A Sports-Based Youth Development Program, Teen Mental Health, and Physical Fitness: An RCT

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abstract

OBJECTIVES: To assess the effectiveness of a positive youth development (PYD)-based sports mentorship program on the physical and mental well-being of adolescents recruited in a community setting.

METHODS: This is a randomized controlled trial in which we recruited students from 12 secondary schools in Hong Kong, China. Participants were randomly assigned in a 1:1 ratio to an intervention or a control arm after stratification for school from October 2013 to June 2014. Participants were not blinded to allocation because of the nature of the intervention. Students in the intervention arm received an after-school, PYD-based sports mentorship for 18 weeks. Each weekly session lasted 90 minutes. Students in the control arm received exclusive access to a health education Web site.

RESULTS: Six hundred and sixty-four students (mean age 12.3 years [SD 0.76]; 386 girls [58.1%]) completed baseline and postintervention assessments. The intervention improved students' mental well-being (Cohen's *d*, 0.25; 95% confidence interval [CI], 0.10 to 0.40; $P = .001$), self-efficacy (Cohen's *d*, 0.22; 95% CI, 0.07 to 0.37; $P = .01$), resilience (Cohen's *d*, 0.19; 95% CI, 0.03 to 0.34; $P = .02$), physical fitness (flexibility [Cohen's *d*, 0.28; 95% CI, 0.13 to 0.43; $P = .02$], lower limb muscle strength [Cohen's *d*, 0.18; 95% CI, 0.03 to 0.33; $P = .03$], and dynamic balance [Cohen's *d*, 0.21; 95% CI, 0.06 to 0.37; $P = .01$]), and physical activity levels (Cohen's *d*, 0.39; 95% CI, 0.24 to 0.55; $P < .0001$). The intervention did not significantly improve physical well-being (Cohen's *d*, −0.01; 95% CI, −0.17 to 0.14; $P = .86$), BMI *z* scores (Cohen's *d*, −0.03; 95% CI, −0.18 to 0.12; $P = .69$), body fat proportion (Cohen's *d*, −0.15; 95% CI, −0.31 to 0.00; $P = .051$), and social connectedness (Cohen's *d*, −0.03; 95% CI, −0.18 to 0.12; $P = .72$).

CONCLUSIONS: A PYD-based sports mentorship intervention improved healthy adolescents' mental well-being, psychological assets, physical fitness, and physical activity levels.

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WHAT'S KNOWN ON THIS SUBJECT: Mental disorders in adolescents are a global public health concern. Positive youth development may prevent adolescent health and developmental problems, but there were few randomized controlled trials on its causal effects on mental health, particularly in a community setting.

WHAT THIS STUDY ADDS: This randomized controlled trial study demonstrated that a positive youth development–based sports mentorship program could improve healthy adolescents' mental health-related quality of life, resilience, physical fitness, and physical activity levels. A similar model may be adopted in other high-income Chinese cities.

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Physical inactivity has been a prevalent condition worldwide, particularly among adolescents in high-income countries.[1] A recent systematic review has reported that >80% of adolescents could not meet the World Health Organization's physical activity (PA) recommendation.[1] This is a threat to public health because of PA's protective effect against obesity, hypertension, and metabolic syndrome.[2]

PA may also benefit youth mental health, but the evidence is less robust. A Cochrane review[3] of randomized controlled trials (RCTs) has identified 5 studies for depression and 6 for anxiety among youth. There was a significant, moderate effect for depression and an insignificant effect for anxiety. Nevertheless, both the review authors[3] and an independent critique[4] have commented that the evidence is inconsistent, heterogenous, and of uncertain generalizability. The antidepressant effect was found among at-risk groups, including youth with moderate depressive symptoms,[5] psychiatric inpatients,[6] and juvenile delinquents.[7] Subgroup analyses of low-risk populations have yielded smaller and insignificant effect sizes.[3]

Existing PA interventions were often exercise centric and not guided by a well-established framework, such as positive youth development (PYD). PYD is an approach aimed at strengthening the developmental assets of adolescents instead of correcting their problematic behaviors by using a holistic strengthening framework.[8,9] Sport is regarded as a good context for PYD because of its positive image and opportunities for skill building.[10] Previous PYD-based sports interventions could improve adolescents' life skills[11] and psychological assets,[12] but none have examined health-related outcomes. Furthermore, the existing evidence may be confounded because of the lack of randomization.

This article presents an RCT study of a PYD-based sports mentorship program conducted for Hong Kong Chinese adolescents in 1 academic year. We hypothesized that the intervention could improve adolescents' physical and mental well-being and other developmental parameters.

METHODS

Design and Sampling

This study was an individual-level RCT using a parallel group design. Twelve secondary schools were recruited from 4 districts of Hong Kong. Chinese-speaking students who engaged in fewer than 2 extracurricular activities in school were invited. The latter inclusion criterion was to ensure not overburdening the students. Students who could not attend physical education lessons because of medical concerns were excluded. Informed consent was obtained from the parents of participating students. Random numbers were generated by using R statistical software version 2.13 to assign each student individually to either the intervention or control group with a 1:1 allocation ratio with school as a blocking factor.

Participants randomly assigned to the intervention group participated in an after-school sports mentorship program from October 2013 to June 2014, excluding 3 months of school holiday and an examination period. The program had 18 weekly sports mentoring sessions, each lasting for 90 minutes. Students randomly assigned to the control group were provided with exclusive access to a Web-based health education game with 400 questions on healthy lifestyle during the same period. These students were instructed to log onto the Web site individually for 90 minutes per week for 18 weeks. Students who had no computer or Internet access at home could use the school computer rooms. The quiz game was previously shown to improve health-related knowledge and attitude.[13]

Participants were not blinded to treatment allocation because of the intervention nature. To avoid contamination between treatment groups, intervention deliverers were provided with a list of students in the mentorship program. Only those on the list could participate. The quiz game Web site was only accessible with a unique username and password given to each student in the control group. This study had been registered at clinicaltrials.gov (NCT01955265) before implementation. The study was approved by the ethical committee Institutional Review Board of the University of Hong Kong and Hospital Authority Hong Kong West Cluster.

Intervention

Contrary to physical education lessons that focus on sporting skills, this after-school sports mentorship used sports to empower youth and promote life skills. The intervention framework was based on the 8 PYD principles of the National Research Council and Institute of Medicine.[14] These principles ensure the physical and psychological safety of the students, a helpful and constructive environment (eg, supportive relationships and positive social norms), and a proper program structure for skill building. This empowering framework was chosen because of its effect on mental health.[15,16]

The sports mentorship was delivered in small groups of 12 to 19 (median of 16) adolescents. This small group setting ensured an opportunity to socialize, a sense of belonging, and a more youth-centered, empowering environment.[17] Students within each small group chose 1 form of sporting activity that they

wanted to learn. The chosen sports included basketball, volleyball, and kickboxing. Different from regular physical education lessons, this program did not adopt a teacher-centered approach. The mentors acted like facilitators rather than teachers. For example, there were no predesignated curriculums to determine which sporting skills to learn. Instead, the students and the mentors decided their groups' learning paths through communication.

The intervention deliverers (mentors) were sports coaches with relevant certificates from local sports associations. They were also trained to use sports psychology and PYD theories in their previous professional training (higher diploma or bachelor's degree). They received a 1-day workshop from the research team before the intervention, which included a refresher training on youth psychology and PYD, physical and psychological safety precautions, and the principles and semistructured curriculum of this sports mentorship program. Emphasis was put on the youth-centered environment. For example, the mentors were guided to help the participants in setting their own sporting goals. Techniques of problem solving in the sports context were also provided. These were designed to construct an environment that can foster resilience building.

All the small groups followed the same semistructured curriculum (Supplemental Table 5). The intervention was divided into 2 similar parts (each with 9 sessions) that were separated by a school examination period and holiday from December to January. Each part started with 1.5 sessions (135 minutes) of introduction and warm up, during which the mentor introduced the chosen sport through deliberate play. Then, a half-session (45 minutes) goal setting followed, in which the students discussed what kind of sporting goal they would like to achieve. After setting the goals, the students spent 6.5 sessions (585 minutes) building their sporting skills with the support of the mentors and peers, during which the mentors infused problem-solving techniques through experiential learning. Lastly, a 45-minute debriefing was conducted for skill consolidation and self-reflection. This also helped the participants transfer their learned skills to other parts of their lives. This curriculum assigned ~83% (~1350 minutes) of time for playing sports and/or PA and 17% (~270 minutes) for instruction, demonstration, and discussion led by the mentor. The program was mostly delivered in schools. Nearby community centers were used when the schools could not provide a relevant venue or facility.

Investigators and research assistants visited one-fourth of the randomly selected sessions to ensure program fidelity. The mentors were reminded if the observers identified students who were not active during the sessions. The checking revealed that the mentors could generally follow the PYD principles and the semistructured curriculum. The mean class time observed was 101 minutes, 12.2% longer than the scheduled length.

Outcome Measures

A questionnaire survey and a battery of physical fitness tests were completed by all participants 1 week before the start of intervention (baseline) and 1 month after intervention completion (postintervention) in their schools. The postintervention was chosen to take place 1 month after intervention completion because the primary outcome measures (physical and mental well-being measured by SF-12v2) have a 4-week recall period. The physical fitness and anthropometric parameters were measured on-site by using standardized measurement tools by field assessors. Field assessors and questionnaire-scoring personnel were blinded to the intervention allocation.

Physical and Mental Well-Being

The primary outcome measures of this study were the physical and mental well-being measured by the Chinese version of SF-12v2. The 12-item, self-report questionnaire was validated among Hong Kong Chinese adolescents with good psychometric properties and could accurately distinguish healthy youth in the community from patients.[18] Acceptable test-retest reliability has also been shown.[19]

Physical Fitness Tests

Students' physical fitness was tested in different domains, including a 1-minute sit-up test; handgrip test; standing long jump for measuring core, upper limb, and lower limb muscle strength; sit-and-reach test for flexibility; and Y-balance test for dynamic balance.[20] Good reliability and correlation with physical health and injury reduction have been reported.[20–22]

PA Level

Participants' PA levels were assessed by using the self-rated Physical Activity Rating Questionnaire for Children and Youth. Based on the Jackson Activity Coding[23] and the Godin-Shepard Activity Questionnaire,[24] the Physical Activity Rating Questionnaire for Children and Youth is a 1-item questionnaire to evaluate the students' average weekly PA levels for 4 weeks with the consideration of PA frequency, duration, and intensity. The scale has 11 points, with a range from 0 ("no exercise at all") to 10 ("doing vigorous exercise almost every day"). Good criterion, convergent validity, and test-retest reliability have been reported in Chinese adolescents.[25] It has also been used in clinical

and epidemiologic studies in Hong Kong.[26,27]

Body Weight and Fat Proportion

Students' heights were measured to the nearest 0.1 cm by using a static stadiometer, weight to the nearest 0.1 kg, and fat proportion to the nearest 0.1% by using a standard segmental body composition monitor (BC545N; Tanita Corporation, Tokyo, Japan). BMI and age- and sex-specific BMI *z* scores were calculated by using the standard formula. Overweight and obesity status were defined by using the International Obesity Task Force cutoffs.[28,29] Body fat proportion was found to have good test-retest reliability in Chinese adolescents.[30]

Developmental Assets

Youth developmental assets (traits that could help adolescents develop[31]) were measured in the following 2 dimensions: psychological and social. Psychological assets included self-efficacy and resilience, which were measured by using the Chinese version of the Generalized Self-Efficacy Scale and the Connor-Davidson Resilience Scale. Both self-report scales were shown to be valid and reliable in the Chinese population.[32,33] Social assets were measured with the Chinese version of the Resnick School and Family Connectedness Scales.[34] Both Resnick scales were shown to have acceptable reliability.[34]

Additional Measures

Students in the intervention group were asked to rate their perceived intervention benefit to physical, mental, and social well-being as well as the performance of the coaches in building a good relationship, delivering an interesting mentorship, and teaching effectively. These items were scored on a 5-point Likert scale as a measure of acceptability.

Sample Size Calculation

The study was designed to detect a small-to-moderate effect size (Cohen's *d*, 0.25), which requires a sample size of 506 at a .05 significance level and 0.80 statistical power. Because there were 2 primary outcome measures, the effective sample size required after Bonferroni adjustment was 612. Assuming 10% attrition, the current study was designed to recruit 680 students. Six hundred and ninety-two were recruited to ensure a sufficient number of students in each activity group.

Statistical Analysis

We evaluated the program's effectiveness using intention-to-treat analysis. Baseline and postintervention differences were tested by using independent, 2-sample *t* tests. The association between attendance and intervention effectiveness (dose-response pattern) was explored by using linear regressions with the categorized attendance as the independent variable (control [reference group], low [<50%], moderate [50%–80%], and high [≥80%] attendance). Based on clinical experience, it was hypothesized a priori that the intervention benefit to physical health-related outcomes was more prominent among physically inactive adolescents. The participants were thus divided into 2 subgroups by using the median value of their baseline PA levels. All statistical analyses were conducted by using R statistical software version 3.2.5.

RESULTS

Participants

In October 2013, a total of 719 students from 12 secondary schools were invited and assessed for this trial, of whom 27 declined to participate (Fig 1). Among the remaining 692 students, half were randomly assigned to the intervention group and the other half to the control group. One (0.3%) student in intervention group encountered a minor foot injury during an intervention session and subsequently recovered in 2 months. Twelve students in the intervention (3.5%) and 15 in the control group (4.3%) could not be followed because of competing activities. The final analysis included 664 (333 intervention) students.

The participating students were 12.3 years old on average (SD 0.76), and 58.1% were girls (Table 1). At baseline, approximately one-fourth were overweight or obese whereas 2.4% were underweight.

Intention-to-Treat Analysis

Baseline assessments can be found in Table 2. No significant differences were found between the 2 groups. One month after intervention completion, students in the intervention group had better mental well-being (Cohen's *d*, 0.25; 95% confidence interval [CI], 0.10 to 0.40; *P* = .001), self-efficacy (Cohen's *d*, 0.22; 95% CI, 0.07 to 0.37; *P* = .01), resilience (Cohen's *d*, 0.19; 95% CI, 0.03 to 0.34; *P* = .02), lower limb muscle strength (Cohen's *d*, 0.18; 95% CI, 0.03 to 0.33; *P* = .03), flexibility (Cohen's *d*, 0.28; 95% CI, 0.13 to 0.43; *P* = .02), dynamic balance (Cohen's *d*, 0.21; 95% CI, 0.06 to 0.37; *P* = .01), and PA levels (Cohen's *d*, 0.39; 95% CI, 0.24 to 0.55; *P* < .001) than those in the control group (Table 3).

Additional Analysis

Among the 331 students in the intervention group, 251 (75.8%) stated the program could benefit their holistic well-being, and 277 (83.6%) positively rated the mentors. Half (47.4%) of the students in the intervention group had an 80% or higher attendance rate, but 21.1% attended fewer than half of the sessions. The intervention benefits to mental well-being, resilience,

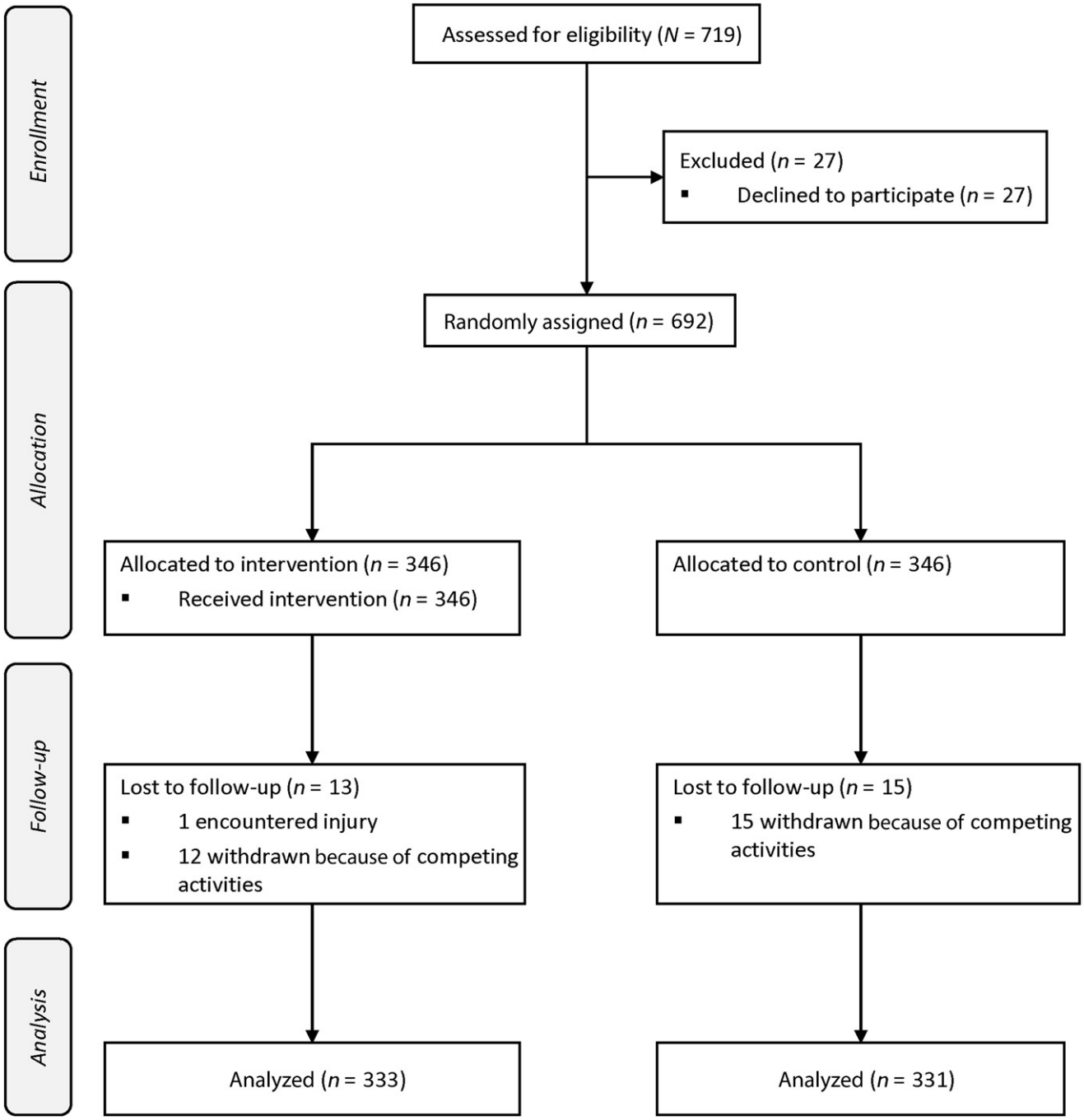

FIGURE 1
Study flowchart.

and flexibility were increased with higher attendance (Table 4). In the control group, 279 (83.8%) students registered on and used the Web site at least once.

Baseline PA level significantly moderated the intervention's effectiveness on postintervention PA level (Supplemental Fig 2) and body fat proportion (Supplemental Fig 3) but not BMI *z*-score (Supplemental Fig 4) and physical well-being (Supplemental Fig 5). Participants who were physically less active at baseline had a larger reduction in body fat (Cohen's *d*, 0.06; *P* = .04) and became more active postintervention (Cohen's *d*, 0.18; *P* < .0001).

DISCUSSION

This is 1 of the first sports programs that improved the mental well-being of adolescents in a community setting. The current program was based on

TABLE 1 Participant Characteristics

Characteristics	Intervention (n = 331)	Control (n = 333)
Age, mean (SD), y	12.32 (0.76)	12.26 (0.75)
Girls, *n* (%)	191 (57.7)	195 (58.6)
Weight status, *n* (%)		
Normal	232 (70.1)	236 (70.9)
Underweight	8 (2.4)	10 (3.0)
Overweight	73 (22.1)	68 (20.4)
Obese	18 (5.4)	19 (5.7)
Birth place, *n* (%)		
Hong Kong	258 (78.0)	274 (82.3)
Mainland China	65 (19.6)	51 (15.3)
Other	8 (2.4)	8 (2.4)
Maternal education, *n* (%)		
Lower secondary and less	143 (43.2)	142 (42.6)
Upper secondary	141 (42.6)	147 (44.1)
Tertiary	33 (10.0)	36 (10.8)
Not disclosed	14 (4.2)	8 (2.4)

No significant between-group differences were detected.

TABLE 2 Baseline Assessments 1 Week Before Intervention

	Mean (SD)		Baseline Difference	
	Intervention	Control	Cohen's *d* (95% CI)	*P*
Health-related quality of life				
Physical component score	49.59 (6.51)	49.87 (5.77)	−0.04 (−0.20 to 0.11)	.58
Mental component score	47.66 (8.89)	47.16 (9.16)	0.06 (−0.10 to 0.21)	.48
BMI *z* score	0.54 (1.15)	0.48 (1.16)	0.05 (−0.11 to 0.20)	.56
Body fat proportion (%)	19.90 (8.41)	20.51 (7.93)	−0.07 (−0.23 to 0.08)	.34
Health-related physical fitness				
One-min push-up test (time)	21.47 (12.19)	22.91 (14.00)	−0.11 (−0.26 to 0.04)	.26
Handgrip strength total (kg)	40.42 (12.33)	39.70 (11.97)	0.06 (−0.09 to 0.21)	.45
Sit-and-reach test (cm)	27.16 (9.29)	28.42 (8.13)	−0.14 (−0.30 to 0.01)	.13
One-min sit-up test (time)	28.75 (8.34)	27.59 (7.78)	0.15 (−0.01 to 0.30)	.13
Standing long jump test (cm)	132.96 (27.16)	130.98 (24.21)	0.08 (−0.08 to 0.23)	.32
Y-balance test average (m)	1.28 (0.24)	1.26 (0.20)	0.10 (−0.05 to 0.26)	.18
Psychological assets				
Self-efficacy	27.21 (6.63)	27.88 (6.10)	−0.10 (−0.26 to 0.05)	.18
Resilience	63.76 (18.39)	64.13 (16.36)	−0.02 (−0.17 to 0.13)	.79
Social assets				
Family connectedness	42.73 (9.56)	43.73 (9.38)	−0.11 (−0.26 to 0.05)	.18
School connectedness	23.35 (4.82)	23.91 (4.99)	−0.11 (−0.27 to 0.04)	.15
PA level	5.42 (2.79)	5.24 (2.55)	0.07 (−0.08 to 0.22)	.40

a developmental theory and had additional empowerment components to ensure mental health benefits.

The effect sizes of this intervention were small-to-medium sized, which were anticipated because these participants were generally healthy. Nonetheless, this sports mentorship program is still considered to be clinically meaningful because of its multidimensional benefits in a low-risk population. This characteristic allows the program to be a viable, primary prevention model to improve population health.

Contrary to our findings, previous PA interventions yielded a mixed and inconsistent effect on mental health outcomes. The Kinder-Sportstudie (KISS) study[35] reported similar benefits on PA level and physical fitness but identified no improvement in mental well-being.[35] On the other hand, other, previous studies reported a similar effect size on depression, anxiety,[3] and self-esteem,[36] although most were conducted among at-risk youth. We hypothesize the heterogeneity to be related to the differences in intervention design and focus. It has been reported that only the intervention with proper structure, context, and caring coaches and mentors could improve mental well-being.[10,37,38] A previous PA intervention has also attributed the null effect on mental well-being to the lack of developmental context.[39] Observing these experiences, the current intervention used an environment of empowerment. Adolescents randomly assigned to the intervention group were encouraged to express their opinions and interest in various settings. Such experience was new to the participants because schooling in Hong Kong is largely teacher centered, in which teachers lecture for 90% of the classroom time.[40] This youth-centered environment could be 1 of the major boosters to their self-efficacy and resilience,[41] which could in turn help them cope with stressors and maintain a good mental well-being.[27]

The current program could only reduce the body fat proportion of sedentary adolescents but not their physically active counterparts. There was also no significant reduction in BMI *z* scores. This is in contrast with the KISS program, which substantially reduced the body fat and BMIs of all participants.[42] Although both interventions had 90 minutes of PA and/or physical education weekly, the implementations were different. The KISS program's physical-education lessons were implemented during school time and instructed by physical-education teachers. This approach ensured a good compliance but is not feasible in Hong Kong, a city with enormous academic stress.[43] Despite the support from schools and acceptability from students, most participants still skipped several sessions (median attendance was 77.8%) because of competing activities, which were mostly academic tutorials.

Implications and Generalizability

With the benefits to mental well-being and developmental assets, this intervention could be of significant public health relevance. Mental health is a major public health issue with increasing burden worldwide,[44] but the effects of psychiatric medications and behavioral therapies have been variable.[45] To alleviate the burden on the health care system, effective primary preventions for mental disorders are needed. The current model of PA intervention might be a potential answer to this issue should a follow-up show sustainability in mental health outcomes or even a risk reduction in psychopathology.

With the rapid urbanization of China, sedentary lifestyle, physical fitness, and mental health may become significant issues in some Chinese cities.[1,46] However, successful interventions in Western developed countries may not be directly applicable to China, especially those related to mental health, because of cultural differences.[47] Because participants of this study represent a Chinese adolescent population from an economically developed city, the findings should also be applicable to other high-income Chinese cities, such as Beijing and Shanghai. However, adaptation may be needed if the model is applied to less industrialized regions.

Limitations

The findings of the current study should be interpreted with the following caveats in mind. First, participants could not be blinded to treatment allocation. The intervention benefits could have been partially overestimated because of a placebo effect. Second, the intervention program has multiple components, and the current study design could not identify which component or combination of components was responsible for the benefits. Third, PA level was measured by self-reported questionnaire and not by objective measurements. There were also no PA measurements during the intervention. However, the self-reported questionnaire tool was shown to be valid and reliable in Chinese adolescents and had good correlation with accelerometer-measured PA levels.[25] In addition, some measurement tools have unknown test-retest reliability, which may affect the interpretation of intertime-point comparison. Last, but not least, aerobic fitness tests cannot

TABLE 3 Evaluation Assessment 1 Month After Intervention

	Mean (SD)		Intention-to-Treat Analysis	
	Intervention	Control	Cohen's *d* (95% CI)	*P*
Health-related quality of life				
Physical component score	51.49 (6.64)	51.57 (5.70)	−0.01 (−0.17 to 0.14)	.86
Mental component score	48.41 (8.33)	46.15 (9.59)	0.25 (0.10 to 0.40)	.001**
BMI *z* score	0.57 (1.07)	0.60 (1.10)	−0.03 (−0.18 to 0.12)	.69
Body fat proportion (%)	19.89 (9.18)	21.28 (8.75)	−0.15 (−0.31 to 0.00)	.051
Physical fitness				
One-min push-up test (time)	30.81 (12.62)	32.10 (13.26)	−0.10 (−0.25 to 0.05)	.55
Handgrip strength total (kg)	40.89 (14.85)	38.75 (14.64)	0.15 (−0.01 to 0.30)	.07
Sit-and-reach test (cm)	27.79 (9.58)	25.24 (8.15)	0.28 (0.13 to 0.43)	.02*
One-min sit-up test (time)	31.03 (10.74)	31.21 (9.52)	−0.02 (−0.17 to 0.13)	.91
Standing long jump test (cm)	136.92 (24.89)	131.97 (30.33)	0.18 (0.03 to 0.33)	.03*
Y-balance test average (m)	1.36 (0.27)	1.30 (0.29)	0.21 (0.06 to 0.37)	.01**
Psychological assets				
Self-efficacy	29.69 (4.92)	28.45 (6.21)	0.22 (0.07 to 0.37)	.01**
Resilience	68.37 (13.15)	65.43 (17.76)	0.19 (0.03 to 0.34)	.02*
Social assets				
Family connectedness	41.80 (9.85)	43.23 (9.07)	−0.15 (−0.30 to 0.00)	.054
School connectedness	22.36 (5.23)	22.50 (5.03)	−0.03 (−0.18 to 0.12)	.72
PA level	6.10 (2.20)	5.10 (2.75)	0.39 (0.24 to 0.55)	<.001***

* *P* < .05; ** *P* < .01; *** *P* < .001.

TABLE 4 Association Between Attendance and Effectiveness

	Low Attendance (<50%)		Moderate Attendance (50%–79.9%)			High Attendance (≥80%)	
	β (95% CI)	*P*	β (95% CI)	*P*		β (95% CI)	*P*
Mental component score	−.56 (−2.85 to 1.73)	.63	1.26 (−0.69 to 3.22)	.21	—	4.18 (2.49 to 5.87)	<.001***
Self-efficacy	1.19 (−0.26 to 2.64)	.11	.69 (−0.54 to 1.93)	.27	—	1.63 (0.56 to 2.70)	.003**
Resilience	1.79 (−2.24 to 5.83)	.38	1.82 (−1.69 to 5.32)	.31	—	4.17 (1.18 to 7.15)	.006**
Sit-and-reach test	1.03 (−2.53 to 4.58)	.57	2.35 (−0.36 to 5.06)	.09	—	3.86 (0.79 to 6.92)	.01*
Standing long jump test	3.29 (−3.99 to 10.58)	.38	6.28 (0.03 to 12.54)	.049	*	4.81 (−0.60 to 10.22)	.08
Y-balance test average	.05 (−0.03 to 0.12)	.20	.09 (0.02 to 0.15)	.007	**	.05 (−0.01 to 0.10)	.08
PA level	.72 (0.04 to 1.41)	.04*	1.07 (0.50 to 1.64)	<.001	***	1.06 (0.57 to 1.55)	<.001***

β, regression coefficient representing the difference in outcome compared with the control group.
* *P* < .05; ** *P* < .01; *** *P* < .001.

be conducted because of the limited time available.

CONCLUSIONS

This PYD-based sports mentorship program could improve Chinese adolescents' mental well-being, self-efficacy, resilience, physical fitness, and PA levels. The program design and curriculum can be adopted in other high-income Chinese cities with support from schools and high-quality sports mentors. Scaling up this program may be useful in tackling the increasing burden of mental disorders and physical inactivity.

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ABBREVIATIONS

CI: confidence interval
PA: physical activity
PYD: positive youth development
RCT: randomized controlled trial

manuscript; Drs Chow and Ip conceptualized the study, interpreted the data, and critically revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

This trial has been registered at www.clinicaltrials.gov (identifier NCT01955265).

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