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Family Physical Activity Planning and Child Physical Activity Outcomes: A Randomized Trial

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Abstract

Introduction: Regular moderate-to-vigorous intensity physical activity (MVPA) and high physical fitness are extremely important to the health of children and track to positive health profiles in adulthood. Family-based interventions to improve MVPA are essential given that children live within a structure of parental influence. The purpose of this study was to examine the effect of a parent planning skills intervention to support child physical activity on the subsequent MVPA (primary outcome) and fitness of their children across 26 weeks (primary end-point). **Methods:** One hundred and two children (aged 6 to 12 yr), who were below international physical activity recommendations at baseline, were recruited through advertisements and randomized to either the planning + education condition (n = 52) or an education only condition (n = 50). MVPA was assessed via accelerometry at baseline, six-week, 13-week, and 26-week time-periods and fitness (aerobic fitness, muscular strength, flexibility), and body mass index tests were conducted at baseline and 26-weeks. The trial was conducted with rolling recruitment between 2012-2017. **Results:** Generalized linear mixed modeling conducted in 2019 showed that the patterns varied by condition over time (beta = -.05; $p < .05$), where children in the planning intervention significantly increased MVPA compared to the education condition at six-weeks and 13-weeks but not at 26-weeks. Aerobic fitness ($p = 0.04$; $d = 0.26$) was the only significant health-related physical fitness change between the two groups, and favored the planning group over the education group. **Conclusions:** There was initial efficacy of the planning intervention, but effectiveness waned by 26-weeks. These changes appeared to be sufficient for modest changes in aerobic fitness. Future research should aim to improve the maintenance of these early positive changes and assist parents in planning for activities that also include opportunities to improve child musculoskeletal fitness.

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Introduction

Children who engage in regular moderate-to-vigorous physical activity (MVPA) are more likely to display better body composition, cardiorespiratory and musculoskeletal fitness, academic achievement and cognition, pro-social behaviors, cardiovascular and metabolic health, and overall mental health.[1-5] Furthermore, better child health-related physical fitness outcomes (e.g., body composition, aerobic and musculoskeletal fitness) predict favorable adult health outcomes,[6,7] and regular physical activity in childhood is associated with regular physical activity patterns in adulthood[8,9] and lowered risk of chronic disease.[10,11] Unfortunately, under 20% of children adhere to the public health target of 60 minutes of MVPA per day,[12] making the promotion of physical activity during childhood a public health priority.

Children spend considerable time under parental care, so family-based physical activity promotion initiatives appear important to successful intervention.[13-15] Indeed, it has been suggested that parents are the "gatekeepers" of child physical activity[16] and thus need to be the focal point of contact to change child behavior. Parental support represents the functional characteristics associated with interactions between a parent and his/her children in promoting health behaviors.[17,18] Observational studies have shown that parental support is a reliable correlate of child physical activity[19] and a recent meta-analysis of 18 intervention studies showed an standardized mean difference of 0.29 (95% CI 0.14 to 0.45) in favor of the intervention group over the control group in changes in child physical activity.[20] Despite this evidence for the utility of family-based interventions of child physical activity, Brown et al.[20] noted considerable heterogeneity in the findings and several limitations. Certain targets for intervention do not appear as effective as others. For example, educating parents about the health benefits of child physical activity has not been effective for increasing child physical activity.[20-22] Further, parents

83 often have very high intentions to assist their children in being physically active, but this goes
84 unrealized among nearly half of them.[23,24]
85
86 Interventions targeting more rational parental antecedents that focused on "why" children should
87 engage in regular physical activity, have had less success than interventions that empowered
88 parents with skills on "how" to enact physical activity change in their children.[20] This mimics
89 more recent advances in theory that move beyond basic intention formation approaches,[25] such as
90 the Health Action Process Approach[26] and the Multi-Process Action Control Approach[27,28] where
91 the binding of intention to behavior is considered a consequence of sound planning and self-
92 regulation tactics.[29] Brown et al.[20] noted that more studies that examine planning and self-
93 regulation approaches are needed to replicate the present small number of studies in family-based
94 physical activity interventions.
95
96 A second limitation highlighted by Brown et al.[20] was that the outcome used in family-based
97 interventions has often been self-reported child physical activity, which has noteworthy
98 biases.[30,31] More recent family-based intervention studies have incorporated direct measures of
99 child physical activity (e.g., accelerometry) with several showing null results,[32-35] and suggesting
100 that positive effects in the early literature may not generalize to more rigorous measurement.
101 Continued experimentation with direct physical activity measures is warranted.
102
103 Finally, Brown et al. noted that 85% of family-based physical activity interventions were less
104 than three months in duration (half were a month in duration) and thus only provide evidence of
105 short-term impact. If the goal of family-based physical activity planning is to establish patterns of
106 behavior, then longer follow-up is needed in order to understand the effect of interventions.

With these limitations in mind, the primary objective of this study was to employ a randomized trial to examine the short and long-term effect of a family self-regulatory planning intervention with an emphasis on supporting child MVPA compared to an education-only intervention. The trial targeted low-active children aged 6 to 12 years and included directly assessed MVPA at six-week, 13-week, and 26-week time-periods. Based on the preliminary findings of Brown et al.[20] and past empirical findings,[23,24,36] it was hypothesized that the self-regulatory planning condition would result in greater child MVPA compared to the education-only group over the 26-weeks. It was further hypothesized however, that the effect may diminish over time and thus the 26-week assessment would show less effectiveness than the more proximal assessments of six-weeks and 13-weeks.[37]

A secondary objective of this study was to examine whether the effect of the family self-regulatory planning intervention would also result in improvements in physical activity related child fitness and body mass index (BMI) measures from baseline to 26-weeks. It was hypothesized, that children in the planning group would result in higher fitness scores and lower BMI, compared to the education group.

Methods

The full detailed methods for this study have been reported elsewhere.[37] The study was approved by the University of Victoria Human Research Ethics Board (HREB) and parents (written consent) and their children (verbal consent) provided informed consent prior to being enrolled. The design, conduct, and reporting of the trial followed the Consolidated Standards of Reporting Trials (CONSORT) guidelines.[38] The trial was registered with the Clinical Trials Registry at the

National Library of Medicine at the National Institutes of Health (ClinicalTrials.gov) Identifier: NCT01882192.

Design

A two-arm parallel design randomized trial was conducted where participants were randomized using an online program, Research Randomizer™.[39] This program provided a simple randomization that allowed for allocation of participants to one of two groups after baseline assessment: 1) family physical activity planning + information/education; or 2) physical activity information/education only. Participants were allocated to these conditions using a 1:1 ratio and subsequently assessed at six-weeks (physical activity), 13-weeks (physical activity), and 26-weeks (physical activity, fitness). Participants were aware of the condition they were in, but blind to the other condition. Initial recruiters were blinded to treatment allocation as this was concealed by a trial coordinator (who performed the randomization). Fitness testers were blind to the condition the families were randomized to, however, the intervention delivery team were aware of the condition so they could deliver appropriate intervention materials. Rolling recruitment began in June 2012 and completed in April 2017.

Participants

Participants were recruited through advertisements, booths at local markets and recreation centers, through materials passed out at local schools and through referrals. Families received a $25 CAN grocery store gift card if they referred another family who enrolled in the study.

Inclusion criteria**.** Participants were children, aged 6 to 12 years, from single or dual parent families. Children were included in the study if they didn't meet physical activity guidelines of at least 60 minutes of MVPA per day.[40] The initial screening involved defining Canadian physical activity guidelines for parents and then asking whether their children met this target (i.e., Over the past three months, has your child(ren) engaged in at least 60 minutes of moderate or vigorous

activity each day?). Examples of moderate/vigorous activities were provided. This inclusion criterion was validated using the baseline physical activity assessment of the children via accelerometry. While all children aged 6 to 12 in a family were invited to participate in the intervention, only one child was designated as the target child for measurement a priori (chosen at random in cases where multiple children met inclusion criteria).

Study setting**.** Participants were recruited in greater Victoria, British Columbia, Canada.

Intervention

More details of the intervention can be found in a previous publication.[37] To summarize, intervention materials were delivered face-to-face by a research assistant after the one week baseline accelerometry assessment. Both conditions received the Canadian Physical Activity Guidelines[40] hand-out recommending a physical activity goal of 60 minutes of MVPA daily for children. Intensity was discussed as to what constituted MVPA and examples were provided.

The physical activity information/education only condition received a booklet outlining the benefits of physical activity for the whole family[2] and common barriers reported by families as well as examples for how to overcome those barriers.[41,42]

For the planning condition, in addition to the information/education material provided, families also received a workbook on planning family physical activity and a dry erase calendar.[42] The workbook included brainstorming exercises for families to plan for their physical activity and focused on skill training for implementation intentions and action planning as well as coping planning and traditional goal setting (see Supplementary Table 1).[43-47] Check-in sessions were conducted with all families at six-weeks and 13-weeks, and coincided with MVPA measurement. The check-in sessions included discussion on whether families have been using the materials, if

178 they have been able to incorporate physical activity, if they have been experiencing any
179 challenges and how they might overcome those challenges, and for the intervention group, if they
180 have used the planning materials.

181 **Outcomes**

182 The primary outcome of the study was minutes per week of MVPA measured via accelerometry.
183 The primary endpoint was the full 26 weeks of the trial, with secondary endpoints at the six-week
184 and 13-week assessments. The Actigraph GT3X accelerometer enabled for single axis was used
185 to assess the participants. Participants wore the accelerometer on an elastic belt above the right
186 hip for seven consecutive days for at least 10 hours a day only removing for sleep, water
187 activities or showering. Logbooks were used to confirm the accelerometer data matched
188 participant activity reports.

189

190 The ActiLife software version 6.11.9 [48] was used to initialize, download, and analyze the data.
191 The accelerometers were initialized to collect pre-filtered data at a sample rate of 30 Hz for the
192 children and were downloaded into 10-second epochs to capture the sporadic nature of child
193 physical activity. [49-51] A minimum of four days with at least 600 minutes per day including at
194 least one weekend day of valid wear time were included in analysis based on recommended best
195 practice.[51,52] For determining valid wear time, the Troiano[53] algorithm was used which defines
196 non-wear time as a period of at least 60 consecutive minutes of zero counts, with an allowance
197 for one to two minutes of counts between 0 and 100. These periods of non-wear-time were
198 subtracted from total wear-time. Child MVPA was determined using the Evenson[54] cut-points
199 based on recommendations from Trost et al.[55] Data were modelled so that all participants had a
200 complete seven-day dataset. This was conducted by taking the average of the valid days and
201 inputting those averages for the missing days.[56] Forty-two percent of the sample had seven

202 complete days of wear-time averaged across the four assessment times (28% had 6 days, 15%
203 had 5 days, 15% had 4 days).
204
205 The secondary outcomes of the trial were fitness and body composition. Children's waist
206 circumference was measured, along with height and weight, which was used to calculate BMI. A
207 steady state walking treadmill test [57] was used to calculate a predicted maximal aerobic power
208 (VO_2max). Push-ups, sit & reach flexibility, and partial curl-ups were measured to determine
209 musculoskeletal fitness using the protocols established by Gledhill and Jamnik. [58,59]
210 **Procedures**
211 The study followed procedures established in a prior pilot study [42] as a guide for recruitment,
212 study protocol, and assessment. The lead trial coordinator conducted study protocol quality
213 control training and cross-checks with all research assistants to ensure standardization. This study
214 was advertised as a family-based intervention, although child MVPA was considered the critical
215 outcome of interest across the study data collection and during advertisement. Only the child
216 outcomes are reported in this paper. After interested parents contacted the researcher and were
217 determined to be initially eligible to participate in the study, the trial coordinator scheduled r a
218 baseline assessment at the University of Victoria laboratory. The baseline assessment included a
219 parent-reported questionnaire with factors such as background demographic information (age,
220 sex, gender, ethnicity, education, income, marital status, employment status), a fitness test, and
221 getting setup with an accelerometer for the seven-day assessment protocol.
222
223 After baseline assessment, participants were provided with an accelerometer for each family
224 memberand a researcher provided verbalinstructions for device wear and ensured the belts were
225 the appropriate size for participants. After the completion of the accelerometry assessment,

participants were randomized to one of the two conditions. Following randomization, the trial coordinator scheduled a baseline session with the family to deliver the study materials. At six-weeks and 13-weeks, a member of the research team met with families to drop off accelerometers and conduct a check-in session. As an incentive for families to complete all assessments, an honorarium was provided upon pick-up of the accelerometers starting at $25 at baseline and increasing by $5 at each time point. In addition to the follow-up testing at 26-weeks, parents and children assigned to the planning intervention condition completed brief study satisfaction questions [42].

Statistical Analysis

Given the nested structure of the data (i.e., repeated assessments nested within participants), generalized linear mixed modeling was used in SPSS v25.0. Power analysis (.80) of a trend with 4 repeated assessments, one-between group factor, an estimated small-medium effect size based on our prior pilot study[42] and recent meta-analysis of the family physical activity intervention literature,[20] with an alpha of .05 suggested that a sample size of 96 could detect the primary hypothesis.[60] The analyses used a 4-step process. First, a model was entered with a random intercept (i.e., the baseline score for a given MVPA outcome) and a fixed linear trend (i.e., coded 0 = baseline, 6 = 6 weeks, 13 = 13 weeks, 26 = 26 weeks to reflect the weekly change over the 26-week period). The second model entered a random intercept and random linear trend. The third model added a fixed quadratic trend and the fourth model added a random quadratic trend. These analyses were used to determine if there was significant variation across participants in the intercept, linear and / or quadratic trends. Once this was determined, the final models entered condition (0 = education; 1 = planning+education) to predict the intercept, linear and quadratic trends. Finally, once the main analysis was completed, three separate models were run with the linear trend centered at six weeks, 13 weeks, and 26 weeks. This allowed for a condition effect to

be examined at each time via the condition x intercept interaction. Identical exploratory analyses were also conducted for moderate- and vigorous-intensity physical activity to decompose the MVPA results.

For the secondary fitness outcomes, changes in fitness from baseline to six-months was investigated using an analysis of covariance, controlling for baseline, between subject conditions (education, education+planning).

End of study Process Evaluation

Descriptives were generated for end of study process evaluation questions. The open-ended question about barriers was categorized and coded into common themes.[61] Total frequency of the themes and the percentage of endorsement were also calculated as an estimate of commonality across responses.

Results

Participant Flow

One hundred and eighty-eight parents contacted the research team about participating in the study. Of these, 36 children were ineligible (over MVPA guidelines) and 47 families were uninterested. The 102 participants who met study inclusion criteria and completed baseline assessments were randomly assigned to one of the two conditions (Figure 1; n = 52 planning + education; n = 50 education). Of these, 42 participants in the planning + education group and 38 education group participants completed the study to the 26-week endpoint (22% attrition). This included a gradual continuous drop-out across the six week (8% attrition), three month (7% attrition) and six month (7% attrition) assessment times with the most common reasons being lack of interest to continue (41%), changes in family circumstances such as divorce (18%), and a

child's refusal to wear the accelerometer (14%). These attrition numbers were not significantly different ($p > .05$) across the groups. No participants cited harms associated with the study.

Baseline Characteristics of Respondents

Children were on average 8.93 years of age (SD = 2.08), 52% were female and were primarily white (see Supplementary Table 2). Participating families identified as dual-parent (55.6%) and single-parent (44.4%) and 29% of these families also included siblings who participated in the intervention. Most parents were college educated (64%), married/common-law (70%), had moderate to high incomes (56% >$74,000 CAN) and were employed (72%). Child accelerometry assessment at baseline indicated 49.12 (SD = 17.91) minutes of daily MVPA among the sample.

Primary Outcome: Weekly MVPA Minutes

No transformations on these data were performed as it had acceptable skewness / kurtosis values (i.e., < 2.0) and was normally distributed. The unadjusted means are presented in Table 1. Based on the preliminary analyses for MVPA, the final model included a random intercept with fixed linear and quadratic trends. Results in Table 2 show that baseline activity scores were similar for both conditions. Further, the main effects for the linear and quadratic trends were non-significant. However, condition significantly ($p < .05$) predicted the linear and quadratic trend. The follow-up analyses showed that the planning+education group engaged in significantly more MVPA at six weeks (beta = 9.15, $p < .01$) and 13 weeks (beta = 11.85, $p < .01$), but there was no condition effect at 26 weeks (beta = 7.04, $p > .05$).

Exploratory Analyses by Moderate- and Vigorous-Intensity Physical Activity

MVPA findings were further decomposed to moderate- and vigorous-intensity physical activity sub-components. Both sets of data showed normality. Results from Table 2 show that the baseline activity scores were similar for both conditions (see Table 1 for unadjusted means).

Condition significantly ($p < .05$) predicted the linear and quadratic trends for moderate-intensity physical activity, but not for vigorous-intensity. Follow-up analyses showed that the planning+education group engaged in significantly more moderate-intensity physical activity at six-weeks (beta = 6.76, p < .01), and 13-weeks (beta = 8.53, p < .01) than the education group but there was no condition effect at 26-weeks (beta = 4.66, p > .05). There were no condition effects at any time point for vigorous-intensity physical activity (Baseline beta = .73, p > .05; six-week beta = 2.37, p > .05; 13-week beta = 3.21, p > .05; 26-week beta = 2.51, p > .05).

Secondary Outcome: Child Health-related Physical Fitness

All health-related physical fitness test data were normally distributed (e.g., skewness below 1.8) but 22% of these data were missing at 26-week follow-up. These data were missing completely at random [Little's test (9) = 13.57; p = .13]. A more specific analysis of dummy coding a "missingness" variable and testing for the association with various baseline variables and missing data showed no association with parent/child demographics, fitness, or behavior variables ($p >$ 05). Thus, an imputation approach was conducted using the expectation-maximization algorithm.[62,63] A significant increase in estimated maximal aerobic power (VO_2max) was found in the planning + education group compared to the education only group from baseline to 26-weeks (See Table 3). No other fitness tests showed significant differences from baseline between conditions.

End of Trial Process Evaluation

Among the children in the planning + education condition, 32 participants (76%) reported that they learned more about why physical activity was good for them. Nine children reported a "maybe" response and only one child reported "no" to this question. Seventy four percent of these children (n = 17 for "yes" and n = 14 for "a bit") reported that their family used the

planning material in the intervention. Finally, 55% of children reported that they thought their family had increased physical activity since starting the study, while an additional 30% indicated "maybe" to this question. Among the parents, 29% said they had thoroughly re-read the intervention material since the booster sessions with the trial coordinator and another 69% reported they had skimmed through it. Only one parent indicated they had not attended to the intervention material. However, only 50% of parents reported that they used the planning material regularly. Reasons for not using the planning material among the 21 parents who reported this showed that 19% of parents used their own planning material, and thus 60% of the parents in the planning group employed planning tactics over the 26-weeks of the trial. The parents who reported not using the material cited limited time (29%), too much effort (10%), forgetfulness (10%), lack of interest in the planning material supplied (10%), or that they were not a family who plans (10%). Overall, 76% of parents rated the planning material provided as useful (i.e., regardless of whether they actually used it regularly).

Discussion

The results showed significant changes in MVPA at six weeks and 13-weeks favoring the planning+education condition over the education only condition but not at the hypothesized primary end point for the trial of 26-weeks post-intervention, whereby children in both conditions were approaching their baseline values. The findings did demonstrate a drop-off in effectiveness over time which was predicted.

These findings provide helpful theoretical and practical evidence for family-based intervention. First, the results highlight the importance of longer-term assessments in family-based interventions because initial effectiveness may not reflect longer term outcomes. Family-based

physical activity interventions for children have mainly been of short duration;[20,21] thus, mapping out longer-term trajectories of these interventions helps identify boundary conditions of effectiveness.

The findings of this research show the promise of family-based intervention. From a theoretical perspective, the results of this trial support the short-term effectiveness of family planning over information/education only approaches.[20,21] The advancement beyond this approach may be needed, however to sustain physical activity patterns. Rhodes and colleagues[27,28,64] have suggested that the formation of parental support and subsequent child physical activity habits (i.e., cued- behavioral response bonds with techniques focused on consistency of practice and salient precipitating cues) and identity (family self-categorization as active with techniques focused on affirmation and prioritization of physical activity over other activities) may be necessary to maintain behavior over the long-term, given the fatigue that may occur with constant volitional self-regulation. This suggestion has been supported through observational research,[23] but not experimental testing. Thus, the supplementation of family planning interventions for physical activity with identity and habit formation techniques[65] may be a useful aim of future research.

Interestingly, the planning intervention only affected moderate-intensity physical activity and not vigorous-intensity physical activity. Thus, changes in MVPA were driven exclusively by underlying changes in moderate-intensity activities. While the two intensities were not distinguished in the intervention material, it is speculated this may be a consequence of the family-based physical activity approach (e.g., outdoor play, family walks). It may be prudent in future research to explore specific exemplars of higher intensity activities.

The results of this study also contained practical information relevant to future intervention development. For example, our process evaluation showed that acceptance and use of planning was not uniform in the intervention. Family-regulatory interventions such as this one may have upper limits in terms of which families it can help. Broader socio-ecological intervention (e.g., lower work-hours or more occupational flexibility, greater access to recreation, low cost activities) would likely be required to assist some families.[66]

The results supported the hypothesis of positive changes in aerobic fitness, albeit with very modest effects. It is important to highlight that marked and clinically relevant health benefits in both adults and children alike can be accrued with relatively small changes in physical activity behaviour and/or fitness.[67,68] There were no differences in other health-related variables between the groups. Both MVPA and high physical fitness are critical antecedents to both child health[2,69] and lifelong adult health[6] so this demonstrates additional utility and relevance of the intervention. Still, given the benefits of musculoskeletal fitness in children and youth,[70] future applications of similar family-based interventions may wish to provide more examples of activities that could affect this component of fitness.

Limitations. The sample of families was mainly white, middle income, and educated. While many of these features do represent Victoria,[71] the generalizability to other contexts is unknown. Second, the intervention was fairly intense with face to face and laboratory and home visits suggesting that there may be barriers to expanding implementation. Replication and extension of this intervention with other platforms (e.g., mhealth, ehealth) appears prudent.

Conclusions

An intervention focused on family planning skills to support child MVPA resulted in significantly increased child MVPA compared to an education-only intervention. The MVPA, however, decreased over time with significant differences seen at six and 13-weeks disappearing by 26-weeks post-intervention. Change in aerobic fitness was the only significantly different fitness outcome that favoured the planning group over the education group. The short-term efficacy of a family planning intervention was demonstrated. Research to improve the maintenance of short-term outcomes and assist parents in planning activities to increase child musculoskeletal fitness is needed.

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Figure Captions

Figure 1 CONSORT Flow Diagram

Table 1.
Descriptives for physical activity variables over time by condition

	Baseline M (SD)	6 Weeks M (SD)	13 Weeks M (SD)	26 Weeks M (SD)
Moderate PA				
Planning	35.37 (11.14)	38.58 (12.83)	39.65 (11.42)	39.50 (11.33)
Education	32.75 (12.03)	31.85 (11.21)	30.10 (9.50)	33.36 (10.83)
Vigorous PA				
Planning	15.54 (7.88)	16.17 (10.29)	19.69 (10.58)	18.38 (9.97)
Education	14.72 (9.54)	14.05 (8.90)	14.52 (7.65)	15.09 (9.34)
MVPA				
Planning	50.91 (16.66)	54.75 (21.45)	59.62 (16.28)	57.88 (17.82)
Education	47.67 (19.24)	46.03 (18.75)	44.62 (15.50)	48.44 (19.10)

Note. M = mean; SD = standard deviation; PA= physical activity; MVPA = moderate to vigorous physical activity. Results are presented unadjusted for the linear and quadratic trends.

Table 2.
Results from generalized linear mixed models (N = 102)

	Moderate PA		Vigorous PA		MVPA	
	Beta	95% CI	Beta	95% CI	Beta	95% CI
Intercept	32.87	29.48 to 36.24	14.67	12.03 to 17.30	47.74	42.36 to 53.13
Condition	2.54	-2.05 to 7.13	.73	-2.63 to 4.10	3.04	-4.07 to 10.15
Linear Trend	-.26	-.74 to .23	.06	-.34 to .47	-.22	-1.01 to .56
Condition	.91**	.27 to 1.55	.34	-.26 to .94	1.30*	.24 to 2.37
Quadratic Trend	.01	-.01 to .03	-.001	-.02 to .02	.01	-.02 to .05
Condition	-.03**	-.06 to -.01	-.01	-.04 to .01	-.05*	-.09 to -.004

Note. * $p < .05$; ** $p < .01$; PA = physical activity; MVPA = moderate to vigorous intensity physical activity; CI = confidence interval

Table 3.
Effects of family physical activity planning or education interventions on changes in fitness in children (N=102)

Variable	Baseline M (SD)	Post Study M (SD)	Mean change M (95% CI)	Between-group difference M (95% CI)	*p* value	Cohen's *d*
BMI						
Planning group	17.30 (3.24)	17.80 (3.28)	0.50 (0.27 to 0.73)	0.09 (-.028 to 0.46)	.62	.03
Education group	18.99 (4.05)	19.39 (4.16)	0.39 (0.11 to 0.67)			
VO_2 Max						
Planning group	36.35 (11.06)	39.88 (10.51)	3.53 (1.49 to 5.58)	2.78 (0.07 to 5.49)	.04	.26
Education group	33.25 (10.70)	34.75 (10.82)	1.51 (-0.55 to 3.56)			
Push-ups						
Planning group	2.88 (3.80)	4.04 (4.13)	1.16 (0.35 to 1.97)	0.54 (-0.61 to 1.68)	.35	.14
Education group	2.05 (3.69)	2.92 (3.63)	0.87 (-0.06t to 1.80)			
Sit and Reach						
Planning group	28.90 (7.95)	29.23 (7.88)	0.32 (-0.92 to 1.56)	-0.37 (-2.41 to 1.67)	.72	-.05
Education group	26.75 (7.73)	28.07 (7.24)	1.31 (-0.56 to 3.18)			
Curl-Ups						
Planning group	9.79 (7.48)	12.44 (8.21)	2.65 (0.78 to 4.52)	-1.66 (-4.22 to 0.90)	.20	-.21
Education group	7.13 (7.88)	12.27 (8.36)	5.14 (3.17 to 7.11)			

Note: Between-group differences were adjusted for baseline values. There was a significant difference in BMI (planning < education group) ($p < .05$) at baseline but no significant differences among other health related fitness variables as baseline.

CONSORT
TRANSPARENT REPORTING of TRIALS

CONSORT 2010 Flow Diagram