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PHYSICAL ACTIVITY

Examining the Influence of Physical and Health Education on Ontario Grade 9 Students' Physical Activity Intentions and Behaviors

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Abstract

Insufficient physical activity and a sedentary lifestyle are major contributors to health risks for Canadian youth. Adolescents, particularly females, tend to experience major drop-offs in physical activity levels during high school. However, there is minimal research examining the extent to which physical and health education (PHE) courses promote physical activity and mitigate against this decline. Grounded in the theory of planned behavior (TPB), this quantitative short-term longitudinal study examined the effectiveness of Grade 9 PHE for 197 students' reports of TPB constructs, physical activity intentions, and physical activity behavior. Results were analyzed using 2 (time: Time Point 1 [T1], Time Point 2 [T2]) × 2 (condition: in PHE/not in PHE) × 2 (TPB status: higher or lower than the mean) MANCOVAs with males and females examined separately. Findings revealed there was no interaction among time, condition, and TPB status, meaning that students' physical activity intentions and TPB constructs did not

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change over the study. There was a significant effect of condition for females in PHE. Attitude and Physical Activity Behavior were higher at both time points, indicating that females taking PHE classes had more positive attitudes and higher physical activity behavior than females not enrolled in PHE classes. PHE teachers should focus attention on changing attitudes toward physical activity for this age group, given the importance of this construct.

Physical inactivity is the highest of all modifiable risk factors for several illnesses including type 2 diabetes, obesity, and cardiovascular disease (Warburton et al., 2006). Physical inactivity and a sedentary lifestyle have been linked to a major obesity epidemic across many developed countries including Canada and the United States (Cecchini et al., 2010; Centers for Disease Control and Prevention, 2013). Further, insufficient physical activity and its associated health risks are issues for Canadian youth (Janssen, 2012). With the increasing number of individuals at risk of chronic diseases, such as cardiovascular disease, as a result of physical inactivity, the focus on health promotion efforts at this age level needs to increase (Janssen, 2012; Liebert, 2012; Tremblay & Willms, 2003). Physical activity is beneficial to children and youth across multiple domains, including affective, physical, and cognitive (Bailey et al., 2009). With a greater physical activity level, youth can achieve more health benefits (Colley et al., 2011). Using accelerometer data to measure physical activity levels of Canadian youth, Colley et al. (2011) noted that less than 10% of males and less than 5% of females aged 6 to 19 years were active enough to achieve health benefits, and regardless of age group, males were more active than females.

Furthermore, with the link between health and physical activity, longitudinal tracking studies that follow adolescents' physical activity levels to adulthood indicate a strong relationship between people who participated in physical activity during adolescence and continuing that physical activity into adulthood (Trost, 2006). This trend is the same for adolescents who have low physical activity levels—they are less likely to continue physical activity into adulthood. The fact that adolescents' physical activity levels can be predictive of adulthood physical activity levels highlights a need for focused physical activity promotion efforts with the adolescent population.

One place where physical activity can be promoted is physical and health education (PHE) classes. PHE classes in Ontario aim to improve students' physical health as well as their understanding of healthy activities (Ontario Ministry of Education [OME], 1999). PHE classes provide access to the Canadian youth population, which constitutes a large part of the inactive population, according to Statistics Canada (Colley et al., 2011). Understanding how educators can promote physical activity to this age group in a context that already exists is essential for the promotion of physical activity and health benefits. In the examination of physical activity promotion in PHE classes, it is beneficial to use a theoretical framework for behavior change that has been established in the literature and been shown efficacious in a PHE physical activity context.

The theory of planned behavior (TPB) has been employed extensively in research on health behavior change in adult and adolescent populations (e.g., Chatzisarantis & Hagger, 2005; Mummery et al., 2000). TPB suggests that some behaviors do not occur automatically and therefore require conscious attention to complete. For behaviors requiring attentional forethought, of which physical activity is often one, TPB posits that the necessary intentions to act are influenced by Attitude, Perceived Behavioral Control, and Subjective Norms. TPB hypothesizes that Attitude, Subjective Norms, and Perceived Behavioral Control directly influence behavioral intentions, which then lead to actual behavior. TPB is one of the most cited models for human social behavior prediction (Ajzen, 2011). TPB has been found useful in understanding students' intentions to continue physical activity, with variations in the contribution of the three variables across grade, gender, and socioeconomic status (Ajzen, 2011; Duncan et al., 2012; Mummery et al., 2000).

Given the specific PHE context as well as the adolescent age group with which TPB has already been used, including the Canadian youth population, it seemed a comprehensive choice for examining behavior change within the PHE context in Ontario. Although PHE classes are an accessible location for public health promotion efforts, and although other researchers have suggested a need for a focus on changing PHE classes to become more effective (e.g., Sallis & McKenzie, 1991; Sallis et al., 2012), to our knowledge no studies have examined the Ontario PHE context to further understanding

of the efficacy of PHE classes in changing students' perceptions of physical activity.

This study examined the effectiveness of Grade 9 PHE students' reports of TPB constructs, physical activity intentions, and physical activity behavior, providing a real-world test of TPB for adolescents in a Grade 9 context with physical activity as the primary focus. Although studies have utilized TPB to examine adolescents in physical activity settings (e.g., Mummery et al., 2000) and to examine interventions in PHE classes based on TPB principles (e.g., Chatzisarantis & Hagger, 2005), TPB has not been used in the examination of the effectiveness of PHE courses in achieving their aims of increasing lifelong physical activity. Thus, this study has a unique contribution of testing TPB in a context with a curriculum that targets physical activity promotion. This study also provides an opportunity for the exploration of the TPB constructs to see if there is something modifiable (e.g., Attitude) that is not working in PHE contexts, which could then be further explored. Furthermore, given the discrepancies in terms of the most useful construct for TPB in adolescent contexts (e.g., Gibbons et al., 2009; Hofmann et al., 2008), this study adds to the literature findings of which TPB constructs are the most valuable in determining physical activity behavior in the examination of this population.

Method

Participants

Participants in this study were selected from preassigned Grade 9 classes from six of 11 public high schools from a single school board in a mid-sized city and surrounding area in Southeastern Ontario. The sample consisted of 252 Grade 9 students (52% female); however, only 197 completed both time points. Of the 197 students, 113 (57.4%) were enrolled in Grade 9 PHE during the semester of data collection (47.8% female) and 84 students (42.6%) were not enrolled in Grade 9 PHE (65.5% female). For all schools participating, Grade 9 PHE classes were single-gendered.

Procedure

A recruitment email was sent to each principal in the selected Ontario school district. The six principals who agreed to participate

in the study were provided with a recruitment script to email to Grade 9 teachers. Teachers interested in participating were provided with consent forms and letters of information to hand out to students in their classes. Questionnaires were administered to students with returned consent forms during class instruction time in September or October (Time Point 1) and mid-December (Time Point 2).

Instrumentation

Demographics

Background information was obtained including students' sex, participation (or not) in school PHE during the semester of data collection, participation in school sports, and participation in physical activities outside of school and during school hours.

TPB Constructs

A quantitative questionnaire was developed consistent with recommendations made by Ajzen (1985), which is common practice for the study of physical activity behavior using TPB (Hagger et al., 2002). Questions were designed to measure the TPB constructs (Attitude, Subjective Norms, and Perceived Behavioral Control plus Physical Activity Intentions). A principal component analysis was run on all related items for the creation of each scale, and variables with a factor loading greater than 0.5 were selected. A reliability analysis was run, and items were removed until the internal reliability was maximized. The questions were answered on a 7-point Likert-type scale anchored with bipolar adjectives. Individuals' responses were averaged for each scale.

Attitude. The Attitude scale was constructed from six items (α = .88). A sample item was "For me to be physically active on a regular basis is … [interesting] [boring]."

Perceived Behavioral Control. The Perceived Behavioral Control scale included three items (α = .78). A sample item was "For me to be physically active on a regular basis is … [impossible] [possible]."

Subjective Norms. The Subjective Norms scale consisted of four items (α= .65). A sample item was "Most people who are important to me hope that I am physically active … [absolutely true] [definitely false]."

Physical Activity Intentions. The Physical Activity Intentions scale included four items (α = .90). A sample item was "I plan to be physically active on a regular basis … [extremely likely] [extremely unlikely]."

Physical Activity Behavior

The Health Behavior in School-Aged Children (HBSC; Freeman et al., 2011) physical activity questions were used in the assessment of actual levels of physical activity. The HBSC collects information on students in Grades 6 to 10 in Canada and worldwide. The use of the HBSC survey for sampling has been established in the literature and validated as a measurement (Currie et al., 2012). Two separate scales were created for physical activity. All questions were standardized using *z* scores because items for physical activity were on different scales.

Summer Physical Activity Behavior. The Summer Physical Activity Behavior scale measured students' perceived summertime physical activity level. The scale included two items (α = .77) answered on an 8-point and a 9-point scale. A sample item was "During this past summer over a typical or usual week, on how many days were you physically active for a total of at least 60 minutes per day?" with answers ranging from 0 days to 7 days.

Physical Activity Behavior. The Physical Activity Behavior scale measured students' physical activity level during the school semester. There scale included five items (α = .84) answered on scales ranging from 1 to 6 and 1 to 9. An example item was "Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?" with answers ranging from 0 days to 7 days.

Data Analysis

Preliminary Data Analysis

Cases were scanned for missing data and outliers. Two participants were removed because there were insufficient usable data from either case. Due to the inherent differences between males and females of this age group as examined in previous TPB (e.g., Craig et al., 1996; McEachan et al., 2011) and physical activity (e.g., Lim & Wang, 2009; Prusak et al., 2004) studies, these two groups were compared at Time Point 1 with independent-samples *t* tests

that determined if further analyses would need to be conducted with males and females separately. Chi-square tests were conducted in the examination of other potential differences between males and females.

In the examination of preexisting differences, independent-sample *t* tests using Time Point 1 TPB and physical activity scales with males and females separated due to initial differences were run for students who were taking PHE during the semester of data collection versus students who were not taking PHE during the semester of data collection. Chi-square tests were completed for all noncontinuous categorical variables (i.e., whether or not students participate in organized physical activity outside of school and whether or not students have gym memberships outside of school). The Summer Physical Activity Behavior scale was treated as a covariate, and this ensured that the preexisting differences on the given variables were adjusted for in the analyses. Quantitative data were analyzed through descriptive statistics (e.g., means and standard deviations).

Multiple Analysis of Covariance (MANCOVA)

A MANCOVA was run due to initial differences between students in PHE and students not in PHE on the Summer Physical Activity Scale. A 2 (condition: in PHE/not in PHE) × 2 (time: Time Point 1/ Time Point 2) × 2 (TPB status: above the mean/below the mean) mixed between-within-subjects MANCOVA was used, wherein condition and TPB status were the between-subjects factors and time was a within-subject factor. Follow-up univariate ANCOVAs were then examined. All data analyses were performed with IBM SPSS software.

Results

Preliminary Analysis

Table 1 shows means and standard deviations for all variables for males and females taking or not taking PHE first semester. Table 2 shows correlations for all Time Point 1 and Time Point 2 variables. Independent-samples *t* tests showed that females significantly differed from males in (1) Attitude, (2) Perceived Behavioral Control,

and (3) Physical Activity Behavior (see Table 3). A chi-square test found a significant relationship between gender and having a gym membership outside of school, $\chi^2(1, N = 223) = 10.02$, $p = .001$, with a greater number of males reporting having a gym membership relative to females. Due to the differences in initial characteristics of males and females and their unequal division across PHE first semester versus no PHE first semester, further analyses were run with males and females separately.

Table 1

Means and Standard Deviations of Variables for Males and Females Taking PHE and Not Taking PHE First Semester

	Males taking PHE (*N* = 55)	Males not taking PHE (*N* = 29)	Females taking PHE (*N* = 53)	Females not taking PHE (*N* = 53)
Variable	***M* ± *SD***	***M* ± *SD***	***M* ± *SD***	***M* ± *SD***
Attitude Scale T1	5.90 ± 1.09	5.82 ± 1.03	5.61 ± 1.13	5.53 ± 1.06
Attitude Scale T2	6.01 ± .89	5.91 ± 1.01	5.81 ± .96	5.50 ± .89
PBC Scale T1	6.23 ± 1.08	6.07 ± .77	5.81 ± 1.19	5.90 ± .91
PBC Scale T2	6.24 ± .91	6.22 ± .86	5.81 ± .99	5.81 ± 1.10
SN Scale T1	5.69 ± 1.07	5.74 ± 1.08	5.51 ± 1.02	5.65 ± .91
SN Scale T2	5.54 ± 1.16	6.01 ± .96	5.71 ± .96	5.72 ± .95
PA Intentions Scale T1	6.07 ± 1.16	5.89 ± 1.22	5.66 ± 1.24	5.82 ± 1.12
PA Intentions Scale T2	5.98 ± 1.03	5.84 ± 1.25	5.81 ± 1.11	5.78 ± 1.08
PA Behavior Scale T1	.21 ± .71	.16 ± .74	-.09 ± .68	-.28 ± .87
PA Behavior Scale T2	.36 ± .63	.19 ± .93	-.19 ± .69	-.27 ± .87
Summer PA Scale T1	-.04 ± .90	.23 ± .89	-.24 ± .94	.11 ± .84
Summer PA Scale T2	.15 ± .88	.22 ± .77	-.28 ± 1.02	.11 ± .78

Note. Questions were answered on a 7-point Likert-type scale except for Physical Activity Behavior Scale and Summer Physical Activity Scale which were changed to standardized scores. PHE = physical and health education; T1 = Time Point 1; T2 = Time Point 2; PBC = perceived behavioral control; SN = subjective norms; PA = physical activity.

Table 2
Correlations Between Variables for Time Point 1 and Time Point 2

Variable	1	2	3	4	5	6	7	8	9	10
1. Gender	—	.14*	-.09	-.22**	-.17*	-.17*	-.10	-.13	-.25**	-.10
2. Taking PHE	.15*	—	.04	.07	-.05	-.01	.07	-.00	-.12	.17*
3. PA Outside School	-.08	.10	—	.03	.30**	.32**	.19**	.34**	.38**	.13
4. Gym Membership	-.15*	.01	-.08	—	.15*	.16*	.04	.17*	.26**	.13
5. Attitude Scale	-.12	-.15*	.36**	.18**	—	.75**	.49**	.84**	.66**	.47**
6. PBC Scale	-.20**	-.01	.30**	.16*	.61**	—	.42**	.70**	.56**	.33**
7. SN Scale	-.01	.05	.31**	.12	.50**	.46**	—	.44**	.39**	.33**
8. PA Intentions Scale	-.08	-.07	.34**	.23**	.78**	.63**	.57**	—	.64**	.45**
9. PA Behavior Scale	-.31**	-.07	.46**	.20**	.57**	.48**	.37**	.64**	—	.52**
10. Summer PA Scale	-.17**	.11	.25**	.12	.43**	.31**	.29**	.45**	.50**	—

Note. Items above the diagonal represent Time Point 1 data; items below the diagonal represent Time Point 2 data. PA = physical activity; PBC = perceived behavioral control; SN = subjective norms.

*$p < 0.05$. ** $p < 0.001$.

Table 3
Independent-Samples t Tests for Males and Females

	Males	Females	
Variable	***M* ± *SD***	***M* ± *SD***	***t***
Attitude	5.90 ± 1.01	5.55 ± 1.08	2.51*
PBC	6.19 ± .96	5.83 ± 1.05	2.60*
PA Behavior	.20 ± .73	-.18 ± .77	3.73**

Note. Questions were answered on a 7-point Likert-type scale except for PA Behavior, which was changed to standardized scores. PBC = perceived behavioral control. PA = physical activity.

*p = .01. **p < 0.001.

Independent-samples t tests showed that males who were in PHE and males who were not in PHE were not significantly different at Time Point 1. There was a significant difference between the females taking PHE (M = -.26, SD = .95) and the females not taking PHE (M = .10, SD = .84) for the Summer Physical Activity Scale, $t(114)$ = -2.09, p = .04, with the females who were taking PHE first semester reporting less summertime physical activity than the females not taking PHE first semester. Thus, the Summer Physical Activity Scale was controlled for in all subsequent analyses. There were no significant differences from the chi-square tests between students in PHE and students not in PHE when students were separated by gender.

MANCOVA Analysis

Students were divided by TPB status using a score created for each individual who completed both time points. The score was based on the average of the three TPB constructs and Physical Activity Intentions, resulting in the TPB status variable. There was a mean total of 1.56 (SD = .16) for the males who completed both time points (n = 84) and a mean total of 1.50 (SD = .17) for the females who completed both time points (n = 106). Participants were separated into two groups based on their score in relation to the mean total. Those with scores above the mean were placed in the higher group and those with scores below the mean were placed in

the lower group. Two MANCOVAs were run (for males and females separately).

MANCOVA for Males

Of the 55 males taking PHE and completing both time points, 30 scored higher than the mean on TPB status and 25 scored lower than or equal to the mean on TPB status. Of the 29 males not taking PHE, 14 scored higher than the mean on TPB status and 15 scored lower than or equal to the mean on TPB status.

There was a significant effect of time on TPB constructs, Physical Activity Intentions, and Physical Activity Behavior, Wilks' Λ $F(5, 70) = 13.21$, $p < .001$, partial $\eta^2 = .49$. There was no significant effect for (1) condition; (2) the interaction between condition and TPB status; (3) the interaction between condition and time; (4) the interaction between TPB status and time; and (5) the interaction among time, TPB status, and condition. To examine which dependent variables were driving these multivariate responses, this study examined follow-up univariate analyses of covariance (ANCOVAs).

There was a significant difference from Time Point 1 to Time Point 2 (across condition and TPB status) on (1) Perceived Behavioral Control, $F(1, 74) = 8.76$, $p = .004$, partial $\eta^2 = .11$, with males reporting greater Perceived Behavioral Control at Time Point 1 ($M = 1.60$, $SD = .19$) compared with Time Point 2 ($M = 1.54$, $SD = .19$); (2) Subjective Norms, $F(1, 74) = 13.24$, $p = .001$, partial $\eta^2 = .15$, with males reporting greater Subjective Norms at Time Point 2 ($M = 1.50$, $SD = .21$) compared with Time Point 1 ($M = 1.42$, $SD = .20$); and (3) Physical Activity Intentions, $F(1, 74) = 12.33$, $p = .001$, partial $\eta^2 = .14$, with males reporting greater intentions to be physically active at Time Point 1 ($M = 1.61$, $SD = .22$) compared with Time Point 2 ($M = 1.54$, $SD = .22$).

MANCOVA for Females

Of the 53 females who were taking PHE, 26 scored higher than the mean on TPB status at Time Point 1 and 27 had scores lower than or equal to the mean on TPB status. Of the 53 females who were not taking PHE, 28 scored higher than the mean on TPB status and 25 scored lower than or equal to the mean on TPB status.

There was a significant effect for the multivariate portion of the MANCOVA for (1) condition, Wilks' Λ $F(5, 94) = 3.29$, $p = .009$, partial $\eta^2 = .15$, and (2) time, Wilks' Λ $F(5, 94) = 15.60$, $p < .001$, partial $\eta^2 = .45$. There were no significant effects for (1) the interaction between TPB status and condition; (2) the interaction between time and condition; and (3) the interaction among time, condition, and TPB status. To examine which dependent variables were driving the multivariate responses, this study examined follow-up univariate ANCOVAs.

There was a significant effect of time from the beginning to the end of the semester (across condition and TPB status) on (1) Perceived Behavioral Control, $F(1, 98) = 32.66$, $p < .001$, partial $\eta^2 = .25$, with females reporting decreased Perceived Behavioral Control from Time Point 1 ($M = 1.54$, $SD = .20$) to Time Point 2 ($M = 1.45$, $SD = .20$); (2) Subjective Norms, $F(1, 98) = 27.31$, $p < .001$, partial $\eta^2 = .22$, with reported Subjective Norms increasing from Time Point 1 ($M = 1.40$, $SD = .19$) to Time Point 2 ($M = 1.50$, $SD = .19$); and (3) Physical Activity Intentions, $F(1, 98) = 10.84$, $p = .001$, partial $\eta^2 = .10$, with females overall decreasing their intentions to be physically active from Time Point 1 ($M = 1.55$, $SD = .22$) to Time Point 2 ($M = 1.50$, $SD = .21$).

There was a significant effect of condition (across time and TPB status) on (1) Attitude, $F(1, 98) = 10.0$, $p < .002$, partial $\eta^2 = .09$, with females who were in PHE ($M = 1.53$, $SD = .20$) reporting overall higher Attitude toward physical activity than females who were not in PHE ($M = 1.48$, $SD = .17$), and (2) Physical Activity Behavior, $F(1, 98) = 6.78$, $p = .01$, partial $\eta^2 = .07$, with females in PHE ($M = -.15$, $SD = .70$) reporting higher Physical Activity Behavior than females not in PHE ($M = -.33$, $SD = .85$).

Overall for both males and females, there was a significant effect of time (independent of condition and TPB status) where Perceived Behavioral Control and Physical Activity Intentions decreased over the semester and Subjective Norms increased over the semester. For females alone, there was a significant effect of condition (independent of time and TPB status), where at both time points females in PHE reported higher Physical Activity Behavior and more positive attitudes than females not in PHE.

Discussion

The purpose of this study was to evaluate the effectiveness of high school PHE classes at meeting their objective of promoting physical activity, specifically changes in students' perceptions of physical activity over the semester. The first research question compared changes in TPB constructs and Physical Activity Intentions from the beginning to the end of a semester between students taking Grade 9 PHE and those not taking Grade 9 PHE. There were no significant interactions between condition, indicating that enrollment in PHE had no effect on change in physical activity intentions or TPB constructs over the study period.

One reason for this lack of change could be that PHE class does not have any effect on changing students' intentions to be physically active or on their feelings toward physical activity. Much research has suggested that PHE classes are a prime location for targeting physical activity promotion among adolescents (e.g., Stone et al., 1998; Trost, 2006). However, most research contexts have included an external intervention that contributes to a change. For example, Chatzisarantis and Hagger (2005) aimed to change students' physical activity behavior by focusing messaging around beliefs about physical activity. Further, a meta-analysis by Ringuet and Trost (as cited in Trost, 2006) that examined school-based physical activity interventions found interventions within school PHE classes to be the most effective way of promoting physical activity. Perhaps for a positive change to occur in PHE class, PHE teachers should implement the content of these specific research-supported interventions on a regular basis to promote positive physical activity behavior change. In this study, there was no external intervention implemented in the PHE classes. Thus, perhaps PHE courses are not currently as effective as they have the potential to be in promoting physical activity.

Another plausible logistical explanation for no change was the first time-point data being taken after students had already been enrolled or not enrolled in PHE class for a relatively extended period (i.e., minimum of 2 weeks, maximum of 6 weeks). It is possible that the first time-point data needed to be taken during the summer before students had access to PHE class (or not) in high school for change to occur. In addition, the males in this study initially

reported high TPB construct scores and physical activity intentions, which left little room for potential increases (i.e., ceiling effect). The average reported TPB constructs and physical activity intentions for both males and females were relatively positive at both time points whether they were in PHE or not in PHE, which could suggest that something about the school environment promoted (or at least did not hinder) a positive physical activity environment external to PHE class (e.g., Wechsler et al., 2000).

Although no main interaction effects were found from the MANCOVAs with respect to condition, significant main effects were found for other independent variables. First, for both males and females, there was a significant effect of time. Overall, students, regardless of gender, significantly decreased their reported Physical Activity Intentions over time. In addition, students reported that Perceived Behavioral Control became more negative (i.e., difficult) over the semester.

The findings that students have decreased feelings of Perceived Behavioral Control and decreased intentions to be physically active could be a precursor to a potential upcoming drop-off in physical activity behavior that is often noted for this age group (Dumith et al., 2011). The strongest predictor of Physical Activity Behavior tends to be Physical Activity Intentions (Ajzen, 2011), and in this study there was a decrease in Physical Activity Intentions, but not in Physical Activity Behavior. This decline could indicate that although students feel less likely to engage in physical activity (i.e., intentions), there is a delay while they still maintain their Physical Activity Behavior for at least the first semester of high school before the regularly predicted decline in Physical Activity Behavior.

Something inherent about students' experiences of entering Grade 9, independent of PHE class, may have also influenced them toward lower reports of intentions to be physically active and lower perceptions of behavioral control over their first semester of high school. These findings of changing physical activity perceptions during a time of transition and for this age group are common (e.g., Dumith et al., 2011; Garcia et al., 1998). The students who were involved in this study were all transitioning from elementary school or middle school to high school.

Although Perceived Behavioral Control and Physical Activity Intentions decreased across the participants, reported Subjective Norms regarding physical activity increased over the semester. It is possible that the students reported increased Subjective Norms because they perceived their classmates or their school environment as having more positive views toward physical activity (Reid et al., 2015). As the semester continued, students would have spent increasingly more time in the environment and may have become more integrated into an overall school culture that values physical activity.

Second, there was a significant effect of condition for females on Attitude. Females taking PHE reported more positive attitudes toward physical activity at both time points relative to females who were not in PHE. The effect size was small (partial $\eta^2 = .09$), indicating that while there was a significant difference between the two groups, it was minimal. Females may have had a higher Attitude in PHE class at both time points than those not in PHE class because they already had a few weeks of PHE class prior to the initial time point. Based on a review of correlates of physical activity in adolescents, Sallis et al. (2000) determined that attitude toward physical activity was one of the modifiable factors that could help change physical activity behaviors. For females who already have a tendency to start lower than males in terms of attitude toward physical activity (Garcia et al., 1998), PHE class may have some positive impact, despite the small effect, and PHE class may be a context in which to modify females' attitudes toward physical activity. Thus, while information from this study is inconclusive, further research is necessary to understand if and how PHE classes can most effectively be utilized for positive impact on adolescent females' attitudes toward physical activity.

The second research question compared changes in physical activity behavior from Time Point 1 to Time Point 2 between those enrolled in PHE courses and those not enrolled in PHE courses. There were no significant interactions, indicating that enrollment in PHE had no effect on change in Physical Activity Behavior. This result could be attributed to similar reasons as presented for the lack of change in TPB constructs and Physical Activity Intentions (i.e., PHE ineffective at promoting physical activity behavior change except under intervention conditions [Stone et al., 1998], timing of

questionnaire administration, ceiling effect for males, and positive physical well-being environment [Wechsler et al., 2000]).

However, there were significant effects for other independent variables. For condition, there was a significant effect with females who were taking PHE classes reporting greater Physical Activity Behavior across both time points relative to females not taking PHE. These results were not replicated for the males. There was no decline in males' physical activity behavior reported despite this age group often being cited as having declining physical activity levels (Dumith et al., 2011).

Females experience a greater drop-off in physical activity levels relative to males in this age group (Dumith et al., 2011). Considering that females in PHE reported higher Physical Activity Behavior relative to females not in PHE and that Physical Activity Behavior did not change between time points (despite no initial differences between groups), there is some factor influencing the higher reported Physical Activity Behavior. It is plausible that PHE class caused females to report higher physical activity behavior because of the increased time doing physical activity in the PHE class.

In addition, given that one of the barriers to physical activity for this age group is access to facilities (Sallis et al., 2000), PHE class may help adolescent females by providing a space to be involved in physical activity that they might not otherwise have access to—or choose to participate in—outside of PHE classes. In line with this hypothesis and the lack of change over time, students who were involved in PHE would have already had access to this physical/environmental resource at the first time point.

PHE curriculum in Ontario includes an expectation that PHE classes will provide students with opportunities to understand "the importance of physical fitness, health, and well-being and the factors that contribute to them" (OME, 1999, p. 2). This expectation targets an understanding of the importance of physical activity, which is representative of Attitude toward physical activity. In addition, the PHE courses aim to provide students with an opportunity for "a personal commitment to daily vigorous physical activity and positive health behaviors" (OME, 1999, p. 2), which aims directly to improve Physical Activity Behavior (or maintain it). Thus, PHE classes in Ontario should be actively working toward changing students'

perceptions of PHE by providing lessons that target understanding of why physical activity is good, in addition to making students feel competent and encouraging them to participate in regular physical activity behavior. On the basis of this study, it seems there is not an overall large effect in doing so, but it would be interesting to understand what teachers are doing that is helping or hindering these efforts.

Limitations

One limitation of this study was the timing of two data collection points. Given the length of the high school semester and time constraints (i.e., inability to access schools until principals returned from summer holidays), it was necessary to collect the first time-point data during late September and early October when students had already been in school and had either been taking or not taking PHE for a full month prior to the initial data being collected. This may have had implications for the significant difference between females who were in PHE compared to females not in PHE in attitudes and physical activity behavior and the lack of change between the two time points. More longitudinal research needs to follow students who continued to take PHE in future years of high school to determine if they continued to derive more benefit from PHE or if the initial PHE benefit was all they received.

Another limitation was the use of self-report questionnaires in the measurement of both feelings toward physical activity and actual physical activity behavior. Thus, the measures taken might be inflated or inaccurate. However, the measures used for both the TPB questionnaire and physical activity questionnaire were validated instruments that used questions designed to elicit from the participants responses that were as accurate as possible (Hagger et al., 2002). Similar findings that correspond to previous research lend support to the convergent validity of the use of this theory and thus allow meaningful interpretation of these findings. Future research should attempt to measure physical activity behavior through both observation and accelerometer data to lend insight into the overall PHE class behavior and attitudes that were found for females.

Conclusion

Although some findings from this study indicate potential implications of the use of PHE classes as a public health promotion tool in Ontario, there is a need for future research to clarify and/or replicate the findings. PHE teachers should focus on changing attitudes toward physical activity by targeting salient beliefs through presenting the positive effects of regular physical activity participation. Ensuring that information such as the positive implications for regular exercise in PHE classes is available could help instill appropriate beliefs for students regarding physical activity and thereby increase the likelihood of regular physical activity participation. The provider of the messaging (e.g., PHE teacher, health care provider, university/college student/intern) should also be considered.

Additionally, because adolescents of this age group, females in particular, have such a large drop-off in physical activity level, it would seem important to investigate physical activity policies at the secondary school level and consider including more regular mandatory participation in physical activity. Warburton et al. (2006) noted that physical inactivity prevalence is the highest of all modifiable risk factors for various illnesses, and yet PHE is still not mandated in high schools in Ontario beyond one credit (OME, 2016). Many of the issues associated with declining enrollment and effectiveness of PHE courses could be remedied with changing school policies to further enhance student opportunities for PHE and promotion of student health. If PHE were mandated throughout high school, then perhaps physical activity in the adolescent age group would not drop off so drastically. School policies could be revised to provide more opportunity for mandatory physical activities beyond one semester course.

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