Integrated adventure-based training and health education programme in promoting regular physical activity among childhood cancer survivors

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KEY MESSAGES

1. Physical inactivity remains a common problem among childhood cancer survivors.
2. The adventure-based training programme is effective in promoting the adoption and maintenance of regular physical activity among childhood cancer survivors.
3. The adventure-based training programme is suitable to be implemented in the Hong Kong Chinese context.
4. Health care professionals should form multidisciplinary partnerships to maintain the adventure-based training programme in the long run.

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Introduction

Advancement in cancer screening and medical treatment has increased the survival rates for childhood cancer. However, improved survival rates are highly associated with increased physiological and psychological problems that severely affect survivors' quality of life (QoL).[1] Although regular physical activity can help ameliorate some treatment-related adverse effects,[2] physical inactivity is common in childhood cancer survivors.[3] It is crucial for health care professionals to enhance the adoption and maintenance of regular physical activity among childhood cancer survivors. Adventure-based training has been used to change cognitive thinking and behaviours in different populations.[4] Nevertheless, rigorous empirical scrutiny is imperative to examine its effectiveness, in particular to integrate adventure-based training with health education to promote regular physical activity among childhood cancer survivors.

Methods

This is a randomised controlled two-group pretest and repeated posttest study. Hong Kong Chinese childhood cancer survivors were included if they were (1) aged 9 to 16 years, (2) able to speak Cantonese and read Chinese, and (3) did not engage in regular physical activity for the past 6 months. Those with evidence of recurrence or second malignancies, physical impairment, or cognitive and learning problems were excluded. A full spectrum of cancer subtypes and treatments was included to increase the generalisability of the findings.

After informed consent, participants were randomly allocated into either the experimental or control group. In the experimental group, participants took part in four separate 1-day adventure-based training sessions over a 6-month period. Before each training session, participants received a 40-minute briefing session that contained health education components. Adventure activities were conducted by two qualified trainers, with increasing levels of difficulty. These activities included icebreaking and team-building games, shuttle runs, rock climbing, high- and low-level ropes courses and descending. In the control group, participants attended leisure activities organised by a community centre on four different days. Activities included cartoon film shows, handicraft workshops, chess games, health talks on the prevention of influenza and healthy diet, day visits to museum and theme park.

The primary outcomes were physical activity levels and self-efficacy. The secondary outcomes were physical activity stages of change and QoL. Assessment was conducted before the intervention (T1) and at 3 months (T2), 6 months (T3), 9 months (T4), and 12 months (T5) after starting the intervention.

The sample size calculation was based on a study that examined the effectiveness of an adventure-based training programme in Hong Kong Chinese children's QoL, in which intervention effect sizes were medium.[4] To predict this effect size of

differences in outcomes between two groups at a 5% significance level and a power of 0.80, at least 64 participants in each group were required. To allow for a potential 20% attrition, 16 participants were added per group; a total of 160 participants were required.

Intention-to-treat analysis was used. Missing data was substituted by the last-observation-carried-forward procedure. Inferential statistics (independent *t*-test and X^2) was used to assess the comparability of the experimental and control groups. Mixed between-within group ANOVA was conducted to determine whether the training programme is effective in promoting the adoption and maintenance of regular physical activity among childhood cancer survivors.

Results

Data collection lasted for 28 months from February 2014 to May 2016. A total of 528 childhood cancer survivors were assessed for eligibility. Of them, 308 met the inclusion criteria, but 146 failed to participate. The remaining 162 (52.6%) participants were randomly assigned to either the experimental (n=85) or control (n=77) group. Throughout the study period, 23 participants dropped out (11 from the experimental group and 12 from the control group). The attrition rate was 85.8%. A Consolidation Standards of Reporting Trials flowchart is shown in the Fig. The two groups were comparable in terms of demographics, clinical characteristics, and outcome measures at baseline (Table).

For physical activity levels, a mixed between-within group ANOVA demonstrated a significant main effect for time ($F_{2, 157}$=50.70, P<0.0001, partial eta squared=0.56), a significant interaction effect ($F_{2, 157}$=37.69, P<0.0001, partial eta squared=0.48), and a significant main effect for intervention ($F_{1, 160}$=27.40, P<0.0001, partial eta squared=0.15). Post hoc test using the Bonferroni adjusted alpha identified significant differences in physical activity levels between the experimental and control groups at T3, T4, and T5. Referencing Cohen's guidelines,[5] the partial eta squared of 0.15 suggested a large effect size.

For physical activity self-efficacy, a mixed between-within group ANOVA indicated a significant main effect for time ($F_{2, 157}$=15.35, P<0.0001, partial eta squared=0.28), a significant interaction effect ($F_{2, 157}$=17.14, P<0.0001, partial eta squared=0.30), and a significant main effect for intervention ($F_{1, 160}$=9.20, P<0.0001, partial eta squared=0.05). Post hoc test using the Bonferroni adjusted alpha identified significant differences in self-efficacy between the experimental and control groups at T4 and T5. The partial eta squared (0.05) indicated that the effect size of the intervention was small to moderate.

For QoL, a mixed between-within group ANOVA revealed a significant main effect for time ($F_{2, 157}$=12.60, P<0.0001, partial eta squared=0.24), a significant interaction effect ($F_{2, 157}$=12.44, P<0.0001, partial eta squared=0.24), and a significant main effect for intervention ($F_{1, 160}$=3.94, P=0.04, partial eta squared=0.02). Post hoc test using the Bonferroni adjusted alpha identified a significant difference in QoL between the experimental and control groups at T5. The partial eta squared was 0.02, indicating a small-to-moderate effect size.

The Friedman test indicated a significant difference in the stages of change in the experimental group but not in the control group over time. Post hoc test using the Bonferroni adjusted alpha identified significant differences in stages of change in the experimental group between T1 and T2, T1 and T3, T1 and T4, and T1 and T5.

Discussion

Participants in the experimental group reported higher physical activity levels and self-efficacy than those in the control group. Additionally, more participants in the experimental group moved

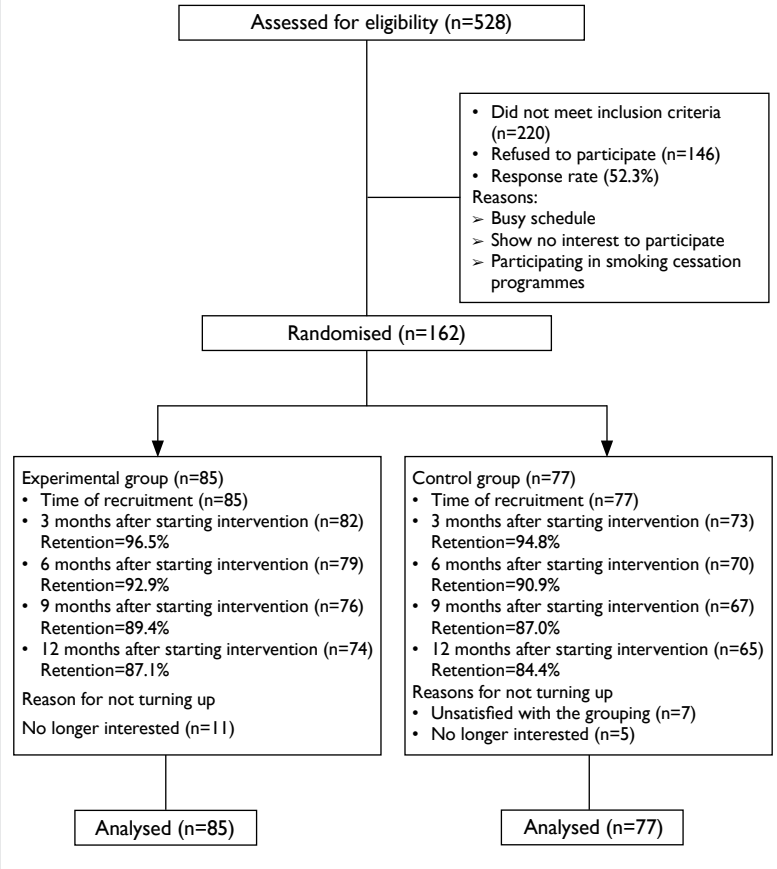

FIG. Consolidation Standards of Reporting Trials flowchart

TABLE. Demographic and clinical characteristics of participants (n=162)*

Characteristic	Experimental (n=85)	Control (n=77)	χ^2 or *t*	P value
Sex				
Male	44 (51.8)	41 (53.2)	0.36	0.88
Female	41 (48.2)	36 (46.8)		
Diagnosis				
Leukaemia	35 (41.2)	33 (42.9)	0.34	0.99
Lymphoma	20 (23.5)	19 (24.7)		
Brain tumour	10 (11.8)	8 (10.4)		
Bone tumour	12 (14.1)	9 (11.6)		
Neuroblastoma	8 (9.4)	8 (10.4)		
Parents' educational attainment				
Primary school or below	13 (15.3)	9 (11.7)	1.13	0.77
Lower secondary school	27 (31.8)	22 (28.6)		
Upper secondary school	29 (34.1)	32 (41.6)		
Tertiary education	16 (8.8)	14 (18.1)		
Treatment received				
Surgery	10 (11.8)	3 (3.9)	3.57	0.31
Chemotherapy	56 (65.9)	55 (71.4)		
Radiotherapy	3 (3.5)	4 (5.2)		
Mixed method	16 (18.8)	15 (19.5)		
Time since treatment was completed, mo				
6-12	25 (29.4)	24 (31.2)	3.73	0.59
13-24	22 (25.9)	21 (27.2)		
25-36	15 (17.6)	13 (16.9)		
37-48	7 (8.2)	10 (13.0)		
49-60	14 (16.5)	6 (7.8)		
>60	2 (2.4)	3 (3.9)		
Age, y	12.2±1.9	12.0±2.0	0.78	0.44
Physical activity stages of change				
Pre-contemplation	20 (23.5)	18 (23.4)	0.11	0.99
Contemplation	49 (57.6)	44 (57.1)		
Preparation	16 (18.9)	15 (19.5)		
Physical activity levels	2.9±2.3	2.9±2.4	0.23	0.82
Physical activity self-efficacy	9.2±3.5	9.2±3.2	-0.09	0.93
Quality of life	70.5±14.9	69.6±11.0	0.45	0.66

* Data are presented as mean±standard deviation or No. (%) of participants

through the stages from pre-contemplation to maintenance than in the control group. Adventure-based training can increase the self-efficacy of childhood cancer survivors, which is crucial in promoting the adoption and maintenance of regular physical activity.

Education alone is not enough to motivate behavioural change. To promote the adoption and maintenance of physical activity, addition of adventure activities is needed. This approach aimed to stress the importance of regular physical activity, to correct any misconceptions, and to enhance levels of self-efficacy in engaging in physical activity, which results in stage progression from pre-contemplation to maintenance.

In the training programme, participants overcame different physical challenges in an outdoor environment (concrete experience). Trainers guided the participants to evaluate their own performance and think about what they had experienced (reflective

observation). After reflection, the trainers provided constructive comments to reframe any negative interpretations of failure. Also, the trainers directed the participants to consider alternative ways of overcoming challenges (abstract conceptualisation). With proper advice and encouragement, the participants tried alternative approaches to the challenges. Through overcoming increasingly difficult physical challenges, participants could gradually build up their self-efficacy in engaging physical activity.

Finding suitable strategies to ameliorate adverse effects and enhance QoL of cancer survivors is a prime concern for health care professionals. The adventure-based training enabled better QoL than leisure activities at 12 months. Increased physical activity levels enhance physical and psychological well-being and consequently improve QoL in the long run.

There were limitations in this study. The single-blind technique might have caused biases. Non-probability sampling may have undermined the representativeness of the sample. The crucial components of the training programme were not teased out, limiting the generalisability of our findings. Data collection was only up to 12 months. Cost-benefit analysis was not conducted and the applicability of such programme outside the research setting is not known. Results may have been confounded as deficient participants varied in their time since treatment completion. Physical activity levels were self-assessed.

Conclusions

Integrated adventure-based training and health education programme is effective in improving the physical activity levels, self-efficacy, stages of change, and QoL of childhood cancer survivors. Such programme is feasible to be implemented in the Hong Kong Chinese context.

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