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The Question of Participation: An Investigation on Interventions to Increase Physical Activity Among University Students

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ABSTRACT

Background Recent studies indicate that physical activity levels among Ontario university students are about 35% to 42%. Furthermore, there is a sparsity of evidence on effective interventions to support increased physical activity among university students. The current study uses the Comprehensive School Health (CSH) framework for the analysis of current physical activity interventions at York University and provides four observations of an effective program.

Methods 249 York University undergraduate students (n = 153 women, n = 96 men) ages 18 – 42 (M = 19.92 years, SD = 2.99 for men; M = 19.96 years, SD = 2.61 for women) were recruited from the school of Kinesiology and Health Sciences. Participants were measured for their physical activity status and physical activity factors pertaining to the CSH framework via an online survey.

Results 67.9% of the participants were considered physically active, and 80.3% declared they would not "travel to the university only to engage in physical activity". Additionally, 74.7% of the participants reported that they believed that they had enough information regarding physical activity, with 44.2% having been exposed to signs and posters about physical activity on campus. 49.4% of participants reported engaging in the school's mandatory practicums (PKINs) with a resulting 125 minutes of average weekly physical activity. 16.9% of participants reported having received physical activity counseling and 83.1% did not.

Conclusions Based on the results of this study, an effective intervention to support increased physical activity among university students, in the case of York University, was one that fit well with the students' academic schedule, did not rely on signs or posters for physical activity promotion, integrated itself into the curriculum, and would benefit from incorporating partnerships with healthcare professionals.

KEY WORDS: **Comprehensive School Health Framework, Physical Activity Promotion, Health Promotion, Health Policy**

1 | INTRODUCTION

A review of recent surveys on the physical activity levels of Ontario university students paints a dark picture of the state of physical activity amongst this population; two surveys conducted by the American College Health Association on more than 40,000 Ontario university students in 2013 and 2016 puts the physical activity rate of this group at 38% and 42%, respectively. These rates are further corroborated by a 2007 study by Irwin; in this study, 392 undergraduate students from two universities in southwestern Ontario were surveyed and it was revealed that only 35% were physically active. In addition, a similar rate of physical activity (35%) has been reported for students at York University (College Health Association, 2013). What makes the implications of these results more troubling is the operational definition used by these studies to determine physical activity status; in all four studies, students were considered physically active if they had engaged in a combination of moderate physical activity for at least 30 minutes on 5 or more days per week, or vigorous physical activity for at least 20 minutes on 3 or more days per week. This categorization sees an individual who engages in 60 minutes (3*20 minutes) of vigorous physical activity per week as "physically active". This contrasts with the definition put forth by the Canadian Society for Exercise Physiology (CSEP). CSEP states that "adults aged 18-64 years should accumulate at least 150 minutes of moderate to vigorous-intensity aerobic physical activity per week" (CSEP, 2017).

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Using the CSEP definition, it is reasonable to assume that the physical activity rates of university students in Ontario are likely lower than those measured by the studies.

It is unfortunate that so few university students are physically active in their day-to-day lives, given the numerous benefits of physical activity. Students stand to gain much from an increase in their physical activity levels as there are many benefits to physical activity. Physical activity has been shown to decrease the risk of coronary heart disease (Paffenbarger, Hyde, Wing, & Hsieh, 1986; Morris & Froelicher, 1991; Chandrashekhar & Anand, 1991; Smith et al., 1995), modulate the risk factors related to the occurrence of type 2 diabetes (Uusitupa et al., 2000), reduce the negative effects of obesity (He & Baker, 2004), lower the incidence of hypertension (Paffenbarger, Wing, Hyde, & Jung, 1983), increase the health-related quality of life in survivors of cancer (Blanchard et al., 2004; Penedo, Schneiderman, & Dahn, 2004), enhance functionality in patients with osteoarthritis (Lin, Davey, & Cochrane, 2004), diminish symptoms of depression and anxiety (Ross C & Hayes, 1988; Stephens, 1988), and even lower the risk of erectile dysfunction in men (Derby et al., 2000).

A physical activity intervention is an intervention designed to improve physical activity levels within any population; it is therefore pertinent to review interventions that have been attempted in the past. Unfortunately, lack of effect within physical activity interventions is common. In a 1998 review by Baranowski, Anderson, & Carmack, it has been pointed out that a majority of physical activity intervention studies have shown little to no effect. Furthermore, those interventions that have been shown to have statistically significant results demonstrated minute effect sizes. These findings were repeated in our review of physical activity intervention studies published from 2000 - 2012 which targeted university students; a lack of long-term effects was observed across interventions targeting university students (Table 1). This lack of results is despite the fact that students are shown to place great importance on their physical activity (Wilson, Rodgers, Fraser, & Murray, 2004).

Since most current and past interventions have proven to be unsuccessful, a new perspective was used in order to organize this study: the Comprehensive School Health (CSH) framework. This framework has been endorsed by the World Health Organization as an effective tool for health promotion within schools and universities (2006). The CSH posits that successful interventions benefit from targeting the following four interrelated pillars:

- **Social and Physical Environment**: the "quality of relationships, and emotional well-being of students and staff, in addition to the buildings, grounds, spaces around the school, and essential requirements such as air and water quality." (Bassett-Gunter, Yessis, Manske, & Stockton, 2012)
- **Teaching and Learning**: provision of formal and informal education opportunities to support the development of the skills required to engage in physical activity and improve mental health and well-being.
- **Healthy School Policy**: management practices, rules, procedures and policies that support the promotion of physical activity and promote mental health and well-being.
- **Partnerships and Services**: health, education and other sectors working together to support the promotion of physical activity and mental health; community and school-based services that support and promote physical activity and mental health (Bassett-Gunter, Yessis, Manske, & Stockton, 2012).

The purpose of this study was to explore potential factors categorized based on the pillars put forth by the CSH that can influence the effectiveness of interventions to support increased physical activity rates among university students.

2 | METHODS

Study Design: an online survey was utilized for this descriptive study.

Participants: York University undergraduate students (N = 249; n = 153 women, n = 96 men) ages 18 – 42 (M = 19.92 years, SD = 2.99 for men; M = 19.96 years, SD = 2.61 for women) were recruited through an online portal: Kinesiology Undergraduate Research Experience (KURE). KURE is a research portal that allows undergraduate kinesiology students from York University to enroll in available studies. These 249 students were given bonus marks in a course that was not taught by any of the researchers in this study, as a token of appreciation for their participation.

Protocol: an online survey was conducted using SurveyMonkey. An initial email was sent to all the participants through the KURE system providing them with a link to the study. One to two reminders were sent to participants who were unresponsive to the initial email. Within the survey, participants were given information about the study and were asked for their written consent.

Table 1. Interventions targeting physical activity among university students

Author(s)	Year	Participants	Description of the Intervention	Posttest Results Regarding Physical Activity Rate	Follow-up Performed	Time of Follow-up	Follow-up Results
Saelens et al.	2000	256 students from one university in southern California	Phase one: Lectures regarding physical activity benefits Phase two: Phone and mail reminders and development of behavioral and cognitive strategies	**A significant increase** in the intervention group compared to control	Yes	1 and 2 years following the end of phase two	**No significant difference** compared to control at 1- or 2-years follow-up
Leslie, Sparling, & Owen	2001	338 students from one university in the USA	This intervention [Project GRAD] consisted of weekly lectures and peer-led laboratory sessions. In this program, students were asked to come up with a plan to engage in physical activity and to increase and maintain activity in their lifestyle.	**No significant difference** compared to baseline **for men**. **A significant increase** compared to baseline **in women**.	Yes	2 years following the end the study	**No significant difference** compared to baseline at 2-years follow-up.
Cholewa & Irwin	2008	51 students from University of Western Ontario	This intervention included two parts: 1) Participants were divided into groups of two [of same-sex participants] who worked together to increase their physical activity. 2) Students were asked to track their "activity frequency, duration, goals, and progress."	**No significant difference** compared to baseline.		No follow-up was performed	
Franko et al.	2008	476 students from six universities across the USA	Online module regarding nutrition and physical activity. This information was tailored specifically for university students	**No significant difference** compared to control	Yes	3 and 6 months following the end the study	**No significant difference** compared to control at 3- or 6-months follow-up
Boyle, Mattern, Lassiter, & Ritzler	2011	178 students from one university in the USA	This intervention consisted of two parts: 1) Students received a lecture on behavior change, goal setting, planning for change, and rewards. 2) Students had to choose one of two semester-long behavior change projects as part of their academic course: I) "Attempt to change a behavior of the student's choice without outside help (control)." II) "Attempt to improve the student's level of PA and physical fitness with the help of an exercise physiologist in training (intervention)."	**No significant difference** compared to control **for men**. **A significant increase** compared to control **in women**.		No follow-up was performed	
Magoc, Tomaka, & Bridges-Arzaga	2011	117 students from one university in southwestern USA	Online lessons regarding physical activity, self-regulation skills, goal setting, self-efficacy, barriers, social support, and outcome expectations and expectancies	**A significant increase** compared to control		No follow-up was performed	
Cavallo	2012	134 female undergraduate students from one university in southeastern USA	A Facebook group was created and participants [all female] were invited to join. The group was meant to provide social support and facilitate the exchange of physical activity-related information.	**No significant difference** compared to control.		No follow-up was performed	

After they consented to take part in the study, the respondents were asked to indicate their sex, an estimate of their weekly physical activity (in minutes), then were directed to a questionnaire regarding factors that affected their physical activity. The questions were presented in a random order for each participant in order to minimize carryover effects (Tourangeau, Rasinski, Bradburn, 1989). The participants were granted their marks upon the completion of the survey. The participants remained completely anonymous during the course of this survey.

This study was reviewed and approved by the Kinesiology and Health Science Delegated Ethics Review Committee, York University, and conforms to the standards of York University's Office of Research Ethics (REB# 2017-18-XX).

Physical activity status: Participants were considered "physically active" if they engaged in more than 150 minutes of weekly physical activity, with physical activity being defined as any moderate to vigorous intensity bodily movement that requires energy expenditure. The 150 minute cut-off was taken from the Canadian Physical Activity Guidelines for Adults 18-64 years (2011).

Physical activity factors: Factors that affect students' physical activity were based on the pillars of the CSH. Unfortunately, established variables and questionnaires for this framework were unavailable. This is due to the fact that the CSH framework is still in its infancy (Bassett-Gunter, Yessis, Manske, & Stockton, 2012). As such, unique items were generated to address CSH intervention factors. These items were constructed in a manner that would touch upon each pillar of the CSH: Social and Physical Environment, Teaching and Learning, Healthy School Policy, Partnerships and Services.

Physical activity factor - Social and Physical Environment: Within this pillar, two items were measured: students' willingness to travel to campus only to engage in physical activity, and average travel time to campus.

Physical activity factor - Teaching and Learning: Two items were measured regarding this pillar: students' awareness of relevant physical activity material ("how to optimize benefits, how often or how long to be active, how to avoid injury, etc."), and their exposure to material promoting physical activity within the campus.

Physical activity factor - Healthy School Policy: for this pillar, Three of York University's physical activity related policies were selected: PKINs (Practicum Kinesiology Classes), York University Recreation App, and Drop-In classes at Tait McKenzie Centre and students' participation within them were measured.

Physical activity factor - Partnerships and Services: Apropos this pillar, students' current participation and willingness to engage in future fitness counseling was measured. Fitness counseling is broadly defined as an activity in which a health professional designs a physical activity plan for another individual in order to improve their health and wellbeing.

Statistical Analysis: Several custom frequency tables were built using IBM SPSS (version 24.0):
A) One where the rows were set to participants' sex and the columns to their physical activity status. This table was built in order to demonstrate the distribution of participants' physical activity status between the sexes.
B) One where the rows were set to participants' knowledge of physical activity and the columns to their exposure to material pertaining to physical activity. This table was built in order to demonstrate the distribution of participants' physical activity knowledge among those exposed to physical activity material and those who were not.
C) Furthermore, an independent-samples t-test was performed, comparing the average travel time to campus of those who indicated that they would travel to campus only to participate in physical activity, with those who indicated that they would not.

3 | RESULTS

Physical activity status: 67.9% of the participants were considered physically active. This rate was further broken down based on participants' sex with 75.0% of males and 63.4% of females being considered physically active (Table 2).

Table 2. Physical activity status of the participants broken down by sex

		Physical Activity Status (frequency)		
		Active	Inactive	All
Sex	Male	72	24	96
	Female	97	56	153
	All	169	80	249

Physical activity factor - Social and Physical Environment: 80.3% of participants indicated that they would not "travel to the university only to engage in physical activity". There exists a significant difference between average commuting time for those who indicated that they would attend as opposed to those who would not attend (p = .000397) (Table 3).

Table 3. Average travel time of participants broken down by willingness to travel to campus

		Time to Campus (minutes)		
		Mean	Frequency	STD
Willingness to Travel to Campus	No	54.2	193	28.5
	Yes	37.7	48	28.9
	All	49.6	241	29.3

Physical activity factor - Teaching and Learning: 74.7% of the participants reported that they believed that they had enough information regarding physical activity. This is while only 44.2% of the participants reported having been exposed to signs and posters about physical activity on campus.

Physical activity factor - Healthy School Policy: 49.4% of participants reported engaging in PKINs with a resulting 125 minutes of average weekly physical activity, for those involved. Only 28.1% of participants reported having made use of the York University Campus Recreation mobile app. In addition, 12.4% of participants reported partaking in drop-in classes offered at York University (Table 4).

Table 4. Frequency of participants involved with York University's policies

		Participants involved (frequency)	
		Yes	No
Policy	PKINs	123	126
	York University Campus Recreation mobile app	70	179
	Drop-in classes at York University	31	218

Physical activity factor - Partnerships and Services: 16.9% of participants reported having received physical activity counseling in the past 2 months. Of the 83.1% that did not receive physical activity counseling, 67.6% reported that they would use these services if they were offered on campus (Figure 1).

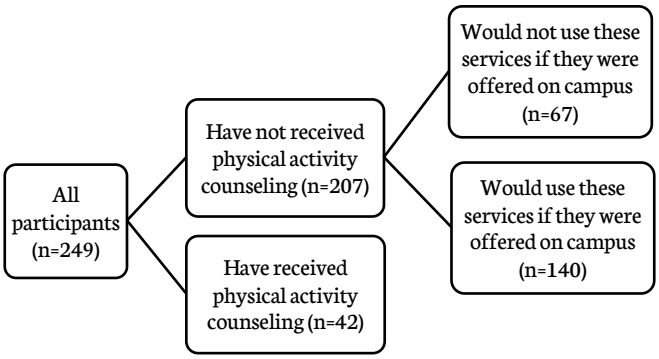

Figure 1. Chart of participants' utilization and willingness to use physical activity counseling

4 | DISCUSSION

Earlier studies have demonstrated that reduced participation in physical activity corresponds to increased barriers to physical activity (Epstein et al., 1991, 1995, 1997). However, the majority of research around physical activity promotion has focused solely on changing individual behaviors as a means to improve physical activity outcomes (Dishman, 1994). The findings of this study, on the other hand, draw upon the holistic CSH framework.

Regarding the results for the 'Physical activity factor - Social and Physical Environment', the students' willingness to travel to the school to engage in physical activity programming may be related to the students' commuting times. This is based on the observation that the students who were willing to travel to campus had shorter commutes, as opposed to those who were unwilling. This observation is consistent with a similar 2010 finding by Cerin, Leslie, Sugiyama, & Owen. In their study, the commuting distance to a sports facility was, similarly, a deciding factor for the participants involved.

With respect to 'Physical activity factor - Teaching and Learning', most participants in this study reported that they had enough knowledge about physical activity. This is inconsistent with an earlier meta-analysis that, amongst other things, analyzed various articles regarding participants' knowledge of physical activity (de Melo Ghisi, Abdallah, Grace, Thomas, & Oh, 2014). Based on the meta-analysis, average participants are considerably less informed about physical activity than the participants of this study.

This inconsistency can be explained by the fact that the participants of this study were recruited from the Kinesiology and Health Sciences program at the university: a program that teaches its students about physical activity as a matter of curriculum.

Further regarding 'Physical activity factor - Teaching and Learning', the number of participants in this study who were aware of the health promotional material posted on campus is considerably lower than previous studies that utilized posters as their promotional material. In a 2001 study by Kerr, Eves, & Carroll, 93% of participants were aware of the promotional posters, and in a 1994 study by Ward and Hawthorne, 79% of participants read the posters. It is likely that the lower awareness of the promotional material in the participants of this study is due to the environmental differences between these studies. The other studies took place in smaller, more enclosed physical environments, whereas this study took place in a vast campus where participants had a lower likelihood of encountering promotional material.

Apropos of 'Physical activity factor - Healthy School Policy', the results of this study show that more participants benefit from the school's mandatory practicums (PKINs) than the optional drop-in classes and the recreation mobile app. The integration of physical activity as part of the school curriculum for the purposes of physical activity promotion has been previously investigated; Physical Activity across the Curriculum (PAAC) was a three-year school-based intervention that demonstrated the effectiveness of using curriculum-based physical activity for the purposes of health promotion (Gibson et al., 2008, Donnelly et al., 2009).

With regards to 'Physical activity factor - Partnerships and Services', the results of this study show that even though the majority of participants had not received any form of health counselling, most would like to receive it. This is encouraging as previous research has shown that health counselling provided by health professionals have had a positive impact on the participants' physical activity levels (Calfas et al., 1996).

Limitations of the Study

The main limitations of this study pertain to its sample; the participants for this study were all recruited from a kinesiology course. These students are therefore not representative of the broader York University community as they are mostly within the kinesiology program, and students within the kinesiology program are exposed to much more information regarding exercise than any other program within the university. Furthermore, selection bias may affect this sample as well; students that choose a kinesiology degree may have different predisposition towards physical activity compared to students from other majors. A second limitation to this study, again apropos the sample, is the fact that this study gathers participants from one university only: York University. York University is a large school with 50,000 students, most of whom commute to school every day, which may not be the case for most universities. These factors bring the generalizability of the results into question.

5 | CONCLUSIONS

The findings of this study can be summarized into four observations for the construction of an intervention suited specifically to support increased physical activity rates among university students. It appears that a well-received intervention has the following characteristics:

1. Fits well with the students' academic schedule, as the majority of students will not travel to school only to engage in physical activity.
2. Does not rely on signs or posters for physical activity promotion and takes a different approach to the design and placement of promotional material, as many students tend to remain unaware of them.
3. Integrates itself into the curriculum (similar to the PKIN policy at York University), as this will engage students in nearly all their required weekly physical activity.
4. Incorporates partnerships with other organizations and offer services such as physical activity counseling to the students at the school, as most students have not received such a service, but would participate should it become available to them.

Suggestions for Further Research

The culminating evidence that was available regarding physical activity interventions for university students is sparse and has many weaknesses. None of the studies that were looked at for the purposes of this article have been replicated, they all have small sample sizes and some do not include a follow-up (Saelens et al., 2000, Leslie, Sparling, & Owen, 2001, Cholewa & Irwin, 2008, Franko et al., 2008, Boyle, Mattern, Lassiter, & Ritzler, 2011, Magoc, Tomaka, & Bridges-Arzaga, 2011, Cavallo, 2012). These factors must be addressed in future research to procure more reliable results. The lack of uniformity with regards to the definition of 'physical activity' throughout the available research is also a challenge. The studies cited in this paper have used diverging operational definitions for physical activity. This disunity creates a great impediment to the analysis and comparison of data across various studies. The introduction and use of a universal definition of physical activity would be of value.

These factors must be addressed in future research in order to procure more reliable results. Finally, the independent testing of the efficacy of each of the four aforementioned observations and the testing of the observations as a whole could provide invaluable insight into whether the CSH framework is a viable alternative to the traditional approaches apropos of physical activity intervention to enhance participation levels within university students.

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