating overall (1=Harmful, 5=Beneficial, Table 4). This difference is likely the result of the greater percentage of kinesiology students demonstrating the knowledge of the safety, effectiveness and potential side effects of the vaccine, despite the lack of significant difference found through the χ^2 analysis. However, the small sample size of kinesiology students restricted the statistical analysis and the comparison of the two groups.

A very high percentage (>70%) of athletes and kinesiology students recalled having the flu shot in their lifetime (Table 2). Respondents may have overestimated their actual vaccination rates and likely confound their answer due to confusion of the influenza vaccine with other childhood vaccinations (Rickert, Santoli, Shefer, Myrick, Yusuf, 2006). The result could also be enhanced due to a recall bias. Future questionnaires should include a specific time period.

In regards to the practice of athletes in influenza vaccination, approximately one third of athletes received the vaccine more than once throughout their athletic career and intend to continue to receive the vaccine for the remainder of their career (Figure 1). This is consistent with the literature on the university student population (24.75%) (Author, 2013). Unfortunately, the reported participation rate of university students and athletes in influenza vaccination is very low when compared to the 80% vaccination rate required for herd immunity of the average population and 90% requirement for high risk populations (Plans-Rubió, 2012). Within the scope of this study, the approximate 30% participation rate suggests a disconnect may exist between the demonstrated knowledge and seemingly positive attitude by over half of the athlete population towards the influenza vaccine.

The most revealing result of this study was the significant difference found between athletes and kinesiology students in their concern for consequences of infection with the virus and transmission to others ($p<0.05$). Compared to kinesiology students, athletes indicated a higher agreeableness (greater mean rank) with statements regarding concern for potential consequences of infection with the influenza virus (Table 4). These concerns specifically included an interruption in training and competition, and transmission of the virus to teammates. It appears that athletes are aware of the detriment to their personal training regime or competition performance as a result of a lowered level of health and are therefore concerned about contracting the virus. Furthermore, they are concerned about the general health of their teammates and the implications to team performance as a result of transmission of the virus. Despite this concern, only 42.0% of athletes agree and or strongly agree that their daily activities put them at an elevated risk for contraction of the influenza virus and only one third actually report to regularly engage in influenza vaccination behaviours. This trend implies that the athlete population is not aware of their potential increased risk for infection of the influenza virus and perhaps that they are not convinced of the preventative benefits of vaccination practices.

5. Conclusion

Athletes are at an elevated risk for contraction of the influenza virus due to repeated bouts of immune suppression, increased contact with others as well as shared surfaces through training, competition and other team activities (Young et al., 1998). The questionnaire employed in this study has identified the current trends of CIS athletes regarding their knowledge, attitude and practice of the influenza A vaccination. In addition, these trends were compared across another

population of university students. The results of this study may inform the planning of future behavior change communication (BCC) strategies in this population. A BCC strategy would enhance the knowledge and awareness of the risk for influenza infection, and the adoption of preventative health behaviors, such as vaccination. Therefore, the implementation of a BCC strategy also has the potential to facilitate a greater standard of health conducive with training and competition in the CIS athlete population.

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