Development And Evaluation Of An Intervention Based On The Theory Of Planned Behaviour In Promoting Leisure Time Physical Activity Participation

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Abstract

Building upon tenets of the theory of planned behavior, the present study examined whether a an intervention program that aimed to change control beliefs and behavioral beliefs (combined program) was more successful in promoting physical activity intentions and behavior than school-based intervention programs that aimed to change control beliefs only or behavioral beliefs only. Participants were two hundred and nine young students and were recruited from 6 schools (*Male* = 106, *Female* = 103, *Age* = 14.35, *SD* = .50). Results indicated that while the combined intervention program promoted physical activity intentions over and above all other intervention programs, it was as effective in promoting participation in physical activities as the program that targeted control beliefs. Additional analysis indicated that the intervention that targeted behavioral beliefs did not influence physical activity participation. Overall, the findings suggest that it is possible to promote participation in physical activities through cost-effective interventions that target control beliefs only.

Keywords: Theory of planned behavior, additive effects, physical activity behavior

Using The Theory of Planned Behavior To Examine Utility of A School-Based Intervention That Targeted Control Beliefs and Behavioral Beliefs In Promoting Physical Activity Intentions and Behavior

A number of studies have documented that physical activity is beneficial to health and psychological well-being (U.S. Department of Health and Human Services, 1996). However, we currently have limited knowledge of the mechanisms responsible for compliance (Haynes, McDonald, Garg, & Montague, 2003). One reason for this is due to the fact that content of physical activity interventions is not linked to theories of social behavior despite that these theories have been shown to successfully predict and explain health behavior (Hardeman, Johnston, Johnston, Bonetti, Wareham, & Kinmonth, 2002). Therefore, there is still a need for theoretically-guided research that furthers researchers' and practitioners' understanding of the nature of physical activity participation. The present study adopts tenets of the theory of planned behavior to develop and evaluate effectiveness of a brief intervention in changing young people's physical activity intentions and behavior. The study targeted young people because of the increased obesity rates that characterize this population.

The Theory of Planned Behavior

The theory of planned behavior proposes that behavior is function of a person's intention, which is an indicator of how hard people are willing to try, and how much effort people plan to exert toward performance of behavior (Ajzen, 1991, 1998). The theory also proposes that intention is an additive function of three variables: attitudes (positive or negative evaluation of performing the behavior), subjective norms (perceived influences that significant others may exert on the execution of behavior), and perceived behavioral control (the extent to which people believe that they can control performance of social behavior). This notion of "additivity" means

that the combined effect of attitudes, subjective norms and perceptions of control produce, when used in combination, an effect that is greater than the sum of their separately measured individual effects related to attitudes, subjective norms or perceptions of control (Ajzen & Fishbein, 1980). An implication of "additivity" is that interventions that target all antecedents of intentions will be more effects in promoting physical activity intentions and behavior than specific interventions that target attitudes, subjective norms or perceptions of control only.

The theory of planned behavior also deals with antecedents of attitudes, subjective norms and perceived behavioral control. The theory proposes that attitude is a multiplicative function of beliefs that behavior will lead to certain consequences (behavioral beliefs) and evaluations of these consequences (Ajzen, 1991). Changing a person's physical activity attitudes requires changing the salient beliefs regarding the consequences or the evaluation of those consequences. Subjective norms and perceived behavioral control are also proposed to be function of normative beliefs and control beliefs respectively. Subjective norms are determined by a combination of normative expectations of specific referent groups (normative beliefs) and a motivation to comply with those groups (Ajzen, 1991). Changing subjective norms requires changing what an individual perceives a specific referent group would want and the individual's desire to comply with the opinion of that group. Perceived behavioral control is determined by beliefs about the presence of barriers that may impede performance of behavior (control beliefs) and a perceived power of these barriers (Ajzen, 1991). Therefore, the key to changing perceived behavioral control lies in changing beliefs that behavioral barriers are relatively easy to overcome. Overall, according to the theory of planned behavior, physical activity behavior and intentions can change through attitudes, subjective norms, or perceptions for control and/or by changing a combination of these three variables.

Persuasive Communication As A Strategy For Behavioral Change

Ajzen (1998) suggested that persuasive communication is a strategy of behavioral change that can be used to alter intentions and behavior. In general, a persuasive communication involves *belief-targeted messages* that target modal salient behavioral, normative, and/or control beliefs (see also Bright, Manfredo, Fishbein, & Bath,1993). Modal salient beliefs can be elicited by asking a representative group of participants (Chatzisarantis and Hagger 2005) to list (i) advantages (benefits) and disadvantages (disbenefits) of performing the behavior in question (behavioral beliefs), (ii) groups or individuals who are important to participants (normative beliefs) and (iii) factors that may impede performance of behavior (control beliefs or barriers) (Ajzen, 2003). The actual structure of belief-targeted messages involves a set of arguments that are in favor of physical activity behavior (Ajzen & Fishbein, 1980). These arguments should also emphasize salient beliefs of physical activity such as salient benefits or provide strategies for overcoming salient barriers. In addition, the messages should aim to enhance the credibility of the arguments and/or include factual evidence designed to support the arguments (Ajzen & Fishbein, 1980).

The theory of planned behaviour has been one of the most influential and widely-cited models of intentional behaviour in social psychology (Armitage and Conner 2001). Despite this, the majority of health interventions are not based on such rigorous theory; a fact that may partly explain why the effects of interventions have been relatively modest in effecting health behaviour change (see Chatzisarantis & Hagger, 2005; Hardeman et al., 2002; Webb & Sheeran, 2006). Nevertheless, the few experimental and intervention studies that adopted the theory have been relatively successful in changing physical activity intentions but less so in changing physical activity behaviour (Webb & Sheeran, 2006). For example, Darker, French, Eves and

Sniehotta (2010) have provided support for effectiveness of persuasive messages addressing control beliefs and perceptions of control in promoting intentions to walk and actual walking (see also Jones et al., 2005; Sniehotta, 2009). However, these interventions focused on adults and not on young people. A recent small scale intervention, conducted by Chatzisarantis and Hagger (2005), did focus on young people but found mixed results. Specifically, it was shown that while an intervention that targeted behavioural beliefs was successful in changing attitudes and physical activity intentions, the intervention did not change physical activity behaviour. The absence of a behavioural effect is also consistent with a recent meta-analysis showing that changes in intentions do not always lead to behaviour (Sniehotta, 2009; Webb & Sheeran, 2006).

The present study aimed to extend previous work on physical activity interventions among young people. A limitation of previous intervention studies was that they did not target behavioural beliefs and control beliefs simultaneously. This is despite the fact that previous prospective studies have identified attitudes and behavioural control as important antecedents of physical activity intentions (Hagger et al., 2002, 2007). This might have been a reason for the lack of behavioural change found in previous studies (i.e., Chatzisarantis & Hagger 2005). Targeting control beliefs may be necessary for promoting physical activity behaviour considering that lack of control over a behaviour has been identified as a factor that reduces intentions and physical activity participation (Hagger et al., 2007).

Another unique aspect of the present study was that it examined for the first time whether effects of behavioural beliefs and control beliefs on intentions were additive. In addition, the present study examined whether such additive effects are mediated by attitudes and perceptions of control. The issue has theoretical importance because in the prospective of the theory of planned behavior the effects of beliefs on intentions and behavior are additive (Ajzen, 1991). The

present study tested for additive effects because it compared a combined intervention that aimed to change behavioural beliefs and control beliefs with a more specific intervention that targeted behavioural beliefs only and a second specific intervention that targeted control beliefs only. In general, an additive effect is borne out in data if the combined intervention is more effective in promoting physical activity intentions and behaviour than the specific intervention programs that target behavioural beliefs or control beliefs. The present study did not target subjective norms because previous research showed that subjective norms did not exert a significant effect on intentions (Hagger et al., 2007). However, subjective norms were measured in order to control for the influences that peers and other significant figures may have exerted on physical activity intentions and participation.

Overview of the Study and Hypotheses

The present study built upon previous applications of the theory of planned behavior to develop and evaluate utility of belief-targeted messages in changing attitudes, perceptions of control, intentions and physical activity behavior of young people. Our intervention was a school-based intervention that aimed to change (i) attitudes through messages that targeted behavioral beliefs and (ii) perceptions of control through a message that targeted salient control beliefs (Hagger et al., 2002b). In addition, we implemented booster sessions within the program so that we could maximize effects of persuasive messages on physical activity intentions and behavior. Booster sessions were doses of the original intervention that were delivered throughout the intervention program by teachers. The teachers were instructed to deliver the persuasive messages twice per week throughout the intervention program. Our main hypothesis was that a persuasive message that targeted attitudes and perceptions of control (via salient behavioral beliefs and control beliefs) would be more effective in changing physical activity intentions and

behavior than an intervention that targeted attitudes only or an intervention that targeted perceptions of control only. The theoretical implication of this hypothesis is that effects of behavioral beliefs and control beliefs on intentions and behavior are additive (Ajzen, 1991).

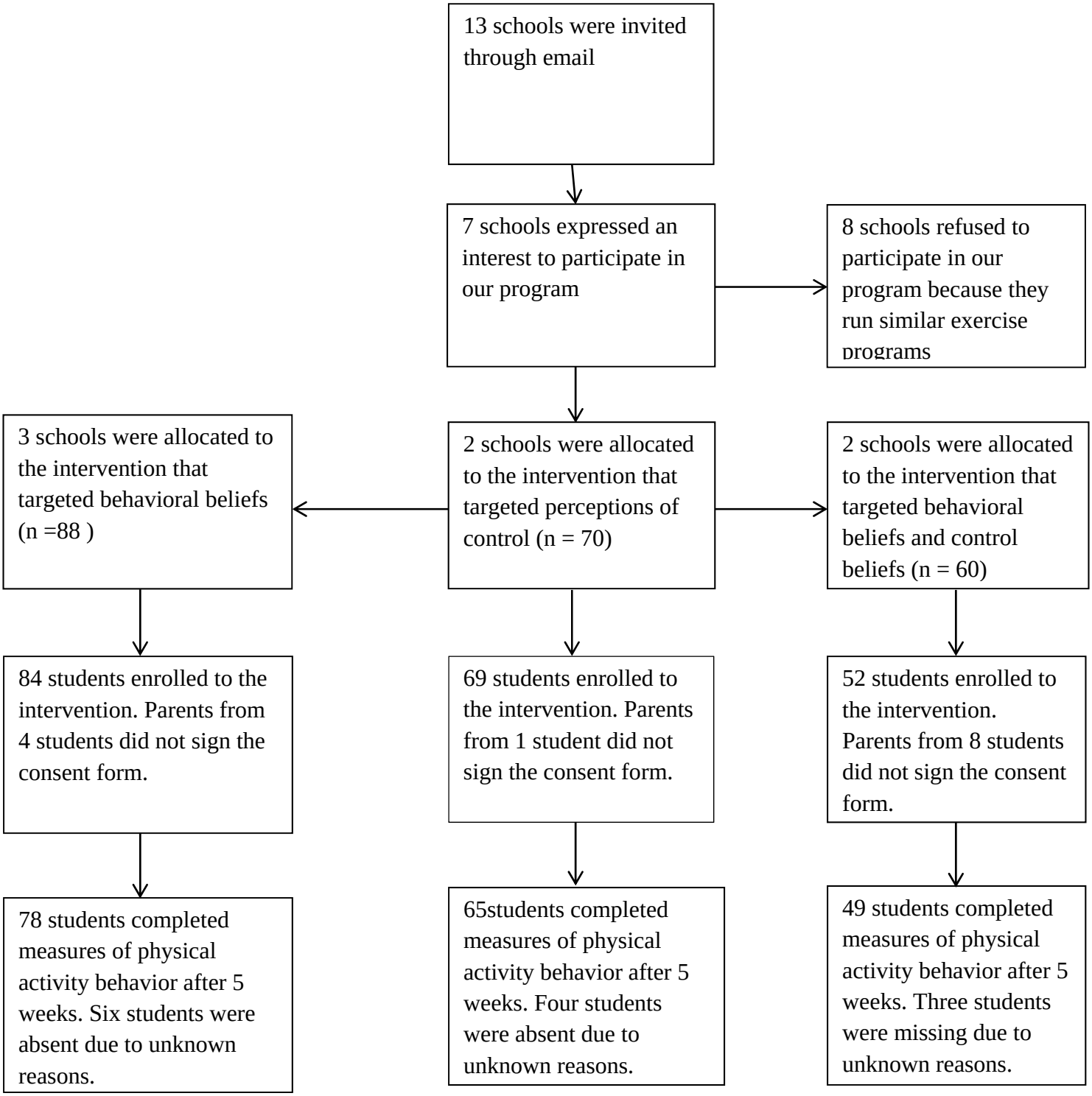
The second purpose of the present study was to examine the process by which persuasive messages influenced physical activity intentions and behavior. We hypothesized that our intervention that targeted behavioral beliefs and control beliefs would influence intentions via attitudes and perceptions of control. This is because, in the perspective of planned behavior theory, salient behavioral beliefs and salient control beliefs determine attitudes and perceptions of control respectively (Ajzen, 1991). Empirically, this means that effects of persuasive messages on intentions and physical activity behavior would be mediated by attitudes and perceptions of control.

Method

Research Participants

The intervention was initially advertised to head teachers of 13 schools via emails. Head teachers from 7 schools expressed an interest. The inclusion criteria were that participants must have been between the ages of 14–16 years, and had physicians permission to participate in physical education classes. The students and their parents were given information sheets explaining risks and benefits of the study. In addition, we seek and obtained parental consent. Thirteen students could not participate in the study because their parents did not sign the consent form. This resulted in 209 young individuals participating in the study (*Male* = 106, *Female* = 103, *Age* = 14.41, *SD* = .54). A consort diagram is presented to show the flow of participants through the intervention (Figure 1).

Figure 1. Consort flow diagram, of participants through the interventions



Research Design

The target activity was exercising for 40 minutes at a time, four times per week, over five weeks. The experiment employed an one-way factorial design with three conditions. In an attitude condition, participants studied a message that targeted modal salient behavioral beliefs (*Male* = 47, *Female* = 37, *Age* = 14.39, *SD* = .51). In the perceived control condition, participants studied a message that targeted modal salient control beliefs (*Male* = 33, *Female* = 36 , *Age* = 14.51, *SD* = .53). In a combined condition, participants studied a message that targeted modal salient control beliefs and behavioral beliefs (*Male* = 26, *Female* = 30, *Age* = 14.32, *SD* = .61).

Procedure

The experiment was run in schools. Persuasive messages were communicated at the end of physical education classes. Specifically, students read a definition of leisure time physical activity adopted from Godin and Shephard (1985). This definition explained the meaning of mild, moderate, and vigorous physical activity. Participants were told that we were interested in the amount of vigorous physical activity that they undertook during their leisure time and not during school time. Participants were also asked to give examples of vigorous leisure time physical activities and they were encouraged to ask questions about the distinction between leisure time and school-time physical activity.

After explaining the definition of leisure time physical activity, the experimenter informed the participants that the study required from them to actually engage in vigorous physical activities, 4 days per week, for at least 40 minutes each time, over the next five weeks, during leisure time. Immediately after, the experimental manipulations were conducted. Manipulations took the form of written persuasive messages that were presented in a paper. The experimenter also read the persuasive messages to participants. Thereafter, participants

completed questionnaire containing measures related to constructs of the theory of planned behavior and past behavior. Measures of past behavior were used to ascertain whether participants who were allocated to different conditions did not differ on exercise habits.

Finally, after five weeks, participation in physical activity during leisure-time was measured through Godin and Shephard's (1985) Leisure-Time Exercise Questionnaire. Participants reported their physical activity behavior at the end of physical education classes. The experimenter prompted participants to consider the amount of vigorous physical activity they undertook during their leisure time only, and not physical activity done during school time. Participants were also asked to give examples of vigorous physical activities that had undertaken outside school time and they were encouraged to ask questions about leisure time physical activity.

Interventions

Intervention that targeted behavioral beliefs (attitudes). Development of the persuasive communication that targeted modal salient behavioral beliefs was based on Hagger et al.'s (2001) study that identified modal salient behavioral beliefs of young people. These behavioral beliefs reflected outcomes related to "having fun", "stay fit", "improve skills", "getting an injury" and "feeling hot and sweaty". In accordance with Ajzen and Fishbein's (1980) recommendations, the actual structure of the message that targeted salient behavioral beliefs consisted of arguments that were in favor of physical activity behavior and of credible evidence designed to support the arguments (see also Chatzisarantis & Hagger, 2005). Specifically, participants in the behavioral belief condition studied the following message for five minutes:

> Scientific studies have indicated that participating in vigorous physical activities outside of your PE lessons (during your leisure time) for at least 40 minutes a time, 4 days per week, for 5 weeks, helps you get fit and stay in shape. Research has also shown that by exercising regularly you can improve your physical skills (i.e. coordination, strength) and fitness levels. Experts in the area of physical activity and health have also documented that if you exercise with care, you can reduce considerably the risk of getting an injury. In addition, you can avoid feeling hot and sweaty if you exercise for an appropriate duration (i.e. 40 minutes at a time). Overall, exercising during your leisure time is great fun and worthwhile doing on a regular basis.

Teachers were also instructed to deliver the message twice per week throughout the intervention program. Because the intervention program lasted 5 weeks, students could attend to the message for a maximum of 10 times.

Intervention that targeted control beliefs (perceived behavioral control). Development of the persuasive communication that targeted modal salient control beliefs was also based on Hagger et al.'s (2001) study that identified modal salient control beliefs of young people. These control beliefs reflected barriers related to "other hobbies", "weather", "doing homework", and "not being good at sports". The actual structure of the message that targeted salient control beliefs consisted of arguments that provided solutions related to overcoming these barriers. Specifically, participants in the behavioral belief condition studied the following message for five minutes:

> It is common for young people like you to think that participating in vigorous physical activities outside of your PE lessons (during your leisure time) for at least 40 minutes a time, 4 days per week the following five weeks is difficult to do because you have other

hobbies to do or because you have friends to meet. You can go around these problems by trying to exercise another day or time which is more convenient to you, by asking your friends meet another day/time or asking your friends exercise with you. Weather is also something that you may find out that does not help you exercising the next five weeks. However, you can solve this problem by exercising in a gym or at home. Of course, doing your school homework is a very important thing to do but you can exercise weekends and perhaps a day during the week after you completed your homework. Finally, some pupils do not exercise during leisure time because they think that they are not good at physical activities. However, you can go around this problem by choosing to engage in easier and more enjoyable physical activity tasks.

As with the intervention that targeted behavioral beliefs, teachers were instructed to deliver the intervention twice per week throughout the program. Therefore, students could attend to the control-based intervention for a maximum of 10 times.

Combined intervention that targeted behavioral beliefs (attitudes) and control beliefs (perceived behavioral control). In this combined condition, participants were asked to read a message that targeted behavioral beliefs and a message that targeted control beliefs. The order of messages was counterbalanced across participants. The content of these messages was identical to content of messages that targeted behavioral beliefs only or the message that targeted control beliefs only. Teachers were instructed to deliver this combined intervention twice per week throughout the program. Therefore, students could attend to the combined intervention for a maximum of 10 times.

Dependent Variables

Our dependent variables included assessments of components of the theory of planned behavior (attitudes, perceptions of control, subjective norms and intentions) and physical activity behavior measured at the end of the program. Three items drawn from Ajzen, (1991) were used to measure behavioral intentions. An example item was: “I intend to do active sports and/or vigorous physical activities, for at least 40 minutes, four days per week, during my leisure time, over the next five weeks”. This item was measured on 7-point scales anchored by “strongly disagree” (1) to “strongly agree” (7). The alpha coefficient for the intention measure was satisfactory (α = .94).

Subjective norms were measured through three items. An example item was: “Most people who are important to me would pressure me to do active sports and/or vigorous physical activities for at least 40 minutes, four days per week, during my leisure time, over the next five weeks.” This item was measured on 7-point scales ranging from “strongly disagree” (1) to “strongly agree” (7). Another item was: “Most people whose opinion I value would approve of my doing active sports and/or vigorous physical activities for at least 40 minutes, four days per week, during my leisure time, over the next five weeks”. This item was measured on a 7-point scale ranging from “very strongly disapprove” (1) to “very strongly approve” (7). The alpha coefficient for the subjective norms measure was below the widely accepted minimum of .70 (α = .22) (Chatzisarantis & Biddle, 1998).

Attitudes were assessed through five bipolar adjectives. One adjective reflected moral evaluations (bad/good), two adjectives reflected instrumental evaluations (useful/useless, harmful/beneficial), and two adjectives reflected affective evaluations (unenjoyable/enjoyable, pleasant/unpleasant). All adjectives were measured on 7-point semantic differential scales (Ajzen, 2003). An example item was: “For me doing active sports and/or vigorous physical activities for

at least 40 minutes, four days per week, during my leisure time, over the next five weeks….". The alpha coefficient for the attitude measure was satisfactory (α = .89).

Perceived behavioral control was assessed through three items on 7-point scales (Ajzen, 1991). Two items were measured on a 7-point scales ranging from (7) "strongly agree" to (1) "strongly disagree". An example item that was measured on this scale was: "I feel in complete control over whether I exercise for at least 40 minutes, four days per week, during my leisure time, over the next five weeks". Another item was measured on a 7-point scale ranging from (1) "no control" to (7) "complete control": "How much control do you believe you have over doing active sports and/or vigorous physical activities for at least 40 minutes, four days per week, during your leisure time, over the next five weeks?" The alpha coefficient for the perceived behavioral control measure was satisfactory (α = .93).

We used Godin and Shephard's (1985) Leisure-Time Exercise Questionnaire in measuring physical activity. Independent evaluations of this questionnaire found it to be valid, reliable, easy to administer, and to display concurrent validity with objective activities and fitness indexes (Jacobs, Ainsworth, Hartman, & Leon, 1993). The instrument contains three open-ended questions capturing the frequency of mild, moderate and vigorous physical activity. Because the present study targeted vigorous physical activity only, participants were asked to report the extent to which they engaged in vigorous physical activity the last five weeks. The stem item was: "During the last 5 weeks, how many times on average did you engage in active sport and/or vigorous physical activities for at least 40 minutes at a time?" Participants reported frequency with which they exercised the past five weeks on a seven point scale ranging from "not at all" (1) to "most of the days per week" (7).

Additional Variables (Covariates)

We also measured three additional variables namely age, dose of intervention and past behavior. We measured these variables in order to assess whether participants in different conditions did not differ on these variables. Teachers were instructed to record number of times they delivered the intervention sessions. Because teachers were asked to deliver the intervention twice per week over a five week interval of time, dose of intervention could range from 0 sessions to 10 sessions. We measured past behavior through the following item: "During the last six months, I have been doing active sports, and/or vigorous physical activities for at least 40 minutes at a time during my leisure time". This item was measured on a 7-point scale, ranging from "not at all" (1) to "most of the days per week" (7) (Bagozzi & Kimmel, 1995).

Results

Preliminary Analysis

A multivariate analysis of variance using the three intervention levels as independent variable and dose of intervention, age and past behavior as dependent variables revealed a statistically significant multivariate effect on the dependent variables (F (3) = 3.98, $p < .001$, η^2 = .06). Post-hoc univariate analysis pointed out statistically significant univariate effects on dose of intervention ($F(2) = 5.04$, $p < .01$, $\eta^2 = .05$). The effects on age ($F(2) = 1.86$, $p = .15$, $\eta^2 = .02$) or past behavior ($F(2) = 2.51$, $p = .08$, $\eta^2 = .02$) were not statistically significant. Given that effects of intervention on dose were statistically significant, we statistically controlled for this variables in the main analysis.

Table 1 presents descriptive statistics of psychological variables. Participants reported that they exercised an average of 3.89 days per week before the intervention and 4.21 days per week after the intervention. Teachers did not encounter any major difficulties with the intervention program because they reported that they delivered (on average) 8 (out of 10)

intervention sessions. Pearson's correlations supported positive relationships between intentions and physical activity participation and between attitudes and intentions. In addition, the relationships between subjective norms and intentions and between intentions and perceived behavioral control were statistically significant.

Table 1. *Descriptive Statistics*

	M	*SD*	1	2	3	4	5	6	7	8
1. Physical activity	4.19	1.42	1.0							
2. Intentions	4.82	1.51	.52	1.0						
3. Attitudes	5.18	1.25	.24	.46	1.0					
4. Subjective norms	4.21	.96	.20	.25	20	1.0				
5. Perceived behavioral control	4.90	1.42	.29	.17	-.24	.11	1.0			
6. Past behavior	3.89	1.51	.62	.44	.24	.31	.21	1.0		
7. Dose	8.44	.50	-.04	.02	.13	-.03	.19	-.09	1.0	
8. Combined intervention	__	__	.22	.26	.12	.02	.24	.05	.12	1.0

Note. The variable "combined intervention" is a contrast-code that indicates membership in the intervention that targeted attitudes and perceived control versus all other groups. Correlations greater than .13 are significant at .05 alpha level. Correlations for the combined intervention are point bi-serial correlations.

We also created a contrast-code that represented membership in the combined intervention (+1) versus all other intervention conditions (-1). This contrast code was positively associated with intentions, perceptions of control and physical activity participation. Dose of intervention was positively associated with perceptions of control but not with physical activity behavior.

Main Analysis

We conducted a multivariate analysis of co-variance to examine effects of interventions on dependent variables. In this analysis, intervention was the independent variable and attitudes, intentions, perceptions of control, subjective norms and physical activity behavior were the dependent variables. Age and dose of intervention were the covariates. Results revealed a statistically significant multivariate effect on dependent variables ($F(10) = 17.79$, $p < .001$, $\eta^2 = .30$). The effect of the covariate (dose) on dependent variables was also statistically significant ($F(5) = 5.06$, $p < .001$, $\eta^2 = .11$).

Table 2. Effects of Interventions On Physical Activity Intentions and Behavior

	Attitude	Subjective norms	Perceived behavioral control	Intentions	Physical activity behavior (5-weeks)
Combined intervention	5.39_a (.15)	4.26_a (.13)	5.45_a (.15)	5.48_a (.20)	4.74a (.18)
Intervention targeting behavioral beliefs	5.70_a (.12)	4.21_a (.11)	3.81_b (.12)	4.63_b (.16)	3.58_b (.15)
Intervention targeting control beliefs	4.37_b (.13)	4.19_a (.12)	5.78_a (.13)	4.53_b (.18)	4.49_a (.16)

Note. Standard errors are presented in parenthesis. Parameters with different subscript are statistically significant at $p < .05$ level.

Post-hoc univariate analysis of variance revealed statistically significant effects of the intervention on attitudes ($F(2) = 28.03$, $p < .001$, $\eta^2 = .22$), perceptions of control ($F(2) = 69.48$, $p < .001$, $\eta^2 = .41$), intentions ($F(2) = 7.84$, $p < .001$, $\eta^2 = .07$) and physical activity participation ($F(2) = 14.86$, $p < .001$, $\eta^2 = .12$). The effect of interventions on subjective norms was not statistically significant ($F(2) = .05$, $p = .95$, $\eta^2 = .00$).

In partial support of our hypothesis, pair-wise comparisons revealed that the combined intervention program that targeted behavioral beliefs and control beliefs increased intentions relative to the specific intervention programs that targeted behavioral beliefs only or control beliefs only (see Table 2). However, the combined intervention program did not increase physical activity behavior over and above the program that targeted control beliefs only. Nevertheless, the combined program was more effective in promoting physical activity participation than the specific intervention program that targeted behavioral beliefs only. Overall, results from this analysis suggested that while the effects of interventions that targeted behavioral beliefs and control beliefs on intentions were additive, such additive effects did not seem to generalize to physical activity behavior. With respect to physical activity behavior, the intervention program that aimed to change control beliefs produce the same effects as the combined program that aimed to change behavioral beliefs and control beliefs.

Despite these unexpected findings, additional analysis also provided some preliminary support to the hypothesis that effects of the combined intervention were mediated by attitudes and perceptions of control. This is because pair-wise comparisons revealed that the combined intervention program or the intervention program that targeted behavioral beliefs facilitated more positive attitudes than the intervention program that targeted control beliefs (see Table 2). In addition, the intervention program that targeted control beliefs or the combined intervention

program that targeted behavioral beliefs and control beliefs increased perceptions of control relative to the intervention program that targeted behavioral beliefs and attitudes only.

One reason for which the combined intervention program did not motivate more physical activity participation relative to the intervention program that aimed to change control beliefs may be related to the fact that the intervention that targeted behavioral beliefs did not influence the physical activity habits of young individuals. To examine this hypothesis, we conducted a repeated measures analysis of covariance using intervention as an independent variable. Type of behavior (past behavior versus future behavior) was used as a within participant factor. Dose of intervention was the covariate.

Table 3. Effects of Interventions On Past and Future Physical Activity Behavior

	Past Behavior	Future Behavior
Combined intervention	4.01_a (.20)	4.74_a (.18)
Intervention targeting behavioral beliefs	3.69_a (.17)	3.57_b (.15)
Intervention targeting control beliefs	4.16_a (.18)	4.49_b (.16)

Note. Standard errors are presented in parenthesis. Parameters with different subscript are statistically significant at $p < .05$ level.

Results from this analysis revealed a statistically significant interaction between intervention and type of behavior (F (2) = 6.98, $p < .01$, $\eta^2 = .06$). The effect of dose on type of behavior was not statistically significant (F (1) = .01, $p = .92$, $\eta^2 = .00$). In accordance with our

expectations, post-hoc analysis revealed that while the combined intervention and the intervention that targeted control beliefs increased the frequency with which young individuals exercised in the past, this was to the case for the intervention program that targeted behavioral beliefs (see Table 3). Hence, the intervention that aimed to change behavioral beliefs did not change the physical activity habits of young individuals.

The Processes Through Which The Intervention Program Influences Physical Activity Intentions And Behavior

We conducted a series of regression analysis to examine utility of attitudes and perceptions of control in mediating effects of the combined intervention program on physical activity intentions. Following Baron and Kenny (1896), we conducted three separate regression analysis that examined effects of the combined intervention program (antecedent) on mediators which were attitudes, subjective norms or perceptions of control. Following these regression analyses, we conducted a forth regression analysis that examined effects of attitudes, subjective norms and perceptions of control (mediators) on intentions (outcome variable). Our fifth regression analysis examined effects of combined intervention (antecedent) on intentions (outcome variable) Finally, we conducted a hierarchical regression analysis that examined impact of combined intervention program on intentions after controlling for effects of attitudes and perceptions of control.

Results from these analyses revealed that the antecedent, which was the contrast-code that represented membership in the combined intervention program, predicted the hypothesized mediator of perceptions of control (*beta* = .24, R^2 = .06, F(1) 12.60=, $p < .001$). The effect of combined intervention on attitudes (*beta* = 12, R^2 = .02, F(1) = 3.20, p = .07) or subjective norms

were not statistically significant (*beta* = .02, R^2 = .01, $F(1) = .12$, $p = .74$). Therefore, subjective norms or attitudes did not mediate effects of combined intervention on intentions. In accordance with tenets of theory of planned behavior, the mediators, which were attitudes (*beta* = 50, $p < .01$), subjective norms (*beta* = .12, $p = .04$) and perceptions of control (*beta* = .27, $p < .001$), predicted the outcome variable which was physical activity intentions. These three mediators explained 30% of variance on intentions ($F(3) = 29.61$, $p < .001$). Further, a hierarchical regression analysis revealed that while the effect of combined intervention on intentions did not reduce after controlling for subjective norms, it was reduced from .25 to .14 after controlling for effects of attitudes and perceptions of control. Interestingly Sobel (1982) tests supported mediating effects for perceptions of control (*Sobel statistic*= 1.89, $p = .03$) but not for attitudes (*Sobel statistic* = 1.18, $p = .23$)

Finally, we conducted a second series of regression analyses to examine utility of perceptions of control and intentions in mediating effects of combined intervention program on physical activity behavior. Results from this analysis revealed that the antecedent, which was the contrast-code that represented membership in the combined intervention program, predicted the hypothesized mediators which were intentions (*beta* = .26, R^2 = .07, $F(1) = 15.00$, $p < .001$) or perceptions of control (*beta* = .24 , R^2 = .06, $F(1) = 12.60$, $p < .001$). In accordance with tenets of theory of planned behavior, the mediators, which were perceptions of control (*beta* = .21, $p < .001$) or intentions (*beta* = .49, $p < .001$), predicted the outcome variable which was physical activity participation. These two mediators explained 32% of variance on physical activity ($F(2) = 47.41$, $p < .001$). Further, the intervention contrast code predicted physical activity behavior (*beta* = .22 , R^2 = .05, $F(1) = 10.49$, $p < .001$). Finally, a hierarchical regression analysis revealed that the effect of the combined intervention on physical activity was reduced from .22

to .04 after controlling for effects of intentions and perceptions of control. Interestingly Sobel (1982) tests supported mediating effects for perceptions of control (*Sobel statistic* = 1.93*, p* = .052) and for intentions (*Sobel statistic* = 2.09*, p* = .04).

Discussion

The present study evaluated utility of a combined intervention program that directly targeted salient behavioral beliefs and control beliefs to bring about measurable changes in young people's physical activity intentions and behavior. The rationale behind implementing a combined intervention was based on (i) tenets of theory of planned behavior which suggest that effects of behavioral beliefs (or attitudes) and control beliefs (or perceived control) on intentions are additive and (ii) previous research which showed that attitudes and perceptions of control were important determinants of physical activity intentions among young people (Hagger et al., 2002). Based on this evidence, we hoped to find that a combined intervention program that targeted behavioral beliefs and control beliefs would be more effective in promoting physical activity intentions and behavior than the more specific interventions that targeted behavioral beliefs or control beliefs only. We also thought that such findings would be theoretically interesting because they would confirm a central tenet of theory of planned behavior concerning additive nature of effects of control beliefs and behavioral beliefs on intentions and behavior.

Results of the present study provided mixed support for our hypotheses. Specifically, in accordance with our hypothesis, results pointed that the combined intervention program was more effective in promoting physical activity intentions than the specific interventions that targeted behavioral beliefs or control beliefs only. In addition, in accordance with tenets of the theory of planned behavior (Ajzen, 1991), the regression analysis revealed that the effects of the combined intervention program on intentions were mediated by attitudes and perceptions of

control. These findings are theoretically important as they conform for the first time, through an intervention study, a basic tenet of the theory of planned behavior that predicts that effects of behavioral beliefs and control beliefs on physical activity intentions are additive. However, results of the present study did not support additive effects on physical activity behavior.

Specifically, results revealed that although the combined intervention program promoted physical activity participation over and above the specific intervention that targeted behavioral beliefs, it did not promote physical activity behavior over and above the intervention that targeted salient control beliefs. Most critical, the repeated measures analysis of variance also indicated that this unexpected finding was due to the fact that the attitude specific intervention did not influence physical activity behavior of young individuals. Hence, the present study suggests that although the effects of attitudes and perceptions of control on physical activity intentions are additive, these additive effects do not extend to physical activity behavior. As far as physical activity behavior is concerned, our findings suggest that a “simpler” intervention program that targets control beliefs should be preferred because it produces the same effects on physical activity behavior as a more demanding intervention program that targets behavioral beliefs and control beliefs.

Although the design of the present study does not allow us explain why the attitudinal intervention did not influence physical activity participation, we speculate that this null finding may be due to the fact that baseline attitudes were generally positive or strong. For example, in our study the mean level of attitudes of participants who did not receive an attitude intervention was 4.75 whereas the mean level of perceptions of control of individuals who did not receive a control intervention was 3.93 (see also Darker et al., 2010). According to Ajzen (1991), such baseline differences in attitudes and perceptions of control influence intervention effects. As a

general rule, interventions are more likely to influence behavior when they target constructs that exhibit low mean scores and less so through constructs that exhibit high mean scores. Relatedly, to the extent that mean levels of attitudes indicate knowledge about behavioral beliefs and benefits of physical activity (Ajzen, 1991), it can be speculated that the attitudinal intervention was not effective in producing behavioral change because individuals were knowledge of benefits of physical activity. Conversely, the control-specific intervention might have been more beneficial and useful because individuals were less knowledgeable of, (and hence more interesting in) information pertaining to how to overcome barriers related to physical activity. The implication of this reasoning is that the attitudinal intervention was not successful in promoting physical activity participation because young people were knowledgeable of benefits of physical activity and hence they might have found portion of messages that emphasized behavioral beliefs less interesting or useful.

Despite this null finding, results of the present study have important implications for theory and practice. The present study makes an important theoretical contribution to the literature because it is the first intervention study that supports tenet of the theory of planned behavior concerning additive effects of attitudes and perceptions of control on intentions. The majority of previous studies did not provide a rigorous test of additive effects because they adopted cross-sectional or prospective designs (see Hagger et al., 2002). The very few experimental studies that have been conducted up to now did not examine additive effects either because they did not incorporate a combined intervention program (i.e., Sniehotta, 2009) or because they did not compare combined intervention programs against specific intervention programs that targeted control beliefs or behavioral beliefs (i.e., Darker et al., 2010).

We also think that the null result of not finding additive effects on physical activity behavior carries important implications for practice. On first glance, this finding implies that as far as promotion of physical activity participation is concerned, attitudinal interventions are redundant and that practitioners should opt for more cost-effective intervention programs that aim to enhance perceptions of control only. This finding is good news as it entails that practitioners can influence physical activity behavior by implementing less demanding interventions that target control beliefs only. Interestingly, Darker et al. (2010) and Sniehotta (2009) also found that interventions that targeted control beliefs were more effective in promoting physical activity participation relative to interventions that did not target salient beliefs.

That said, it is important to note that our findings should not be taken to mean that the more parsimonious control-specific intervention should always be preferred over the more complex and demanding interventions that targeted attitudes and perceptions of control. For example, in real life, there may be settings and contexts in which individuals express negative attitudes toward physical activity. In these cases, a combined intervention program that targets attitudes and perceptions of control may be the ideal program. Our general thesis is that practitioners should use multiple criteria in determining content of intervention programs such as feasibility of the intervention, costs-effectiveness and baseline levels of attitudes and perceptions of control (see Ajzen, 1991). For example, practitioners may wish to implement a combined intervention program at early stages of the program during which young people are likely to hold less positive attitudes and intentions towards physical activity and weak perceptions of control. However, as the intervention program progresses, practitioners may wish to gradually remove

attitudinal components from the program and opt for a more "lean" intervention model that targets perceptions of control only.

Finally, it will be a remiss to not mention some strengths and limitations of the present intervention. A strength of the present program is that it can be easily implemented in the field. Each intervention session lasts 10-15 minutes. In addition, the relative high mean score associated with dose of intervention supports the notion that our program did not interfere with teachers' routines in any substantial way perhaps because it could be easily implemented during debriefing at the end of physical education lessons. In a way, therefore, our study shows that it is possible to influence the exercise habits of young individuals through a series of 10-15 minute communication sessions that are implemented in schools.

A limitation of the present intervention is that it produced medium effect sizes. Although we agree that there may be an economic benefit associated with obtaining medium effect sizes, we also think that such effects echo previous research showing that the theory of planned behavior does not explain participation in physical activities satisfactorily. One reason for this may be due to the fact that the theory of planned behavior is a motivational theory that explains intentions and not necessarily enactment of intentions into behavior (Gollwitzer, 1999). The theory of planned behavior can facilitate enactment of behavioral intentions when it is applied alongside volitional techniques such as implementation intentions (see Chatzisarantis, Hagger, & Wang, 2010; Chatzisarantis, Hagger, & Thorgensen, 2008; Prestwich et al., 2003; Sheeran & Silverman, 2003) and continuation intentions (Chatzisarantis & Hagger, 2008). Therefore, it may be important to examine whether a combined intervention that targets control beliefs and implementation intentions is more effective in promoting physical activity participation than specific interventions that target control beliefs or implementation intentions only.

In conclusion, the present study extends current knowledge by demonstrating that while effects of a combined intervention program that aimed to change behavioral beliefs and control beliefs on physical activity intentions were additive, such additive effects did not generalize to physical activity participation. The main reason for this was that while the intervention that targeted behavioral beliefs and attitudes influenced physical activity intentions, it did not affected physical activity behavior. The implication of these findings is that it is possible to influence the exercise habits of young individuals through a series of 10-15 minute communication sessions that target control beliefs only.

Development of Persuasive Communications

The present project suggests that it is possible to promoted leisure time physical activity through a 10-15 minutes intervention session that addresses control beliefs and behavioral beliefs during physical education classes. In this section, we provide teachers with some guidelines about how to develop such intervention sessions. The process of development involves the following steps.

Step 1: Identify Salient Behavioral Beliefs and Control Beliefs

Not all young people expect to accrue the same benefits from physical activity or face the same barriers. For this reason, it is important to understand first the perceived benefits (salient behavioral beliefs) and physical activity barriers (control beliefs) of our students. To do this, you need to administer to a small sample of students two open-ended questions. The following questions aim to elicit benefits and disadvantages of physical activity (Ajzen, 2003):

(i) What do you see as the advantages of your exercising for at least 40 minutes, four times per week for the next month?

(ii) What do you see as the disadvantages of your exercising for at least 40 minutes , four times per week for the next month?

(ii) What else comes to mind when you think about exercising for at least 40 minutes, three times per week for the next month?

The following questions aim to elicit salient control beliefs (Ajzen, 2003):

(i) Please list any factors or circumstances that would make it easy or enable you to exercise for at least 40 minutes, four times per week for the next months.

(2) Please list any factors or circumstances that would make it difficult or prevent you from exercising for at least 40 minutes, three times per week for the next month.

Step 2: Analyze the Content of Beliefs and Classify Them Into Categories

Responses to the previous questions should be classified into categories. Responses with similar meaning are classified into the same category. Young people do not usually report more than 4 items per question. You do not need to worry about this because the most salient belief is the belief that is reported first by a respondent. You also need to count the frequency with which beliefs are endorsed. Modal salient beliefs (or popular beliefs) are the beliefs that are endorsed by most of the individuals. These popular beliefs are the beliefs that are used to built your persuasive message.

Step 3: Develop A Persuasive Message

The persuasive message should consist of two parts. First, it should include a set of arguments that are in favor of physical activity behavior. These arguments should emphasize the salient benefits of physical activity and downplay salient disadvantages. In addition, the message

that targets control beliefs should make young people aware of strategies that potentially help them overcome salient barriers. Second, your message should aim to enhance the credibility of the arguments and/or include factual evidence designed to support the arguments (Ajzen & Fishbein, 1980). The rationale behind enhancing credibility of arguments is that credibility leads to acceptance of the message and acceptance of the message in turns leads to belief change (Ajzen & Fishbein, 1980).

Step 4: Determine Content of A Persuasive Messages

Before you apply your persuasive messages to a large scale**,** the impact of persuasive messages on intentions and behavior should be tested in a pilot study that involves a small group of young individuals (n = 50). Ask a group of young people to read your persuasive messages and then ask them to score measures of attitudes, intentions, and perceptions of control. If the persuasive messages are effective then students who read the messages that address salient beliefs should report stronger intentions to exercise than students who read messages that do not address salient beliefs. Informing student that they will complete a test related to your message may also increase impact of message on intentions because such a procedure is likely to increase attention to your message. Further, it is important to note that sometimes persuasive messages do not exert a large impact on intentions, attitudes or perceptions of control because students already possess positive attitudes or perceptions of control (see our intervention program). For this reason, it is important to target beliefs and constructs from the theory of planned behavior that young people do not endorse to a great extent. Finally, it is important to note that persuasive messages do not have to be communicated in a textual form. You can be creative in the ways that you communicate health messages. You can use posters, videos or other methods of communication to persuade young people exercise during leisure time.

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