

“Go Girls!”: psychological and behavioral outcomes associated with a group-based healthy lifestyle program for adolescent girls

A Justine Dowd, PhD,¹ Michelle Y Chen, MSc,² Mary E Jung, PhD,³ Mark R Beauchamp, PhD

¹School of Kinesiology,
The University of British Columbia,
Vancouver, British Columbia,
Canada V6T 1Z1

²Department of Measurement,
Evaluation, and Research
Methodology,
University of British Columbia,
Vancouver, BC, Canada

³School of Health and Exercise
Sciences,
University of British Columbia at
Okanagan, Kelowna, BC, Canada

Correspondence to: A Dowd
anna.justine.dowd@gmail.com

Cite this as: *TBM* 2015;5:77–86
doi: 10.1007/s13142-014-0285-9

Abstract

The objective of this study was to assess changes in adolescent girls' health-enhancing cognitions and behaviors targeted by the Go Girls! group-based mentorship lifestyle program. Three hundred and ten adolescent girls (nested within 40 Go Girls! groups) completed questionnaires that assessed cognitions (attitudes, self-regulatory efficacy, and intentions) and behaviors (physical activity and dietary) at four time points (two pre-program, one at the end of the program, and one at 7-week follow-up). Hierarchical linear modeling was used to examine changes in the outcome variables among Go Girls! participants ($M_{\text{age}} = 11.68$ years, $SD = 0.80$). No significant changes occurred in the outcome variables during the baseline comparison period (Time 1–2). When compared to the average of the baseline assessments, 7 weeks after completing the program, girls reported significant improvements in physical activity ($M_{\text{Baseline PA Total}} = 3.82$, $SD = 3.49$; $M_{T_4 \text{ PA Total}} = 4.38$, $SD = 3.75$) and healthy eating ($M_{\text{Baseline}} = 10.71$, $SD = 1.13$; $M_{T_4} = 11.35$, $SD = 1.05$) behavior and related cognitions (d values ≥ 0.65). Findings provide preliminary support for programs that foster belongingness and target health behaviors through mentorship models.

Keywords

Belonging, Program effectiveness, Physical activity, Dietary behavior, Adolescent girls, Self-regulatory efficacy, Group-based lifestyle mentoring program

Adolescent girls are in particular need of effective programs that develop healthy lifestyle behaviors [1]. The high prevalence of inactivity [2] and poor dietary behaviors [3] represents major health concerns for this population. Indeed, 30–50 % of adolescent girls report no leisure-time physical activity [4] and one in three Canadian adolescent girls do not meet current guidelines for fruit and vegetable consumption [5]. In response to these public health concerns, gender-specific lifestyle interventions have been developed for adolescent girls that target health behaviors, such as physical activity and dietary behaviors, and cognitions toward those behaviors.

Implications

Practice: Interventions that foster belongingness and target health behavior change through mentorship models may represent a viable means to improve health-enhancing behaviors among adolescent girls.

Researchers: Future research is warranted that further examines the effectiveness of the Go Girls! program through use of a stepped wedge, full time series, or an experimental design with a parallel control group.

Policymakers: Resources should be directed toward the implementation and dissemination of interventions to improve health-enhancing cognitions and behaviors among adolescents.

The majority of gender-specific lifestyle interventions for youth have tended to focus on the prevention or treatment of obesity [e.g., 6, 7]. For example, Neumark-Sztainer and colleagues [8] examined the effectiveness of a physical education program entitled “New Moves” to target health behaviors and body image among adolescent girls at risk of overweight and obesity. Results from this study [8] indicate that after completing the program, girls reported significant improvements in portion control, reductions in sedentary behavior, and increases in their physical activity self-efficacy and self-reported psychological “stage of change” for both dietary and physical activity behaviors. However, no significant changes were found for physical activity behavior or quality of dietary intake in terms of consumption of fruit and vegetables and sugar-sweetened beverages. Similarly, findings from another school-based lifestyle program for adolescent girls indicated improvements in girls' health behavior intentions and dietary knowledge, but no changes in physical activity or dietary behavior after completing the program [9].

In light of the limited effectiveness of these programs, theory-based research is needed to target behavior change. Specifically, the social context has

been identified as an important factor to consider when developing programs to target adolescent girls' behaviors. For example, interpersonal connections have been highlighted as particularly important for overcoming the unique challenges faced by adolescent girls [10–12]. In particular, when girls experience positive connections to their school, peers, or important adults (e.g., teachers, mentors, etc.), this has been found to be positively associated with adolescent girls' academic motivation and performance [10, 13, 14]. Thus, programs that target girls' health behaviors within a context that promotes a sense of belonging (i.e., positive interpersonal connections) may be particularly effective for adolescent girls. The overall purpose of this study was to evaluate the effectiveness of a group-based healthy lifestyle program for adolescent girls, which specifically aims to foster a sense of belonging among the girls to group members and program mentors. This program is entitled Go Girls! Healthy Minds Healthy Bodies, or Go Girls! for short, and is run by member agencies of Big Brothers Big Sisters (BBBS) of Canada. Although the Go Girls! program has been widely disseminated across Canada over the past decade, this program has yet to be subject to comprehensive external (arms length) evaluation.

Drawing from social cognitive models of behavior change [e.g., 15–19], the Go Girls! program was designed to provide experiential (social learning) opportunities to help girls adopt and maintain healthy lifestyles (i.e., physical activity and healthy eating behaviors as well as their attitudes toward these behaviors; see “METHOD” for program description). The objectives of the Go Girls! program are targeted through weekly sessions with mentors in which girls are provided with an environment that is specifically created to encourage social connections among group members [20]. These connections are fostered through having adolescent girls meet with similar others (i.e., same gender, similar age and grade in school) in a caring, supportive, and positive setting on a repeated basis [20, 21]. Specifically, the program seeks to bolster girls' confidence in their abilities to self-manage [i.e., self-regulatory efficacy; 17] both regular physical activity and healthy eating, by providing opportunities to learn from each other (i.e., vicarious experiences), master new healthy living behaviors (i.e., mastery experiences), and support each other (i.e., verbal persuasion). Thus, it was hypothesized that participants would report improvements (i.e., positive change) in self-regulatory efficacy to be both physically active and consume a healthy diet.

Furthermore, the Go Girls! program also targeted the girls' instrumental attitudes (i.e., perceived health-related benefits of the behavior) and affective attitudes (i.e., how one will feel during or after engaging in the behavior) toward healthy living behaviors. Specifically, Go Girls! mentors attempt to convey the vision that engaging in regular physical activity and healthy eating is not only good for your health (i.e., instrumental attitudes), it can also be fun (i.e., affective attitudes). Thus, it was hypothesized that participants would

report improvements in both affective and instrumental attitudes for both physical activity and healthy eating. Findings from numerous studies suggest that self-regulatory efficacy beliefs and attitudes are related to stronger intentions to engage in physical activity and to consume a healthy diet, as well as actual engagement in those behaviors [15–19]. As such, we also hypothesized that Go Girls! participants would report stronger intentions to engage in physical activity and healthy eating, and display higher levels of these behaviors by the end of and 7 weeks after the program, when compared to baseline.

In sum, evidence from a range of studies suggests that targeting key social cognitions (e.g., self-regulatory efficacy, attitudes, intentions) can lead to changes in behaviors. As highlighted by Glasgow [22], a pragmatic approach to the assessment of the effectiveness of programs that aim to translate research into practice is warranted. Activities in the Go Girls! program were derived from evidence-based strategies to specifically target key health-enhancing cognitions among adolescent girls. Given the importance of increasing physical activity and improving healthy eating behaviors among adolescent girls, evaluation of programs that aim to improve these behaviors, such as Go Girls!, is warranted.

METHOD

Participants

In total, 344 Go Girls! participants agreed to participate in the study (age range 11–14 years, $M_{\text{age}} = 11.68$ years, $SD = 0.80$). Six participants dropped out part way through the study (one because she moved away and the other five did not provide a reason for dropping out). Eleven participants were excluded from the analyses because they were former Go Girls! participants,¹ 1 participant was excluded because she was unable to understand and complete the questions, 11 participants were excluded because the research assistant accidentally went 1 week early (i.e., data were collected at the end of the 6th session, not the final 7th session), and 3 participants were excluded because they told the research assistant they “just filled in their answers at random.” The participants came from 38 elementary or middle schools (40 groups in total as two schools ran two concurrent separate Go Girls! programs) in Southern Ontario, Canada. We followed procedures used by Statistics Canada in the 2006 Census and allowed participants to identify all ethnic/cultural groups with which they

¹ The Big Brothers Big Sisters general policy is that girls can only participate in the Go Girls! program once. However, after one group of girls completed Time 4 questionnaires, the research assistant was informed that these girls had completed the program once before (twice in total). We felt that it was not conceptually and methodologically appropriate to compare girls who had completed the program once to girls who had completed it more than once. As such, 11 girls who had completed the program before were excluded from the analyses.

self-identified (i.e., girls could identify with more than one ethnic group). The largest represented ethnic groups were White (39.20%), Japanese (20.8%), Black (17.50%), and South Asian (e.g., East Indian, Pakistani 9.6%). Eleven other ethnic groups were identified with a frequency of less than 5%.

Procedure

Institutional Review Board and School Board approval were obtained prior to the onset of this study. Participants were recruited through initial contact with Go Girls! program directors, school principals, and school champions (i.e., the liaison between the schools and BBBS agencies). Specifically, once principals agreed to have their schools participate, mentors and their groups were subsequently invited to take part in the study, at which point active consent was obtained from both parents and girls separately. Participation (or not) in the study had no implication on the girl's ability to participate in the Go Girls! program (i.e., girls could choose to not participate in the study and still complete the program). Trained research assistants collected the data at all four time points.

Study design

This study was designed as a prospective observational outcome evaluation. Specifically, assessments were conducted 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 and April 2013), and approximately 7 weeks after program completion (Time 4—data collected in May and June 2013). An average of the scores collected at Time 1 and Time 2 (i.e., during which the girls did not receive any intervention) was utilized as the baseline comparison period to compare changes during the program (Time 3) and after the program (Time 4). In other words, by collecting baseline data approximately 7 weeks before the program started, we were able to obtain data from a pre-program comparison group without delaying the start of the Go Girls! program for this cohort [cf. [23]]. Assessments took approximately 30 min to complete. 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

The Go Girls! program was developed by Ontario Physical and Health Education Association (Ophea) in 2001. Member agencies of BBBS of Canada currently implement the program in hundreds of schools across Canada (<http://www.bigbrothersbigsisters.ca/en/home/mentoringprograms/gogirls.aspx>). Over the past decade, thousands of adolescent girls have

participated in the Go Girls! program.² The Go Girls! program is a 7-week program that is designed to consist of seven 2-h weekly sessions (14 h total), which are run by two female volunteers (i.e., the mentors). Mentors are 18–25-year-old women who have an interest in physical activity, healthy eating, and mentoring. Mentors are recruited and screened by BBBS agencies and trained by agency staff [20]. While the Go Girls! program was initially designed for girls who are not involved in extracurricular activities and/or school sports, to avoid stigmatization of the program, all girls who are interested in the program are eligible to participate. The Go Girls! program is delivered in all types of schools (e.g., public, private, Catholic, Christian, French) across Canada.

Adolescent girls meet with the Go Girls! mentors and 3–14 ($M_{\text{group size}}=8.54$, $SD=3.11$) other girls in a classroom provided by their school during or after school hours. Drawing from social cognitive theories [e.g., 15–19], the sessions are designed to provide experiential (social learning) experiences to help girls adopt and maintain healthy lifestyles. Specifically, these sessions focused on physical activity, healthy eating practices, and empowering girls to feel better about themselves. The program targeted key social cognitions (i.e., self-efficacy, instrumental and affective attitudes, social belonging) and behaviors (i.e., physical activity and healthy eating). See Table 1 for a summary of the weekly program content.

Measures

Go Girls! program belonging—In order to assess the extent to which the intervention created the social context as planned (i.e., the girls felt connected to one another), a measure of belonging to the Go Girls! program was administered immediately after the girls completed the program (Time 3) as a manipulation check. Sense of belonging to the Go Girls! program was assessed using the five-item measure developed by Anderson-Butcher and Conroy [24]. Participants were asked to rate how much they agree with each item using a four-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 answers in samples with children and youth [24]. Sample items include “I feel comfortable at the Go Girls! program” and “I feel committed to the Go Girls! program.” Items were summed and averaged to provide an indication of each participant's mean belonging on a range of 1–4. Data derived from this measure provide evidence of acceptable reliability [Cronbach $\alpha=0.93$; 24]. In the present study, scores derived from this instrument displayed acceptable internal consistency (Cronbach $\alpha\geq 0.87$).

² Teachers and/or school liaisons in participating schools ask adolescent girls if they would like to participate in the program. All adolescent girls in participating schools are eligible to participate in the program. There is no cost associated with participating in Go Girls!

Table 1 | Summary of the Go Girls! weekly program content

Week	Focus
1	Introduction to active living, balanced eating, feeling good about self, begin to develop relationships with the other girls and mentors
2	Communication skills, engage in physical activity, discuss importance of eating fruits and vegetables
3	Recognize social influences on body image, importance of eating breakfast, engage in physical activity
4	Discuss self-esteem and body image, learn new physical activity, discuss importance of calcium, iron, fiber
5	Help girls think about important issues (e.g., relationships, substance abuse, dieting), problem solving, engage in physical activity
6	Goal setting, engage in physical activity, discuss healthy snack options
7	Celebrate successes, develop strategies to maintain healthy lifestyle

Physical activity behavior—Participants' total physical activity behavior was assessed using a two-item questionnaire suitable for use with adolescents [25]. These two items assessed the total amount of physical activity participants engaged in over the past week and over a typical week. These two items were summed and divided by 2 to get an average number of days per week that participants completed physical activity for at least 60 min [25, 26]. Scores derived from this two-item measure demonstrated acceptable reliability at all four time points [Spearman-Brown coefficient ρ values ≥ 0.82 ; 27].

Participants' leisure time physical activity behavior was assessed using two items from the World Health Organization Health Behavior in School Children survey [28]. These two items assessed the amount of time spent each week (bouts per week) engaged in moderate-to-vigorous leisure-time physical activity. In the present study, scores derived from this instrument displayed acceptable internal consistency at all four assessments [Spearman-Brown coefficient ρ values ≥ 0.72 ; 27].

Adolescent dietary behaviors—Participants' dietary behaviors were assessed using a revised version of the Adolescent Food Habits Checklist [29]. Based on recommendations made by three independent dietitians, the questionnaire was revised by culling 6 items from the original 23-item questionnaire. Items were culled based on current scientific evidence as certain items were identified as no longer being appropriate to assess "healthy" behaviors (i.e., such as the notion of avoiding all low-fat foods to be healthy). This revised 17-item questionnaire asked participants to report intake of fruit, vegetables, and energy dense foods using a true/false response format. Four items also had an alternative response, equivalent to "not applicable." Participants received one point for each healthy response and the final score was adjusted for "not applicable" and missing responses using the formula: AFHC scores = number of health responses \times (17/number of items completed). Data derived from this measure have provided evidence of satisfactory reliability [Cronbach $\alpha=0.83$; 29]. In the present study, scores derived from this instrument displayed acceptable internal consistency at all four assessments (Cronbach α values ≥ 0.70).

Self-regulatory efficacy for physical activity—Participants' confidence to self-regulate their physical activity behavior was measured using a questionnaire developed by Shields, Spink, Chad, Muhjarine, Humbert, and Odnokon [30]. Participants were asked to rate their confidence in their abilities to engage in six self-regulatory behaviors with regard to physical activity over the next week. Items were measured on a standard 0 % (not at all confident) to 100 % (completely confident) self-efficacy scale [31]. Item scores were summed and averaged to provide an indication of each participant's mean efficacy out of 100 %. Data derived from this measure have demonstrated acceptable reliability [Cronbach $\alpha=0.85$; 30]. In the present study, scores derived from this instrument displayed acceptable internal consistency at all four assessments (Cronbach α values ≥ 0.86).

Self-regulatory efficacy for healthy eating—Participants' confidence to engage in healthy eating was measured using a version modified for youth [32] of the questionnaire developed by Strachan and Brawley [33]. Participants were asked to rate their confidence to engage in five self-regulatory behaviors that could help them eat healthfully over the next week. Items were measured on a standard 0 % (not at all confident) to 100 % (completely confident) self-efficacy scale [31]. Item scores were summed and averaged to provide an indication of each participant's mean efficacy out of 100 %. Data derived from this instrument have demonstrated acceptable reliability [Cronbach $\alpha=0.86$; 32]. In the present study, scores derived from this instrument displayed acceptable internal consistency at all four assessments (Cronbach α values ≥ 0.89).

Physical activity and healthy eating intentions—Participants' intentions to engage in physical activity were measured using a three-item questionnaire developed by Chatzisarantis and colleagues [34]. Items were measured on a seven-point scale, with anchors ranging from 1 (very unlikely) to 7 (very likely). An exemplar item for physical activity intentions included "I intend to do physical activity at least three times next week." Participants' intentions to eat a healthy diet were measured using a similar three-item questionnaire modified based on Chatzisarantis and colleagues' [34] physical activity

measure and Luszczynska and colleagues [35]. An exemplar item for healthy eating intentions included “I intend to eat a healthy diet every day next week.” In the present study, scores derived from these instruments displayed acceptable internal consistency at all four assessments (physical activity: Cronbach α values ≥ 0.91 ; healthy eating: Cronbach α values ≥ 0.89).

Physical activity and healthy eating affective attitudes—Participants’ instrumental and affective attitudes toward physical activity and healthy eating were assessed using two separate six-item measures [36, 37]. All items began with the stem “For me, engaging in physical activity/healthy eating would be....” Participants were asked to respond using separate seven-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 assess instrumental attitudes include “Useful–Useless,” “Wise–Foolish,” and “Beneficial–Harmful,” and items designed to assess affective attitudes include “Enjoyable–Unenjoyable,” “Pleasant–Unpleasant,” and “Interesting–Boring.” Answers were summed for each subscale and the mean value for each subscale was calculated. Higher mean values represent more positive instrumental and affective attitudes. Data collected using the physical activity questionnaire with adolescents provide evidence for acceptable levels of reliability [38, 39]. In the present study, scores derived from this instrument displayed acceptable internal consistency at all four assessments (physical activity instrumental attitudes: Cronbach α values ≥ 0.81 ; physical activity affective attitudes: Cronbach α values ≥ 0.83 ; healthy eating instrumental attitudes: Cronbach α values ≥ 0.86 ; healthy eating affective attitudes: Cronbach’s α values ≥ 0.84).

Data analysis

A moderate proportion of missing data were found across all the study variables (14.25–24.60%). A missing value analysis was conducted using SPSS (Version 20), which indicated that the assumption of missing completely at random (MCAR) was met. Specifically, Little’s [40] chi-square test of MCAR was non-significant $\chi^2(2023) = 2028.11, p > 0.05$. In the subsequent models, a full information maximum likelihood approach to model estimation was used. Data were analyzed using hierarchical linear modeling (HLM, student version 7.0) controlling for the nested nature of the data (i.e., repeated measures within individuals and girls within groups [41]).

RESULTS

Girls attended on average 91% of the 7 sessions (range 3–7 sessions attended). Sessions were on average 78 min long (range 40–135 min) and total program

Table 2 | Intraclass correlation coefficients (ICC) for outcome variables

Variable	ICC
PA total	0.038
PA leisure	0.050
HE behavior	0.072
Intentions—PA	0.065
Intentions—HE	0.096
IA—PA	0.086
AA—PA	0.022
IA—HE	0.103
AA—HE	0.085
SRE—PA	0.073
SRE—HE	0.028

PA physical activity, HE healthy eating, IA instrumental attitudes, AA affective attitudes, SRE self-regulatory efficacy

minutes were on average 534 min (range 280–910 min). The intraclass correlation coefficients (ICC) for the group-level variation are presented in Table 2. These data suggest that the majority of variance in scores was observed at the individual level (group-level ICCs ≤ 0.103). Scores from the Go Girls! sense of belonging measure (i.e., the manipulation check) confirmed that on average the girls felt a sense of belonging to the Go Girls! group ($M=3.74, SD=0.40$; range 2.0–4.0). Coefficients, standard errors, and effect sizes are presented in Table 3.

Changes in outcomes over time

Before the program—As hypothesized, there were no significant changes during the baseline assessment period (Times 1–2) for physical activity or healthy eating, self-regulatory efficacy for physical activity and healthy eating, affective or instrumental attitudes for physical activity and healthy eating, or physical activity and healthy eating intentions, the absolute values of t values ≤ 1.27 , p values ≥ 0.21 (see Figs. 1, 2, and 3 for changes in psychosocial outcomes over time and Fig. 4 for changes in behavioral outcomes over time).

Immediately after the program—Consistent with our hypothesis, compared to the mean of the scores at Time 1 and Time 2, there were significant improvements in leisure time physical activity behavior and self-regulatory efficacy for healthy eating immediately after the Go Girls! program, t values ≥ 2.44 , p values ≤ 0.02 , d values ≥ 0.78 .³ While means were in the hypothesized direction, increases in physical activity intentions, total physical activity, and healthy eating behavior were not significant at the end of the program (Time 3), t values ≥ 1.38 , p values ≤ 0.17 . Contrary to our hypothesis, there were significant reductions in the girls’ affective attitudes toward physical activity, $t=$

³ Note that effect sizes may be overestimated due to the correction for repeated measures (over time) and the nesting effect of girls in groups [40].

Table 3 | Hierarchical linear modeling analyses for changes in outcomes over time

Variable	Time 1–Time 2			Avg T1-T2 vs. Time 3			Avg T1-T2 vs. Time 4			
	Parameter	Coeff.	SE	Parameter	Coeff.	SE	Parameter	Coeff.	SE	Effect size
PA total	γ_{100}	-0.07	0.06	γ_{200}	0.11	0.07	γ_{300}	0.33***	0.07	1.57
PA leisure	γ_{100}	-0.01	0.04	γ_{200}	0.11**	0.04	γ_{300}	0.24***	0.06	1.38
Diet behavior	γ_{100}	-0.02	0.08	γ_{200}	0.20	0.12	γ_{300}	0.31*	0.14	0.71
SRE-PA	γ_{100}	0.09	0.60	γ_{200}	0.10	0.87	γ_{300}	3.79***	0.88	1.38
SRE-HE	γ_{100}	0.66	0.52	γ_{200}	1.92*	0.79	γ_{300}	0.43	1.02	0.13
Intentions-PA	γ_{100}	-0.01	0.04	γ_{200}	0.09	0.06	γ_{300}	0.13*	0.06	0.65
Intentions-HE	γ_{100}	0.02	0.04	γ_{200}	0.02	0.06	γ_{300}	0.11	0.06	0.59
IA-PA	γ_{100}	-0.02	0.06	γ_{200}	-0.07	0.05	γ_{300}	0.05	0.06	0.27
AA-PA	γ_{100}	0.03	0.05	γ_{200}	-0.11*	0.05	γ_{300}	0.01	0.05	0.04
IA-diet	γ_{100}	-0.01	0.04	γ_{200}	0.07	0.06	γ_{300}	-0.23***	0.06	1.32
AA-diet	γ_{100}	-0.04	0.06	γ_{200}	-0.01	0.06	γ_{300}	-0.04	0.06	-0.23

Standardized regression coefficients are reported

PA physical activity, SRE self-regulatory efficacy, IA instrumental attitudes, AA affective attitudes, SE self-efficacy

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

-2.33, $p = 0.007$, $d = -0.75$, and there were no significant changes in self-regulatory efficacy for physical activity and the other attitudes immediately after program completion (Time 3), t values ≤ 1.35 , p values ≥ 0.19 .

Seven weeks after the program—As hypothesized, compared to the mean of the scores at Time 1 and Time 2, 7 weeks after the program had ended (Time 4), there were significant improvements in healthy eating and physical activity behavior (leisure time and total physical activity), physical activity intentions, and self-regulatory efficacy for physical activity, t values ≥ 2.04 , p values < 0.05 , d values ≥ 0.44 . While means were in the hypothesized direction, no significant improvement in dietary intentions was found, $t = 1.84$, $p = 0.07$. However, contrary to our hypothesis, compared to the mean of the scores at Time 1 and Time 2, there were significant decreases in instrumental attitudes for healthy eating 7 weeks after program completion (Time 4), $t = -4.12$, $p = 0.001$, $d = 1.32$. There were no significant changes in the other psychosocial variables (self-regulatory efficacy for healthy eating and all other attitude measures) compared to baseline, t values ≤ 0.83 , p values ≥ 0.41 .

DISCUSSION

The purpose of this study was to examine changes in health-enhancing social cognitions and behaviors among a sample of adolescent girls who participated in a group-based lifestyle intervention. Most importantly, from a program effectiveness perspective, significant increases in reported leisure time physical activity were maintained 7 weeks after program completion. Furthermore, 7 weeks after the program ended, participants reported improved healthy eating behavior (i.e., diet quality) and engaging in more total physical activity compared to before the program. These findings are noteworthy because previous lifestyle programs for girls have only found changes in cognitions [and not in healthy behaviors; 8, 9]. In addition to the reported improvements in physical activity (leisure time at Time 3 and Time 4, total physical activity at Time 4) and healthy eating behaviors (at Time 4), Go Girls! participants also reported enhanced self-regulatory efficacy for healthy eating (at Time 3) and physical activity (at Time 4) and physical activity intentions (Time 4). From a public health perspective, it is particularly noteworthy that 7 weeks post-program completion, participants reported significant improvements in the health behaviors (i.e., physical activity and healthy eating) targeted in the Go Girls! program when compared to baseline measures. These findings suggest that the Go Girls! program may encourage adolescent girls to initiate health-enhancing behaviors; however, future research is warranted to examine long-term adherence to these behaviors after program completion.

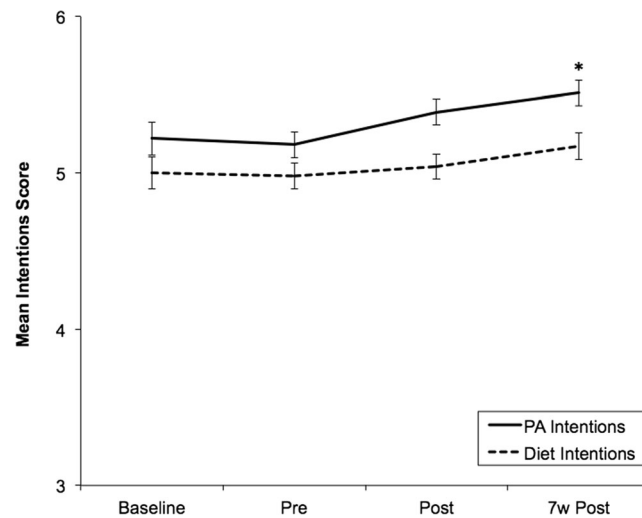


Fig 1 | Changes in behavioral intentions over time. *PA* stands for physical activity. *Error bars* represent standard error. Note: changes between Time 1 and Time 2 represent the initial baseline assessment period during which the girls did not receive any intervention (i.e., the average score from these data served as a pre-program comparison to Time 3 and Time 4 scores)

One of the unique elements of the Go Girls! program is the emphasis on fostering a sense of connection (i.e., belonging) among the girls and with the mentors. Indeed, as confirmed by the manipulation check used in this study, by the end of the program, the girls reported feeling a strong sense of belonging to the Go Girls! program. Based on previous research that highlights the importance of fostering interpersonal relationships when working with girls [10–12], it is plausible to suggest that fostering a sense of belonging may have contributed to the effectiveness of the Go Girls! program. Of course, as we were only able to measure belonging to the Go Girls! program at the end of the program (because the girls could not have reported their belonging to a program before it started), we were unable to examine the extent to which changes in belonging led to changes in the outcomes targeted

in the Go Girls! program. Indeed, this notion represents an important area of future research as changes in social connections over the course of a youth program have been found to be positively associated with changes in social cognitions [42]. Nevertheless, when taken together, these findings are important because they suggest that programs designed to foster social connections among adolescent girls may provide a suitable environment to develop health-enhancing social cognitions and behaviors among this population.

Contrary to our hypothesis, we did not find any significant improvements in the girls' healthy eating intentions, although the means were in the hypothesized direction. It is possible that this finding is due to the measurement of healthy eating intentions. Specifically, healthy eating intentions were assessed using a questionnaire that asked girls to what degree they

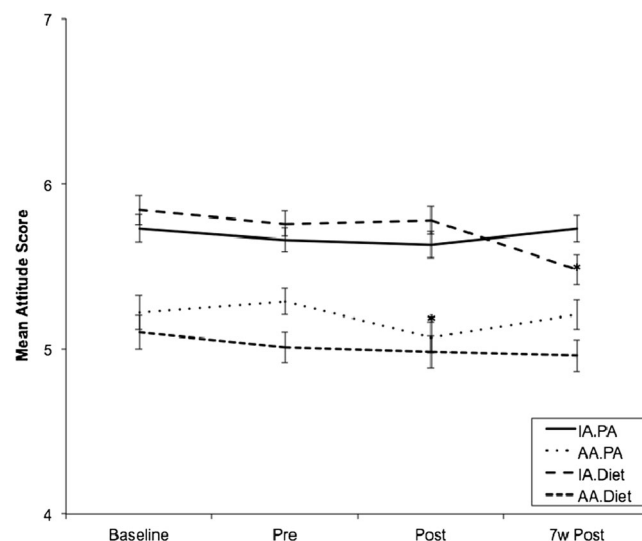


Fig 2 | Changes in attitudes over time. *IA* stands for instrumental attitudes, *AA* stands for affective attitudes. *PA* stands for physical activity. *Error bars* represent standard error

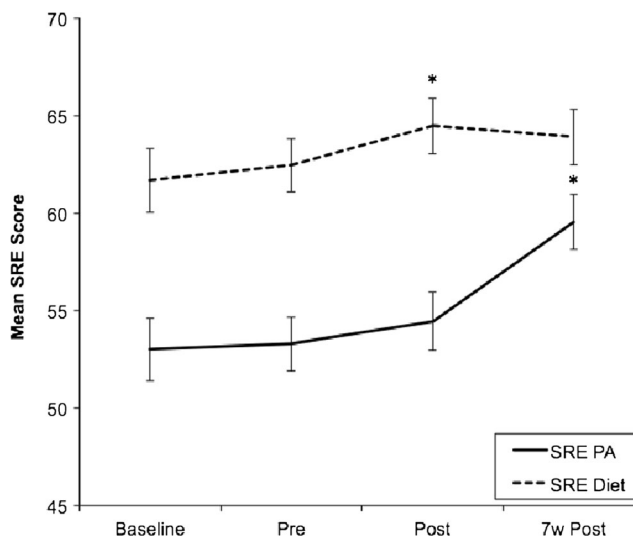


Fig 3 | Changes in self-regulatory efficacy over time. *SRE* stands for self-regulatory efficacy. *Error bars* represent standard error

intended, planned, and were determined to eat a healthy diet every day over the next week. In consideration of the physical activity intentions measure which asked girls if they intended, planned, and were determined to do physical activity at least three times over the next week (and did detect significant improvements in physical activity intentions), it is possible that the healthy eating intentions measure was not sensitive to (potential) changes in the girls' healthy eating intentions. In light of the adolescent girls' improved dietary behavior reported in the current study, future research is warranted to examine changes in dietary intentions using a less stringent standard for healthy eating (e.g., at least three times over the next week).

Furthermore, and again contrary to our hypotheses, we did not find any positive changes in instrumental attitudes for physical activity or affective attitudes for healthy eating, and indeed affective attitudes toward physical activity and instrumental attitudes toward

healthy eating declined. These findings suggest that the strategies that were used to make physical activity fun for the girls (i.e., affective attitudes) and help them understand why healthy eating is important (i.e., instrumental attitudes) could be improved in the Go Girls! program. It is noteworthy that the results for the attitudinal variables did not align with the behavioral measures for physical activity and diet (which both improved) or the other social cognitive measures (e.g., self-regulatory efficacy and intentions) assessed in this study. Disentangling such a discrepancy represents an important direction in any future research.

Balanced against the findings reported in this study, several limitations should be considered. First, although we collected baseline assessments over a 7-week period before the Go Girls! program began, we did not collect data from a separate control group. Although we recognize that randomized controlled trial (RCT) designs are beneficial in estimating causal effects, there has been increased evidence and calls for

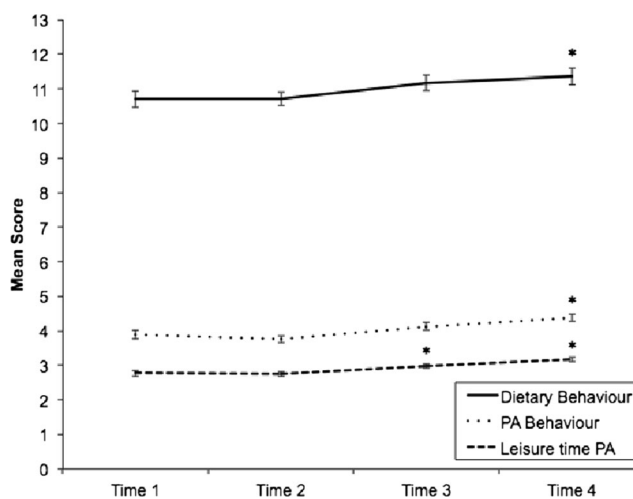


Fig 4 | Changes in the behavioral outcomes over time. *PA* stands for physical activity. *Error bars* represent standard error

the utility of non-randomized designs in the evaluation of large-scale public health interventions when programs might be less amenable to RCT designs [43, 44]. Considering that the Go Girls! program is not a new program but is one that has been widely disseminated across Canada for over a decade, it was not feasible to randomize girls (to separate intervention and control conditions) when they had previously been identified (by teachers and school liaisons) as being at risk or in need of support from this widely disseminated program. Furthermore, the standard passage of care for these girls involved enrolment in this program, and so to allocate them to a control condition (e.g., no-treatment or attention control) would not have been ethically defensible. One option that we proposed to the Big Brothers Big Sisters of Canada in planning this program evaluation study was to operationalize a wait-list control condition; however, due to logistical constraints highlighted by the program directors this was not viable. In light of some of the challenges to evaluating population health interventions in real-world settings, a number of researchers have highlighted the utility of the time series design as a suitable alternative to an RCT [43, 44]. Through such a design, by establishing a baseline trend that is in contrast to subsequent changes that occur during/following the intervention adds strength to the conclusion that the change in behavior resulted from the intervention. Nevertheless, in the future, the use of stepped wedge, full time series, or experimental designs with an appropriate parallel control group would appear warranted to further evaluate the effectiveness of this program.

Second, the outcome variables were all self-reported and subject to bias. Future studies using objective measures to assess outcomes (e.g., accelerometers to assess physical activity) or reports from others (e.g., mentors, parents, or teachers) on the girls' changes in cognitions and behaviors would be beneficial. Third, while it is noteworthy that increases in both physical activity and healthy eating behavior were observed at follow-up, this post-program assessment period was restricted to a 7-week sampling frame. Future research could explore the extent to which any acute effects of the Go Girls! program are sustained over a longer time frame (e.g., 6 months, 1 year).

Despite these limitations, the findings of this study are noteworthy for a number of reasons. First, we found medium-large size effects for the significant improvements in both physical activity and dietary behaviors. Second, this was the first study to examine the effectiveness of the Go Girls! program, which has previously demonstrated considerable "reach" [cf. 45] by providing thousands of adolescent girls with the opportunity to participate in the program across Canada every year. Indeed, one of the biggest strengths of the study is that because we collected data from a large, representative sample of Go Girls! participants, the findings are generalizable to other similar programs implemented in similar contexts (i.e., urban communities in Canada). Given the preliminary

evidence for the effectiveness of the Go Girls! program, future research is warranted to examine the extent to which an adapted version of the Go Girls! program could be beneficial for older adolescent girls (e.g., high school girls). Third, the use of hierarchical linear modeling represents a noted strength of the study because this analytic approach is well suited for missing data, examining changes over time, and accounts for the nested nature of the data.

CONCLUSION

In conclusion, findings from the current study suggest that adolescent girls who participated in the Go Girls! program reported improvements in health-enhancing cognitions and behaviors. These findings provide evidence for the continued implementation of programs that foster belongingness and target health behavior change through mentorship models. In particular, such programs appear to represent a viable means to improve health-enhancing behaviors among adolescent girls. Building on this preliminary positive evidence, future field-based experimental research using adequate comparison groups is warranted to further evaluate the effectiveness of this program.

Acknowledgments: The research team is grateful to the Big Brothers Big Sisters' staff, specifically Karen Shaver, Matthew Chater, Farishta Zarify, Allison Boughner, Theresa Bowler, Susan Nomi, and Lonni Meisner, and the Go Girls! program staff and participants, for their time and assistance in facilitating this program evaluation. The research team would also like to thank the following research assistants for their contributions: Aliyah Deane, Paulina Ezer, Angela Fong, Christina Gigliotti, Shellie McParland, Jessie Rodger, Eva Pila, Tanya Scarapicchia, and Danielle Tobin. This research was supported by a Program Evaluation Grant from the Ontario Ministry of Education awarded to AJD, MRB, and MEJ as well as a doctoral research scholarship from the Canadian Institutes of Health Research awarded to AJD. The funders played no role in the design, conduct, or analysis of the study, nor in the interpretation and reporting of the study findings. The researchers were independent from the funders. All authors had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

Authors' Statement of Conflict of Interest and Adherence to Ethical Standards: Justine Dowd, Michelle Chen, Mary Jung, and Mark Beauchamp declare that they have no conflict of interest. All procedures, including the informed consent process, were conducted in accordance with the ethical standards according to the American Psychological Association.

1. Neumark-Sztainer DR, Story M, Hannan PJ, Rex J. New Moves: a school-based obesity prevention program for adolescent girls. *Prev Med.* 2003; 37: 41-51.
2. Colley RC, Garriguet D, Janssen I, et al. Physical activity of Canadian children and youth: accelerometer results from the 2007 to 2009 Canadian health measures survey. *Health Rep.* 2011; 22: 1-9.
3. Arbour-Nicitopoulos KP, Faulkner G, Irving HM. Multiple health-risk behaviour and psychological distress in adolescence. *Can Acad Child Adolesc Psych.* 2012; 21: 171-178.
4. Kimm SY, Glynn NW, Kriska AM, et al. Decline in physical activity in Black girls and White girls during adolescence. *N Engl J Med.* 2002; 347: 709-715.
5. Riediger ND, Shooshtari S, Moghadasian MH. The influence of sociodemographic factors on patterns of fruit and vegetable consumption in Canadian adolescents. *J Am Diet Assoc.* 2007; 107: 1511-1518.
6. Waters E, de Silva-Sanigorski A, Hall BJ, et al. Interventions for preventing obesity in children. *Cochrane Systematic Reviews.* 2011; CD001871.
7. Wilfley DE, Tibbs TL, Van Buren DJ, et al. Lifestyle interventions in the treatment of childhood overweight: a meta-analytic review of randomized controlled trials. *Health Psychol.* 2007; 26: 521-532.

8. Neumark-Sztainer DR, Friend SE, Flattum CF, et al. New Moves—preventing weight-related problems in adolescent girls: a group-randomized study. *Am J Prev Med.* 2010; 39: 421-432.
9. Story M, Sherwood NE, Himes JH, et al. An after-school obesity prevention program for African-American girls: the Minnesota GEMS pilot study. *Ethn Dis.* 2003; 13: S54-S64.
10. Goodenow C. Classroom belonging among early adolescent students: relationships to motivation and achievement. *J Early Adolesc.* 1993; 13: 21-43.
11. Gilligan C. *In a Different Voice: Psychological Theory and Women's Development.* Cambridge, MA: Harvard University Press; 1982.
12. Ma CQ, Huebner ES. Attachment relationships and adolescents life satisfaction: some relationships matter more to girls than boys. *Psychol Sch.* 2008; 45: 177-190.
13. Furrer C, Skinner E. Sense of relatedness as a factor in children's academic engagement and performance. *J Educ Psychol.* 2003; 95: 148-162.
14. Phan HP. Antecedents and consequences of school belonging: empirical evidence and implications for practices. *J Educ Dev Psychol.* 2013; 3: 117-132.
15. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process.* 1991; 50: 179-211.
16. Bandura A. *Social Foundations of Thought and Action: a Social Cognitive Theory.* New York, NY: Prentice-Hall; 1986.
17. Bandura A. *Self-efficacy: the Exercise of Control.* New York, NY: Freeman; 1997.
18. Bandura A. *Social Learning Theory.* Englewood Cliffs, NJ: Prentice Hall; 1977.
19. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. *Health Educ Q.* 1988; 15: 175-183.
20. Big Brothers Big Sisters of Canada: Go Girls!: Healthy minds, healthy bodies. Burlington; 2006.
21. Baumeister RF, Leary MR. The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychol Bull.* 1995; 117: 497-529.
22. Glasgow RE. What does it mean to be pragmatic? Pragmatic methods, measures, and models to facilitate research translation. *Health Educ Behav.* 2013; 40: 257-265.
23. Panagiotopoulos C, Ronsley R, Al-Dubayee M, et al. The centre for healthy weights—shapedown BC: a family-centered, multidisciplinary program that reduces weight gain in obese children over the short-term. *Int J Environ Res Public Health.* 2011; 8: 4662-4678.
24. Anderson-Butcher D, Conroy DE. Factorial and criterion validity of scores of a measure of belonging in youth development programs. *Educ Psychol Meas.* 2002; 62: 857-876.
25. Prochaska J, Sallis JF, Long B. A physical activity screening measure for use with adolescents in primary care. *Arch Pediatr Adolesc Med.* 2001; 155: 554-559.
26. Tremblay MS, Warburton DE, Janssen I. New Canadian physical activity guidelines. *Appl Physiol Nutr Metab.* 2011; 36(36-46): 47-58.
27. Eisinga R, Grotenhuis MT, Pelzer B. The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *Int J Public Health.* 2012; 58: 637-642.
28. World Health Organization. *The Health of Youth: a Cross National Study.* Copenhagen: World Health Organization; 1996.
29. Johnson F, Wardle J, Griffith J. The adolescent food habits checklist: reliability and validity of a measure of healthy eating behaviour in adolescents. *Eur J Clin Nutr.* 2002; 56: 644-649.
30. Shields CA, Spink KS, Chad K, et al. Youth and adolescent physical activity lapsers: examining self-efficacy as a mediator of the relationship between family social influence and physical activity. *J Health Psychol.* 2008; 13: 121-130.
31. McAuley E, Mihalko SL. Measuring exercise-related self-efficacy. In: Duda JL, ed. *Advances in Sport and Exercise Psychology Measurement.* Morgantown, WV: Fitness Information Technology; 1998: 371-381.
32. Morton KL, Barling J, Rhodes RE, et al. The application of transformational leadership theory to parenting: questionnaire development and implications for adolescent self-regulatory efficacy and life satisfaction. *J Sport Exerc Psychol.* 2011; 33: 688-709.
33. Strachan SM, Brawley LR. Reactions to a perceived challenge to identity: a focus on exercise and healthy eating. *J Health Psychol.* 2008; 13: 575-588.
34. Chatzisarantis NLD, Biddle SJH, Meek GA. A self-determination theory approach to the study of intentions and the intention-behaviour relationship in children's physical activity. *Br J Health Psychol.* 1997; 2: 343-360.
35. Luszczynska A, Tryburcy M, Schwarzer R. Improving fruit and vegetable consumption: a self-efficacy intervention compared with a combined self-efficacy and planning intervention. *Health Educ Res.* 2007; 22: 630-638.
36. Ajzen I, Fishbein M. *Understanding Attitudes and Predicting Social Behavior.* Englewood Cliffs, NJ: Prentice Hall; 1980.
37. Ajzen I. Constructing a TPB questionnaire: Conceptual and methodological considerations. Retrieved October 23, 2012 from <http://www.uni-bielefeld.de/ikg/zick/ajzen> construction a tpb questionnaire.pdf
38. Nasuti G, Rhodes RE. Affective judgment and physical activity in youth: review and meta-analyses. *Ann Behav Med.* 2013; 45: 357-376.
39. Backman DR, Haddad EH, Lee JW, Johnston PK, Hodgkin GE. Psychosocial predictors of healthful dietary behavior in adolescents. *J Nutr Educ Behav.* 2002; 34: 184-192.
40. Dunlap WP, Cortina JM, Vaslow JB, Burke MJ. Meta-analysis of experiments with matched groups or repeated measures designs. *Psychol Methods.* 1996; 1: 170.
41. Hox J. *Multilevel Analysis: Techniques and Applications.* Mahwah, NJ: Erlbaum; 2002.
42. Ullrich-French S, McDonough MH, Smith AL. Social connection and psychological outcomes in a physical activity-based youth development setting. *Res Q Exerc Sport.* 2012; 83: 431-441.
43. Bonell CP, Hargreaves J, Cousens S, et al. Alternatives to randomisation in the evaluation of public health interventions: design challenges and solutions. *J Epidemiol Community Health.* 2011; 65: 582-587.
44. Hawkins NG, Sanson-Fisher RW, Shakeshaft A, D'Este C, Green LW. The multiple baseline design for evaluating population-based research. *Am J Prev Med.* 2007; 33: 162-168.
45. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health.* 1999; 89: 1322-1327.