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Psychosocial Predictors of Changes in Adolescent Girls' Physical Activity and Dietary Behaviors Over the Course of the *Go Girls!* Group-based Mentoring Program

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Abstract

Changes in social cognitions targeted within a group-based mentoring program for adolescent girls were examined as predictors of changes in physical activity (PA) and dietary behavior (in two separate models) over the course of the 7 week program. Data were collected from 310 participants who participated in the program. Multilevel path models were used to assess changes in psychosocial variables predicting changes in behavioral outcomes from pre- to post-program. Analyses revealed that 24.4% and 12.3% of the variance in increases in PA and dietary behavior, respectively, was explained by increases in affective and instrumental attitudes, self-regulatory efficacy (SRE), and intentions. Increases in intentions partially mediated the effects of increases in SRE and affective attitudes on increases in PA behavior. In relation to improvements in dietary behavior, increases in intentions and SRE directly predicted improvements in dietary behavior. These findings suggest potential psychological mechanisms through which a group-based mentoring program may lead to changes in adolescent girls' health-enhancing PA and dietary behaviors.

Key words: self-regulatory efficacy, attitudes, intentions, social belonging, adolescent girls, physical activity behavior, dietary behavior

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When considered against Canada's physical activity (Tremblay et al., 2011) and dietary guidelines (Health Canada, 2011), adolescent girls are at particular risk for negative health consequences because of low levels of health-enhancing behaviors. For example, only 33% of adolescent girls (ages 11-14) engage in at least 60 minutes of moderate-to-vigorous physical activity at least 3 days per week (Colley et al., 2011). Furthermore, one third of Canadian adolescent girls do not meet the recommended guidelines for fruit and vegetable consumption (Riediger, Shooshtari, & Moghadasian, 2007). Theory-based health promotion programs that foster engagement in these health-enhancing behaviors among adolescent girls represent an important focus for public health initiatives.

dThere is increased evidence that mentorship-based programs represent an efficacious and viable means of suporting personal growth, achievement, and health-enhancing outcomes among youth (Hirsch et al., 2000; Loder & Hirsch, 2003; Ma & Huebner, 2008). Mentorship-based models may work particularly well for adolescent girls because of their focus on the development of social connections. Indeed, Rhodes (2005) suggested that the basic component of effective mentoring programs is the development of connections between the mentor(s) and mentee(s). Rhodes and DuBois (2008) explained that "beneficial effects [on outcomes targeted in youth] are expected only to the extent that the mentor and youth forge a strong connection that is characterized by mutuality, trust and empathy. For this bond to arise, mentors and youth are likely to need to spend time together on a consistent basis over some significant period of time" (p. 255). Drawing from the parallel literature on group dynamics, it has similarly been suggested that when when health behaviors are targeted within a cohesive group environment, this may be a particularly effective strategy for improving the associated health-related cognitions and behaviours among group members (cf. Brawley, Rejeski, & Lutes, 2000). When taken together, mentor-based intervention programs that foster a sense of social connection

among adolescent girls have the potential to support improvements in health behaviors among adolescent girls.

The Present Study

The Big Brothers and Big Sisters (BBBS) of Canada offers a program called *Go Girls! Healthy Minds, Healthy Bodies*, or *Go Girls!* for short, and is a program designed to increase healthy eating and physical activity among adolescent girls. This program has been delivered to thousands of adolescent girls across Canada over the past decade. Similar to group-mediated cognitive-behavioral interventions (Brawley et al., 2000), the *Go Girls!* program is underpinned by the tenets of social cognitive theories (Ajzen, 1991; Bandura, 1986) to target key social cognitions (e.g., positive attitudes, self-regulatory efficacy, intentions) within a cooperative environment and through activities that promote social connections, physical activity and healthy eating. Specifically, in this program, the girls learn to work together, learn more about each other, and develop connections with one another (i.e., fostering social belonging among the girls and with the mentors). Drawing from mentoring theory (J. E. Rhodes, 2005), it is suggested that the creation of a safe, supportive and connected environment enables participants to develop important health-enhancing cognitions and behaviors in the program.

From a program evaluation perspective, it is pertinent to examine if participation in a widely disseminated program leads to changes in targeted outcomes. Dowd and colleagues recently reported the findings from an outcome evaluation of the *Go Girls!* program (Dowd, Chen, Jung, & Beauchamp, 2015). The purpose of the outcome evaluation reported by Dowd et al. was to assess the effectiveness of the program by comparing behavioral and psychological outcomes during a baseline period to these outcomes immediately after and 7 weeks post program completion. Findings from the outcome evaluation revealed that participants on average reported feeling a strong sense of belonging to their group. Furthermore, hierarchical linear modeling analyses showed improvements in self-regulatory efficacy for both dietary behavior (immediately after the program) and physical activity behavior (at 7 week follow-up), physical activity intentions (at 7 week follow-up), increases in leisure time physical

activity that were sustained at 7 week follow-up and increases in total physical activity and healthy eating behavior (at 7 week follow-up). Interestingly, participants also reported more negative affective attitudes towards physical activity at the end of the program and more negative instrumental attitudes toward healthy eating at 7 week follow-up. Overall, findings from the outcome evaluation provide preliminary evidence for the effectiveness of the *Go Girls!* program in improving adolescent girls' health-enhancing cognitions, physical activity and dietary behaviors (while also recognizing room for improvement with regard to improving affective attitudes towards physical activity and instrumental attitudes towards healthy diets).

Given that the overall goal of this program is to change adolescent girls' behaviors, an important question that arises is if changes in cognitions targeted in the program predict changes in engagement in the targeted behaviors. With this in mind, the overall purpose of the current study was to examine if changes in adolescent girls' health-enhancing social cognitions during the program predict changes in their behaviors (physical activity and healthy eating) over the same period of time. The current study represents an important avenue because in addition to ascertaining evidence that a program is effective (i.e., the outcome evaluation; Dowd et al., 2015), understanding the determinants/mechanisms of changes in participants' health behaviors during a program can help inform strategies used in the program to foster sustained engagement in targeted behaviors (Baranowski, Anderson, & Carmack, 1998).

A framework that has been widely utilized to understand health behaviors and guide behavior change interventions is the theory of planned behavior (TPB; Ajzen, 1991). Ajzen postulates that intentions are the most proximal predictor of behavior. Furthermore, attitudes, perceptions of subjective norms and perceived behavioral control are theorized to influence intentions to engage in a behavior, and both intentions and perceived behavioral control directly predict behavior. These theory-based health-enhancing social cognitions are targeted through activities over the course of the *Go Girls!* program.

Drawing from the TPB, attitudes toward a behavior are theorized to predict intentions to engage in the behavior (Ajzen, 1991; Bandura, 1986; Rosenstock, Strecher, & Becker, 1988). Over the past decade, researchers have begun to note the important distinction between affective and instrumental attitudes. Affective attitudes relate to how one thinks engaging in a behavior will make them *feel*, whereas instrumental attitudes refer to anticipated *costs* and *benefits* from engaging in a behavior (R. E. Rhodes & Conner, 2010; R. E. Rhodes, Fiala, & Conner, 2009). In line with research that suggests that attitudes are an important predictor of behavior (Nasuti & Rhodes, 2013), the *Go Girls!* program delivers activities that promote opportunities for the girls to enjoy engaging in healthy behaviors, while also ensuring girls understand the benefits of healthy living (i.e., instrumental attitudes). As such, it was hypothesized that changes in both affective and instrumental attitudes derived over the course of the program would indirectly predict changes in behavior through changes in intentions to engage in physical activity and healthy eating behavior.

Additionally, in the TPB, it is suggested that subjective norms (i.e., a person's perception of an important referent groups' thoughts towards the person engaging in a behavior) predict one's intentions to engage in that behavior. Throughout the *Go Girls!* program, the girls are involved in activities that promote positive subjective norms towards both physical activity and healthy eating. Although one would expect that changes in subjective norms pertaining to *Go Girls!* group members would contribute to the prediction of changes in participants' intentions and behaviour, it was not possible to obtain an accurate measure of changes in such norms because participants would not have a sufficient frame of reference to assess group norms when baseline measures were taken (i.e., before groups had covened). As such, subjective norms were not included in the current study.

Ajzen (1991) also suggested that one's perceived behavioral control predicts behavior both directly and indirectly (through intentions). However, it has been recommended that self-efficacy should be assessed rather than perceived behavioral control (Armitage & Conner, 1999; Rodgers, Conner, & Murray, 2008). While perceived behavioral control refers to perception of control over

general external factors that affect engagement in a given behavior, self-efficacy corresponds to a belief in one's capabilities to perform a given behavior (Bandura, 1997) and as such represents a perception of control over *internal factors* (Armitage & Conner, 1999). In line with the sources of self-efficacy posited by Bandura (1997), activities within the *Go Girls!* program target physical activity and healthy eating behavior through the provision of opportunities for (a) mastering these behaviors, (b) social learning from others and (c) verbal support from the mentors and the other participants. Indeed, research drawing from social cognitive theories of behavior change indicates that one of the most important predictors of behavior is a person's confidence in his or her ability to engage in self-regulation (i.e., self-regulatory efficacy) necessary for the behavior (Araujo-Soares, McIntyre, & Sniehotta, 2009; Luszczynska, Gibbons, & Bettina, 2004). Thus, it was hypothesized that changes in participants' self-regulatory efficacy would directly and indirectly (through changes in intentions) predict changes in engagement in physical activity and healthy eating behavior over the course of the 7-week *Go Girls!* program.

Finally, drawing from the TPB, intention to engage in a behavior is the most proximal predictor of behavior. Indeed, findings from a recent meta-analysis suggest that intentions to engage in behavior predict both physical activity and dietary behavior (McEachan, Conner, Taylor, & Lawton, 2011). Bandura (1986) suggests that people intend to engage in behaviors they have positive perceptions towards and are confident they can complete. Given that the *Go Girls!* program targets attitudes, subjective norms, and self-efficacy, it follows that behavioral intentions are also targeted in the program. Therefore, it was hypothesized that changes in intentions over the course of the program would predict changes in physical activity and healthy eating behavior over the same timeframe.

In sum, programs that target intentions, attitudes, and self-regulatory efficacy have the potential to be effective in leading to sustained engagement in physical activity and healthy dietary behaviors among adolescent girls. Furthermore, research suggests mentor-based programs that seek to improve social connections among program participants (i.e., fostering a sense of belonging) represent a viable

means of targeting behavior change through vicarious learning by peer mentoring among adolescent girls in the program. The overall goal of the current study was to examine the extent to which changes in key TPB-derived social cognitions assessed from before to after a group-based mentoring lifestyle program for adolescent girls, predicted changes in both physical activity and dietary behavior from before to after the program. The hypothesized path models for both behaviors can be found in Figures 1a and b.

Method

Participants

Three-hundred and forty-two *Go Girls!* participants agreed to participate in this study (11-14 years of age, M_{age} = 11.68 years, *SD* = 0.80). Over the course of the study, six participants dropped out (five participants did not provide a reason for dropping out, one participant moved away). We had to exclude 11 participants from the analyses because they were former *Go Girls!* participants, 11 participants were excluded because the research assistant accidentally went 1 week early (i.e., data were collected a the end of the 6th session, not the final 7th session), 1 participant was excluded because she was unable to complete or understand the questions, 3 participants were excluded because they told the research assistant that they "just filed in ther answers at random." Data from three-hundred and ten adolescent girls from 38 groups ($mean_{group\ size}$ = 6.38) were included in the current study; M_{age} = 12.16 years, *SD* = 0.80, range 11-14 years). The *Go Girls!* program is run by member agencies of BBBS of Canada. Participants represented 38 *Go Girls!* groups from elementary or middle schools in Southern Ontario, Canada. Procedures used by Statistics Canada in the 2006 Census were followed as participants were asked to identify all ethnic/cultural groups with which they self-identified (i.e., girls could identify with more than one ethnic group). The most common ethnic groups reported were White (27.70%), Black (15.20%), and South Asian (e.g., East Indian, Pakistani; 8.40%). Eleven other ethnic groups were identified with a frequency of less than 5%.

Procedure

Institutional Ethical Review Board and School Board approval were obtained prior to commencing this study. Schools were initially asked to participate in the current study by program directors. Once schools had agreed to participate in this study, participants were then recruited through school principals and school champions (i.e., the liaison between the schools and BBBS agencies) and program directors. Active consent was obtained from both parents and girls separately. Trained research assistants collected the data. Data reported in this study were collected as part of a larger program evaluation that involved assessment of outcomes at four time points. Specifically, participants completed questionnaires that examined their cognitions and behaviors approximately 7 weeks prior to beginning the program (Time 1 – data collected in December 2012 and January 2013), immediately prior to beginning the program (Time 2 – data collected in January and February 2013), immediately after completing the 7 week program (Time 3; data collected in March - April 2013) and approximately 7 weeks after program completion (Time 4; data collected in May - June 2013). For the current study we used data collected at Time 2 and Time 3 to examine changes in cognitions and behaviors (i.e., change scores) that occurred *during* the program. We chose to separate evaluation periods by 7 weeks because the *Go Girls!* program is 7 weeks long. This timing was particularly relevant for the outcome evaluation (Dowd et al., 2015) because it allowed us to compare changes in adolescent girls' cognitions and behaviors during a typical 7 week time period (i.e., before the program started) to during the 7 week program and during the 7 week period after participants completed the program. For a detailed description of the outcome evaluation (i.e., changes across all four time points) please see Dowd et al., (2015).[1] Questionnaires took approximately 30 minutes to complete. After all 4 assessments, groups were given the sum of $10 per participant (range from $40-$150 per group) to spend on a mutually agreed upon reward.

The Intervention: The *Go Girls!* Healthy Bodies, Healthy Minds Program

Go Girls! is a 7-week program that consists of 2-hour weekly sessions (14 hours total), with each session run by two female volunteers mentors.[2] BBBS recruits and screens mentors who are

trained by agency staff (Big Brothers Big Sisters of Canada, 2006). Mentors are women (aged 18-25) who have an interest in healthy/active living and mentoring. Participants meet with the mentors and 3 to 14 ($M_{group\ size}$ = 8.54, *SD* = 3.11) other girls in a classroom provided by each school. The sessions were designed using social cognitive theories of behavior change (Ajzen, 1991; Bandura, 1986; Rosenstock et al., 1988) to provide opportunities for social learning to help girls adopt and maintain healthy lifestyles (see Dowd et al., 2015, for a detailed description of the *Go Girls!* program as well as the *Go Girls!* website: http://www.bigbrothersbigsisters.ca/en/home/mentoringprograms/gogirls.aspx). The *Go Girls!* program is currently widely disseminated across Canada with over 5000 adolescent girls participating in the program annually.

Measures

***Go Girls!* Program Belonging.** The 5-item measure developed by Anderson-Butcher and Conroy (Anderson-Butcher & Conroy, 2002) was used to measure the participants' sense of belonging to the *Go Girls!* program as a manipulation check. Items were measured using a 4-point scale with anchors NO! = 1, no = 2, yes = 3 and YES! = 4. This response format has been found to be easy to understand and differentiate between youth's answers (Anderson-Butcher & Conroy, 2002). Exemplar items include "I feel accepted at the *Go Girls!* program" and "I feel committed to the *Go Girls!* program". Responses to items were summed and averaged to provide a score of each participant's sense of belonging to the program. Scores range from 1-4, with higher scores representing a greater sense of belonging to the program. Data derived from this measure have been found to provide evidence of acceptable reliability (Cronbach α = .93; Anderson-Butcher & Conroy, 2002). In the present study, scores derived from this measure were found to be internally consistent with an ordinal coefficient alpha (Zumbo, Gadermann, & Zeiser, 2007) of 0.95.

Physical activity behavior. A 2-item questionnaire, validated for use with adolescents, was used to assess participants' *total physical activity behavior* (Prochaska, Sallis, & Long, 2001). These two items assessed (a) the total amount of physical activity participants engaged in over a typical week

and (b) over the past week. Participants were asked to respond on a scale from 0 days to 7 days. Higher scores represent engagement in more physical activity per week. In the present study, scores derived from this measure were found to be internally consistent with Spearman-Brown coefficient $\rho \geq .82$ (Eisinga, Grotenhuis, & Pelzer, 2012).

Adolescent dietary behaviors. A revised version of the Adolescent Food Habits Checklist (AFHC) was used to assess participants' dietary behaviors (Johnson, Wardle, & Griffith, 2002). Three independent dietitians reviewed the original questionnaire and made recommendations to cull items based on current scientific evidence as certain items were identified as no longer appropriate to assess "healthy" behaviors (i.e., such as the notion of avoiding all low-fat foods to be healthy). Based on the dietitians' recommendations, six items were culled from the original 23-item questionnaire. The revised 17-item questionnaire asked participants to report intake of vegetables, fruits, and energy dense foods using a true/false response format. An alternative response, equivalent to "not applicable", was available for four items. Respondents received one point for each 'healthy' response and the final score was adjusted for missing responses and not applicable using the formula: AFHC scores = number of healthy responses * (17/number of items completed). Higher scores indicate engagement in more healthy dietary behaviors. Data derived from the AFHC have provided evidence of satisfactory reliability (Cronbach $\alpha = .83$; Johnson et al., 2002). In the present study, scores derived from the revised AFHC were found to be internally consistent with Cronbach $\alpha \geq .80$.

Physical activity and healthy eating attitudes. Two separate 6-item measures were used to assess participants' affective and instrumental attitudes toward physical activity and healthy eating using procedures outlined by Ajzen (2002). All items began with the stem "For me, engaging in physical activity/healthy eating would be…". Participants were asked to respond to items using separate 7-point semantic differential scales based on their expectations that either engaging in physical activity or healthy eating will lead to affective and instrumental outcomes. Items designed to measure affective attitudes include "Enjoyable—Unenjoyable", "Pleasant—Unpleasant", and "Interesting—

Boring" and items designed to measure instrumental attitudes include "Useful—Useless", "Wise—Foolish", and "Beneficial—Harmful". In the assessment of adolescents' attitudes towards physical activity, measures derived from this assessment have been found to demonstrate good internal consistency (Backman, Haddad, Lee, Johnston, & Hodgkin, 2002; Nasuti & Rhodes, 2013). In the present study, scores derived from this measure were found to be internally consistent for instrumental and affective attitudes towards both physical activity and healthy eating with ordinal coefficient alphas (Zumbo et al., 2007) of $\geq .88$.

Self-regulatory efficacy for physical activity. A 6-item measure was used to examine participants' confidence to self-regulate their physical activity behavior (Shields et al., 2008). Participants were asked to respond to items regarding their self-regulatory abilities for physical activity on a standard 0 percent (*not at all confident*) to 100 percent (*completely confident*) self-efficacy scale (McAuley & Mihalko, 1998). An exemplar item for this measure is "If you really wanted to, how confident are you that you can be physically active even if you feel tired over the next week". Data derived from this measure have demonstrated acceptable reliability (Cronbach $\alpha = .85$; Shields et al., 2008). In the present study, scores derived from this measure were found to be internally consistent with Cronbach $\alpha \geq .91$.

Self-regulatory efficacy for healthy eating. Participants' confidence to engage in healthy eating was measured using a version of the questionnaire developed by Strachan and Brawley (2008) modified for youth (Morton et al., 2011). Participants were asked to respond to items regarding their self-regulatory abilities for healthy eating on a standard 0 percent (*not at all confident*) to 100 percent (*completely confident*) self-efficacy scale (McAuley & Mihalko, 1998). An exemplar item for this measure is "How confident are you in your ability to bring a healthy lunch with you to school over the next week". Data derived from this instrument have demonstrated acceptable reliability (Cronbach $\alpha = .86$; Morton et al., 2011). In the present study, scores derived from this measure were found to be internally consistent with Cronbach $\alpha \geq .92$.

Physical activity and healthy eating intentions. A 3-item questionnaire developed by Chatzisarantis and colleagues (1997) was used to measure participants' intentions to engage in physical activity. Participants were asked to respond to items on a 7-point scale, with anchors ranging from 1 (*very unlikely*) to 7 (*very likely*). A sample item for physical activity intentions included "I plan to do physical activity at least three times next week". A similar 3-item questionnaire modified based on Chatzisarantis and colleagues' (1997) and Luszczynska and colleagues (2007) was used to measure participants' intentions to eat a healthy diet. A sample item for healthy eating intentions included "I plan to eat a healthy diet every day next week" with anchors ranging from 1 (*very unlikely*) to 7 (*very likely*). In the present study, scores derived from this measure were found to be internally consistent with ordinal coefficient alphas (Zumbo et al., 2007) of ≥ 0.94.

Data Analysis

Missing values were estimated using multiple imputation (MI). We conducted multiple imputation (MI) with Markov Chain Monte Carlo (MCMC) method (see Asparouhov & Muthén, 2010 for details). Data were imputed after the MCMC sequence has converged. This process was repeated until fifty data sets were generated for the present study. By generating multiple values for one missing observation, multiple imputation takes the uncertainty of missing data into account (Schafer & Graham, 2002). These data sets included complete values for all the variables used in the models across the two time points (i.e., Time 2 and Time 3) of measurement. The data imputation and the subsequent data analyses were conducted using the *Mplus* 6 software program (Muthén & Muthén, 2011). Two-level path models were used to test separate models to examine changes in physical activity and dietary behavior. The level-1 path models are presented in Figure 1a for physical activity and Figure 1b for dietary behavior. To handle the non-independence of the data, the intercepts of the level-1 model were allowed to differ across groups (level-2) and the random intercepts were allowed to covary. No group level predictors was included in the level-2 model. All the level-1 predictors were group mean centered before entering the models. Both models were estimated using maximal likelihood estimation with

robus standard errors (MLR). Data from Time 2 (immediately before the program) and Time 3 (immediately after completing the program) were used to calculate change scores for all of the variables used in the current study (i.e., changes in cognitions and behaviors). Change scores were used in the models so that we can directly test if the changes in participants' attitudes predicted changes in their intentions and changes in the physical activity and healthy eating behavior over the course of the Go Girls! Program. The measures of attitudes, intentions, and behavior did not show flooring or ceiling effect at these two time points. For ease of model interpretation, we used simple change scores rather than residualized change scores (e.g., Zumbo, 1999).

Results

Intra-class correlation coefficients (ICCs) indicated that the majority of variance in scores was observed at the individual level (ICCs $\leq .19$; see Table 1). However, given the nested nature of the data, multilevel models were run to allow the intercepts of individual-level predictors to vary across groups. The same models were tested based on the sub-sample of 190 girls with full responses on all the variables (i.e., listedwise deletion was used) as well as the full sample of 310 girls with multiple imputation for the missing responses as a sensitivity check. The models yielded the same conclusions in terms of significant test results and relative importance of the path coefficients. To avoid redundancy, results were reported only based on the analyses with multiple imputation. Means and standard deviations for each variable are reported before and after imputation in Table 1. Correlations are reported in Tables 2 and 3.

Intervention Manipulation Check

At the end of the program, an assessment of participants' belonging to the *Go Girls!* program was conducted as a manipulation check to ascertain whether a sense of connection to the group was evident. Analysis of the responses to the *Go Girls!* program belonging measure confirmed that on average, the girls felt a strong sense of belonging to their group ($M = 3.74$, $SD = 0.40$; range 2.0-4.0). It was not possible to obtain an accurate measure of the participants' perceptions of belonging to their *Go*

Girls! group at Time 2 (immediately before the program began), as such, we were unable to examine if changes in belonging to the group moderated the relationship between changes in the cognitions and behaviors.

Model 1 – Predicting Physical Activity Behavior

The model for physical activity was just-identified, however, just-identified models are not an impediment to appropriately testing path models (Preacher, Zyphur, & Zhang, 2010; Reichardt, 2002; Tomarken & Waller, 2003). Given that fully saturated models always result in perfect fit, it is not meaningful to assess such models with indices of global fit; thus, goodness of fit indices are not reported. Path analyses revealed changes in participants' affective attitudes (β = 0.243, p < .01) and self-regulatory efficacy for physical activity (β = 0.213, p = .001) predicted changes in physical activity intentions (see Table 4 and Figure 2a for results). In addition, changes in affective attitudes (β = 0.314, p < .001), self-regulatory efficacy (β = 0.212, p < .01) and intentions for physical activity (β = 0.196, p < .01) directly predicted changes in physical activity behavior.

With regard to indirect effects on physical activity behavior, the results revealed that intentions mediated the relationships between the social cognitions assessed (i.e., attitudes and self-regulatory efficacy) and physical activity behavior. Specifically, the indirect effect of affective attitudes on physical activity behavior was partially mediated by intentions, as a1*b1 (β = 0.036, p < .05) was significant. The indirect effect of self-regulatory efficacy on physical activity behavior was also partially mediated by intentions, as a3*b1 was significant, (β = 0.002, p < .05). The TPB variables explained 24.4% of the variance (R^2 = 0.244) in physical activity behavior.

Model 2 – Predicting Dietary Behavior

The model for dietary behavior was also just-identified; as such goodness of fit indices are not reported. Path analyses revealed that changes in self-regulatory efficacy (β = 0.233, p < .010) and changes in intentions for healthy eating (β = 0.168, p < .010) directly predicted changes in dietary behavior. None of the indirect effects tested were significant; as such changes in intentions did not

mediate the relationship between changes in the social cognitions assessed and changes in dietary behaviour. The TPB variables explained 12.3% of the variance ($R^2 = 0.123$) in dietary behavior.

Discussion

Adolescent girls are at risk of poor health outcomes because of low levels of health-enhancing behaviors (e.g,. physical activity and healthy eating; Colley et al., 2011; Riediger et al., 2007). It has been suggested that interventions that foster a sense of connections among girls while also instilling a change in attitudes and beliefs, may be particularly effective as a means of addressing these health behavior concerns in this population (Gilligan, 1982; Goodenow, 1993; J. E. Rhodes, 2005; J. E. Rhodes & DuBois, 2008). One intervention format that can be used to target belonging is through mentor-based programs. In this study we examined changes in psychosocial variables in relation to changes in physical activity and dietary behavior among adolescent girls involved in a group-based mentoring program that aimed to foster a sense of belonging to the program. At the end of the program, as suggested by the manipulation check, participants reported an elevated sense of belonging to their group. Furthermore, consistent with the TPB, changes in participants' affective attitudes, self-regulatory efficacy and intentions over the course of the program contributed to the prediction of changes in physical activity behavior over the same timeframe. Interestingly, only changes in self-regulatory efficacy and intentions predicted changes in dietary behaviors. These findings suggest that changes in the psychosocial variables targeted in this group-based program contributed to positive changes in health-enhancing behaviors.

Consistent with the TPB and previous research (Ajzen, 1991; Araujo-Soares et al., 2009; Luszczynska et al., 2004), positive changes in adolescent girls' enjoyment (i.e., affective attitudes) of physical activity and confidence in their capabilities to engage in physical activity predicted changes in their behavioral intentions and changes in actual behavior. Specifically, these findings are in line with those of a recent meta-analysis (Nasuti & Rhodes, 2013), which suggest that affective attitudes, rather than instrumental attitudes, were most important in predicting physical activity behavior among

adolescents in this study. However, it is important to consider these findings in relation to findings from the outcome evaluation (Dowd et al., 2015), which revealed that affective attitudes toward physical activity *declined* over the course of the program. While overall mean affective attitudes declined, for participants who experienced an improvement in affective attitudes, this predicted positive changes in their corresponding physical activity behavior. Nevertheless, that attitudes declined over the course of the program highlights the importance of improving the strategies that are used to target affective attitudes in the program.

Contrary to our hypothesis and the TPB, neither changes in attitudes nor self-regulatory efficacy significantly predicted changes in intentions and none of the indirect effects were significant in the prediction of changes in dietary behavior. It is worthy of note that changes in instrumental attitudes and self-regulatory efficacy were positively related to changes in dietary intentions, however the path coefficients did not reach standard levels of significance (*ps* = .089 and .056, respectively). Regarding the direct effects, changes in self-regulatory efficacy and intentions directly predicted changes in dietary behaviors which is consistent with previous work (Ajzen, 1991; Araujo-Soares et al., 2009; Luszczynska et al., 2004). Taken together, the results from the current study suggest that targeting self-regulatory efficacy may lead to changes in corresponding behaviors among at-risk adolescent girls. Future work is warranted to explore other effective strategies to target dietary intentions and behaviors in this important group.

The social environment created within the *Go Girls!* groups appeared to be an important contextual factor that may have contributed to the effectiveness of the program. Specifically, findings from the manipulation check revealed that participants reported a high sense of belonging to their *Go Girls!* groups. Indeed, the program was designed to develop positive and supportive relationships between the girls and mentors, which likely fostered the participants' sense of belonging to the program that targets health-enhancing cognitions (Baumeister & Leary, 1995; J. E. Rhodes, 2005). These findings are in line with group-mediated cognitive-behavioral interventions (Brawley et al., 2000),

which create a cohesive group environment and use group processes to foster health-enhancing cognitions. Drawing from the group dynamics and mentoring literature and the findings from the current study, it appears that targeting social cognitions (i.e., self-regulatory efficacy, attitudes and intentions) in a safe, supportive and connected environment is an important focus for health promotion programs designed to help adolescent girls.

In spite of the potential contributions of this study, limitations should also be acknowledged. First, data were not collected from a control group and thus we were unable to make causal conclusions regarding the prospective prediction of physical activity and dietary behaviors from the social cognitions assessed in this study. Future research utilizing a randomized controlled design where participants are allocated to the program or a wait-list control (or other comparison group) could specifically test this important research question. Second, in this study we did not examine the extent to which implementation fidelity (i.e., whether the program was implemented as intended) or program dose (i.e., the amount of time the program was delivered) moderated the relationship between the TPB derived cognitions and behavior. As recommended by Rhodes (2008), examination of both program implementation fidelity and dose represent important areas of research when conducting program evaluation. Third, although the *Go Girls!* program sought to develop a socially connected climate as a means to support the adoption and maintenance of health enhancing cognitions and behaviours, a notable (de)limitation of the study corresponds to the fact that we were unable to assess changes in either social belonging or social norms. Methodologically, it would not have been feasible to obtain a measure of belonging to the group, or norms related to the group, prior to group formation since they would have no frame of reference upon which to base their appraisals. Regardless, because we were unable to obtain these pretest measures, we were unable to examine the extent to which changes in these group dynamics variables may have explained any changes in dietary and physical activity behavior. Finally, future research is warranted that examines the long-term effects (one year or more) of this type of mentoring program.

Notwithstanding these limitations, the results of the current study are noteworthy for a number of reasons. First, we collected data from a large sample and the findings are generalizable to similar populations across Canada (i.e., adolescent girls in this program delivered in urban communities). Second, the use of change scores to examine if changes in TPB derived cognitions predicted changes in corresponding behaviors provides some insight into potential mechanisms through which the program may target key outcomes. Third, the use of multilevel modelling represents a considerable strength of the study, as we were able to account for group level effects on the relationships we examined. Finally, the study provided a test of theory in a real world setting and provided evidence for the ecological validity of the findings (Brewer, 2000).

When taken together, the results of the previous outcome evaluation of the *Go Girls!* program and the current study provide complementary insights into (a) the utility of group-based mentoring programs for adolescent girls, as well as (b) important direction for improving the program in the future (i.e., knowledge translation). From a program evaluation standpoint, the findings from the outcome evaluation (cf. Dowd et al., 2015) provided preliminary evidence for the effectiveness of the *Go Girls!* program; significant improvements in health-enhancing cognitions and behaviors were found at the end of the program and at the 7-week follow-up when compared to the baseline assessments. In light of the findings from the current study, that changes in attitudes as well as self-regulatory efficacy beliefs were positively associated with changes in intentions and dietary and physical activity behaviors over the course of the program, this suggests that those cognitions may warrant targeting, through intervention, within group-based mentoring programs involving adolescent girls. Furthermore, of particular note, given that affective attitudes towards physical activity were found to decline at the end of the program and instrumental attitudes towards healthy eating declined at the 7-week follow-up in our previous outcome evaluation analyses (cf. Dowd et al., 2015), the implication is that strategies used to target these attitudes in the *Go Girls!* program should be improved (i.e., finding ways to make physical activity more fun for participants and helping girls understand the health benefits of healthy eating). In

conclusion, an important knowledge translation (Estabrooks, Thompson, Lovely, Hofmeyer, 2006) initiative that derived from the results of this study is that the first author worked in collaboration with BBBS to revise the *Go Girls!* mentor training program manual accordingly.

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Endnotes

[1]Although Dowd and colleagues (2015) previously presented data utilized in the current study, this study addressed a very different set of research questions using different data analytic techniques. The current study was designed to *prospectively assess changes* in social cognitions (i.e., attitudes, self-regulatory efficacy and intentions) measured from before to after the program (Time 2-3) in relation to *changes in behaviors* (i.e., physical activity and healthy eating) from before to after the program (Time 2-3).

[2]Big Brothers Big Sisters offers the *Go Girls!* program for adolescent girls specifically. However, this organization also offers a similar program for adolescent boys entitled *Game On!*. For more information about this program for adolescent boys please see http://www.bigbrothersbigsisters.ca/en/home/mentoringprograms/gameon.aspx.

Table 1. Descriptive Statistics for Physical Activity and Dietary Variables

Time	Variable	Before Imputation			After Imputation				
		N	***M***	***SD***	***M***	***SD***	**ICC**	**Skewness**	**Kurtosis**
	Physical Activity Variables								
T2	1. Affective Attitudes (T2)	248	5.31	1.34	5.29	1.38	0.01	-0.41	-0.59
	2. Instrumental Attitudes (T2)	248	5.65	1.2	5.67	1.21	0.08	-0.85	0.6
	3. SRE (T2)	260	53.73	23.38	53.38	23.41	0.08	-0.07	-0.55
	4. Intentions (T2)	262	5.19	1.39	5.20	1.40	0.03	-0.46	-0.55
	5. Total PA (T2)	261	3.81	1.62	3.79	1.63	0.05	0.18	-0.61
T3	6. Affective Attitudes (T3)	241	5.08	1.55	5.12	1.53	0.01	-0.65	-0.17
	7. Instrumental Attitudes (T3)	240	5.58	1.29	5.59	1.30	0.13	-0.83	0.59
	8. SRE (T3)	242	54.75	24.39	55.06	24.08	0.11	-0.10	-0.61
	9. Intentions (T3)	244	5.38	1.37	5.40	1.34	0.13	-0.71	-0.15
	10. Total PA (T3)	243	4.18	1.70	4.19	1.70	0.01	-0.12	-0.98
	Dietary Variables								
T2	1. Affective Attitudes (T2)	249	5.03	1.53	5.03	1.56	0.11	-0.54	-0.34
	2. Instrumental Attitudes (T2)	249	5.74	1.27	5.77	1.25	0.08	-0.97	0.37
	3. SRE (T2)	260	62.58	23.16	61.61	23.50	0.01	-0.55	-0.15
	4. Intentions (T2)	262	5.02	1.37	5.03	1.36	0.09	-0.46	-0.27
	5. Dietary Behavior (T2)	265	10.83	3.40	10.79	3.44	0.11	-0.41	-0.33
T3	6. Affective Attitudes (T3)	241	5.01	1.59	5.01	1.59	0.05	-0.55	-0.31
	7. Instrumental Attitudes (T3)	241	5.78	1.39	5.76	1.38	0.15	-1.15	0.83
	8. SRE (T3)	241	64.7	23.88	64.80	23.76	0.03	-0.45	-0.41
	9. Intentions (T3)	247	5.02	1.34	5.04	1.34	0.19	-0.33	-0.53
	10. Dietary Behavior (T3)	247	11.25	3.68	11.26	3.67	0.11	-0.52	-0.35

Note. ICC = intraclass correlation coefficient. Affective and instrumental attitudes measured from 1 - 7, SRE (self-regulatory efficacy) measured from 0 – 100, intentions measured from 1 - 7, Total PA (physical activity) measured from 0-7 days/week, where higher scores represent more positive cognitions and behavior.

Table 2. Correlations Between Changes in Physical Activity Variables (after data imputation)

Variable	1	2	3	4
1. Change Score PA				
2. Change Score PA Intention	0.40***			
3. Change Score Self-regulatory Efficacy	0.25***	0.26***		
4. Change Score Affective Attitudes	0.03	0.08	0.07	
5. Change Score Instrumental Attitudes	0.05	0.27***	0.13*	0.42***

Note. *** $p < 0.001$ level (2-tailed); * $p < 0.05$ level (2-tailed).

Table 3. Correlations Between Changes in Dietary Variables (after data impuation)

Variables	1	2	3	4
1. Change Score Diet				
2. Change Score Diet Intention	0.27***			
3. Change Score Self-regulatory Efficacy	0.30***	0.27***		
4. Change Score Affective Attitudes	0.15*	0.26***	0.25***	
5. Change Score Instrumental Attitudes	0.18*	0.21***	0.27***	0.52***

Note: *** $p < 0.001$ level (2-tailed); * $p < 0.05$ level (2-tailed).

Table 4. Multilevel Path Analysis of Effects of Changes in Psychological Variables on Changes in Girls' Behavior

Variables	Estimate	*SE*	*P*
Model 1 (Physical Activity)			
(Outcome: Intentions)			
Predictor: Affective Attitudes (a1)	0.243	0.082	.003
Predictor: Instrumental Attitudes (a2)	-0.073	0.080	.363
Predictor: Self-Regulatory Efficacy (a3)	0.213	0.066	.001
(Outcome: Physical Activity Behavior)			
Mediator: Intentions (b1)	0.196	0.069	.005
Predictor: Affective Attitudes (c1)	0.314	0.078	<.001
Predictor: Instrumental Attitudes (c2)	-0.020	0.066	.757
Predictor: Self-Regulatory Efficacy (c3)	0.212	0.068	.002
Indirect Effects			
Affective Attitudes (a1 * b1)	0.036	0.017	.034
Instrumental Attitudes (a2 * b1)	-0.011	0.013	.398
Self-Regulatory Efficacy (a3 * b1)	0.002	0.001	.031
R^2	0.244	0.054	<.001
Model 2 (Diet)			
(Outcome: Intentions)			
Predictor: Affective Attitudes (a4)	0.040	0.082	.630
Predictor: Instrumental Attitudes (a5)	0.150	0.088	.089
Predictor: Self-Regulatory Efficacy (a6)	0.171	0.089	.056
(Outcome: Dietary Behavior)			
Mediator: Intentions (b2)	0.168	0.062	.007
Predictor: Affective attitudes (c4)	0.081	0.080	.313
Predictor: Instrumental attitudes (c5)	0.001	0.078	.995
Predictor: Self-regulatory efficacy (c6)	0.233	0.077	.002
Indirect Effects			
Affective Attitudes (a4 * b2)	0.004	0.003	.134
Instrumental Attitudes (a5 * b2)	0.056	0.040	.156
Self-Regulatory Efficacy (a6 * b2)	0.004	0.003	.134
R^2	0.123	0.040	.002

Note. Standardized path coefficients are reported.

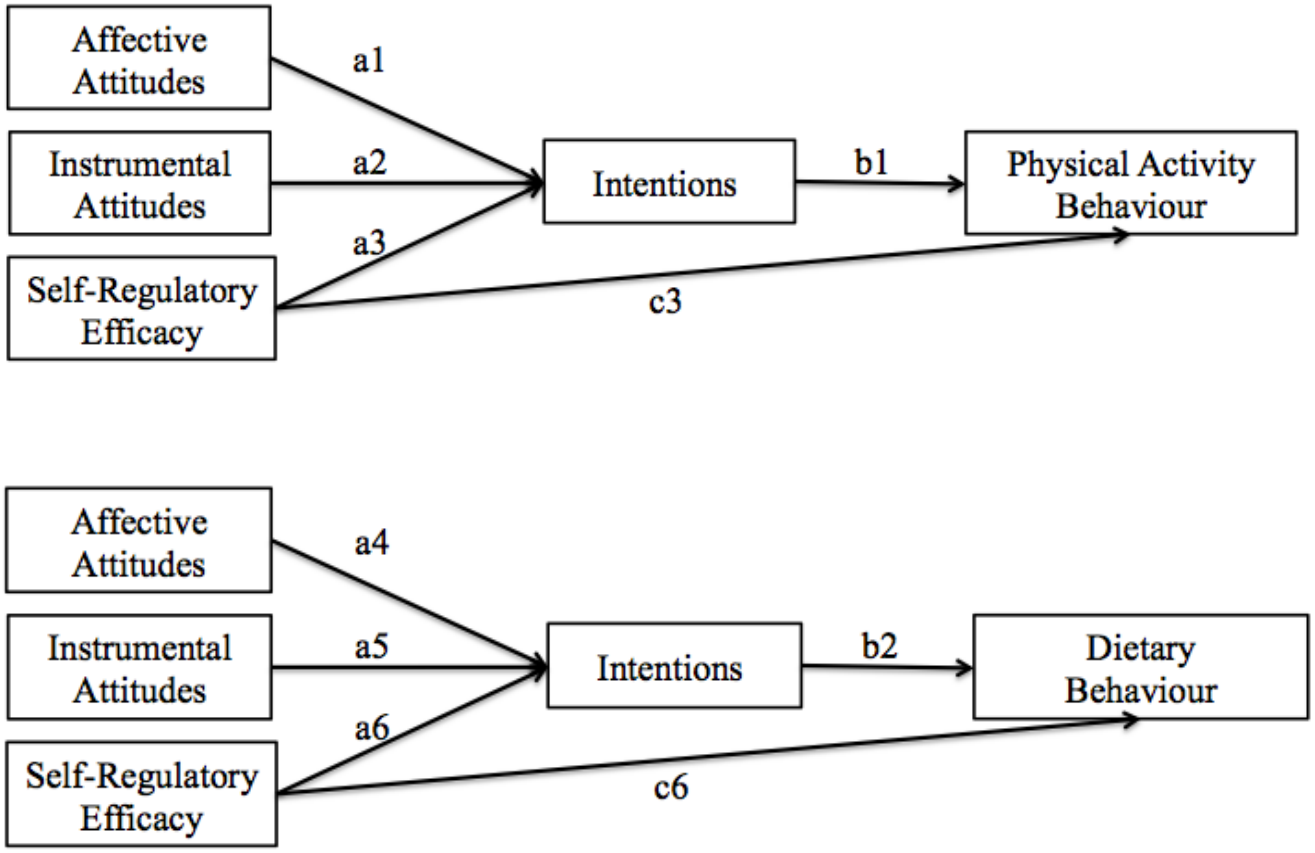

Figure 1. Path diagram of the hypothesized relationships between changes in the psychological variables and changes in (a) physical activity and (b) dietary behavior. Changes were measured from pre- to post-program.

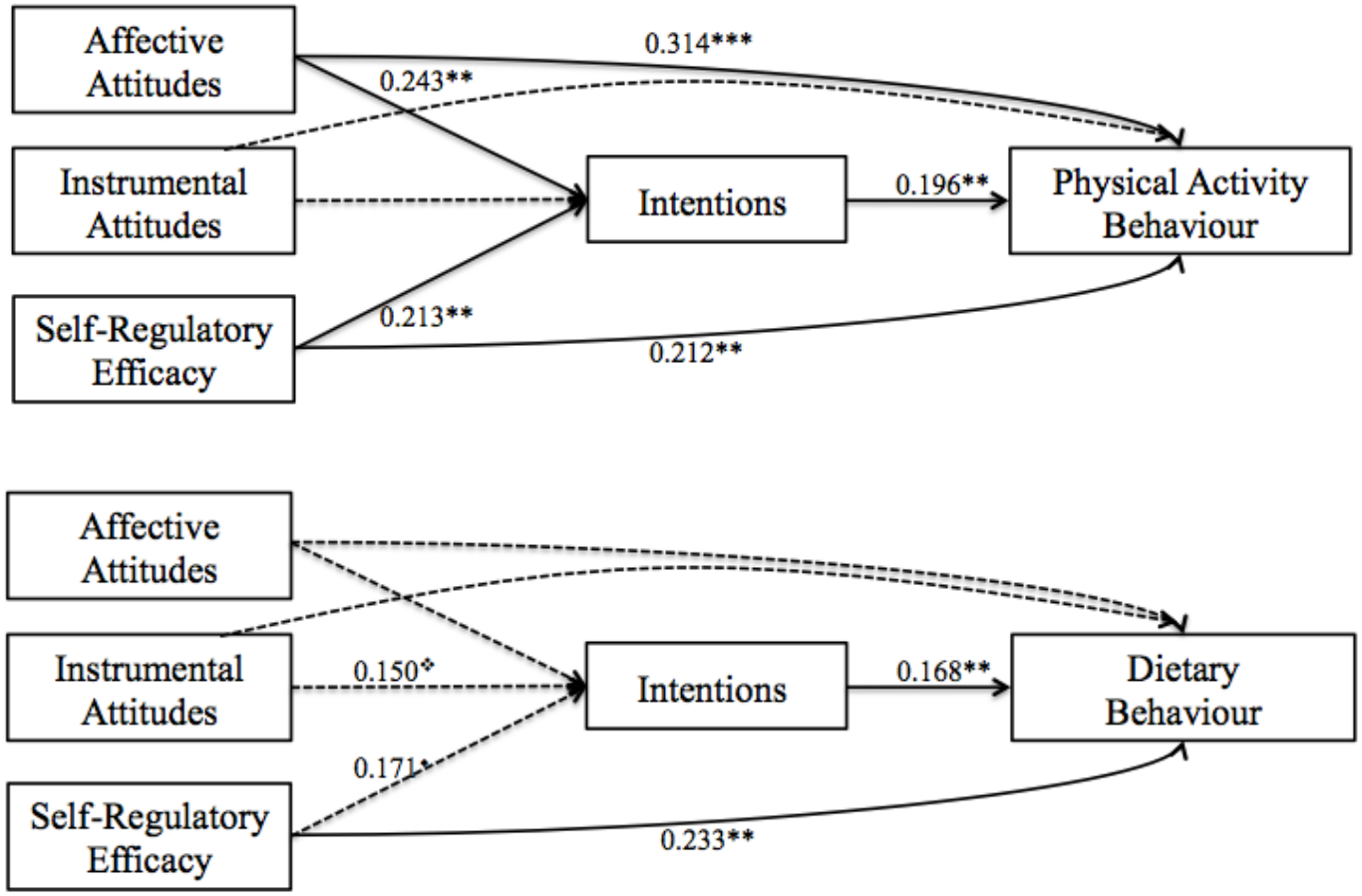

Figure 2. Path diagram of the relationships between changes in psychological variables and changes in (a) physical activity and (b) dietary behavior. Changes were measured from pre- to post-program. Standardized path coefficients are reported.
Note. ⬩p = .089, ❖p = .056