A Project entitled

"Effect of Autonomy supportive teaching on

primary students' perception of perceived autonomy support and motivation"

Submitted by

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Declaration

I, Lam Yuen Sum , declare that this research report represents my own work under the supervision of Dr. Chow Chi Ching Gary, and that it has not been submitted previously for examination to any tertiary institution.

Signed _____

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13/04/2022

Content

Abstract:

Background: Children demonstrated a low physical active level in terms of moderate-to vigorous-intensity physical activity level (MVPA) around the world. Physical Education (PE) is the major platform to promote active lifestyle to children. *Objective:* The purpose of this study is to investigate whether guiding PE teachers to adopt autonomy-supportive teaching (AST) could enhance students' perceived autonomy support, physical activity level and their motivation.

Methodology: 92 primary students from two schools were recruited. Students from each school were randomly assigned to either a) the AST group (age 9.49 ± 0.68 years) (i.e., providing choices and verbal instruction strategy) b) control group (9.58 ± 0.63) (i.e., direct teaching) in a three-week intervention. Global Physical Activity Questionnaire (GPAQ), Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) and Perceived Autonomy Support in Physical Education Scale were used to assess students' physical activity (PA) level, intrinsic motivation, and perceived autonomy support before and after the PE lesson intervention. Teachers' instructions were recorded through auto-tracking × video camera and transferred to text for verify whether autonomy support was provided. *Results:* The result failed to support the hypothesis. However, the time effect of total PA MET-minutes per day had significant difference ($p = 0.048$). Although the interaction effect of intrinsic motivation was not significant ($p = 0.103$), the intrinsic motivation of AST group was increased ($d = 0.189$) and the control group decreased ($d = -0.158$). *Discussion and Conclusion:* The results demonstrated that increasing trend of MVPA, intrinsic motivation and perceived autonomy support by AST. The perceived autonomy support and motivation of students may be influenced when teachers provide students with an experience of autonomy in the long term of autonomy-supportive environment.

Keywords: Perceived autonomy support, motivation, autonomy support teaching, physical education, primary students

Introduction:

Current situation

Children demonstrated a low physical active level in terms of moderate-to vigorous-intensity physical activity level (MVPA) around the world. They are recommended to do at least an average of 60 minutes per day of MVPA across the week (World Health Organization, 2020). According to InspiringHK Sports Foundation (2020), there are more than 95% of children and youth cannot maintain the recommendation of the World Health Organization (WHO). They may increase the risk of chronic diseases such as heart disease (National Centre for Chronic Disease Prevention and Health Promotion, 2011). Physical Education (PE) is the major platform to promote active lifestyle to children, while active physical participation beyond the classroom is critical to achieve successful MVPA-60 in children. However, controlling teaching strategies with direct instruction and commands is commonly adopted in school (Ince et al., 2010). They provided limited choices to students and using commands to direct students towards correct solutions through pressure. It caused limited autonomy support and low motivation of children (Reeve, 2006; Haerens et al.,2015). Research (Ntoumanis et al., 2004) recruited around 400 students. Students who have amotivation in PE and led to low intention for doing physical activity (PA) after school. This showed that the low motivation might lead to the physical inactiveness of students. Hence, teachers have an important role to create a motivational environment to facilitate the motivation of children and support their needs.

Self-determination theory

The self-determination theory (SDT) developed the framework for the human motivation which apply in the educational setting (Ryan & Deci, 2000). It can be classified into three types. First, the amotivation is the state of no drive and lack of motivation to participate in the learning activity. Second, the extrinsic motivation means that the engagement reinforced by reward or external demand. Third, the intrinsic motivation (IM) means that the individual is self-motivated and driven by interest and enjoyment. People cultivate IM, result in maintaining the behavior without any rewards or punishments. The learner is satisfied with psychological needs including autonomy, competence, and relatedness to have self-determined motivation. The need for autonomy means the feeling of psychological freedom and volitation (Ryan & Deci, 2002). In the PE pedagogy, students perceive autonomy support from teachers, which in predicted the IM towards doing PA

(Hagger & Chatzisarantis, 2016). Teachers' provision of autonomy support can fulfill the students' autonomy. Therefore, the more a teacher supports students' autonomy, the higher the students' autonomous motivation should be both inside and outside of the classroom.

Autonomy-supportive teaching (AST)

Autonomy-supportive teachers take account of the perspective and feelings of students. They provide choice, decision-making for students and explain the meaningful rationales for the activities and rules (Perlman & Webster, 2011). They could offer alternative options such as the frequency and type of activity. Communicating with students in ways that bring flexibility and rationales to help students understand the value and importance of the learning activity. Moreover, encouraging and supporting students to develop inner motivational resources includes praise as informational and offering encouragements (Reeve & Jang, 2006). These autonomy-supportive behaviors are distributed the examples from the study (Reeve & Jang, 2006; Cheon et al., 2012).

Some intervention studies have investigated the relationships between AST and motivation in PE pedology. Research (Abula et al., 2020) had a three-month intervention with college students in Beijing. It examined the autonomous motivation of students participate in leisure-time physical activity could be promoted by AST in PE. The teachers in AST group received the three-wave training programs during the 3 months intervention. It found that AST benefits students to be motivated to do physical activity (PA) in their leisure time. Chang et al. (2016) examined the impact of autonomy support on motivation for a six-week intervention among 126 primary students in Taiwan. The students of autonomy support group could discuss the sequence of the PE content for those six weeks. They could choose their partners during practice. Autonomy support group had higher IM than control group (interaction group effect: $F(1,124) = 8.18$, $p = 0.005$). The result indicated that increased autonomy support predicts the students increased their IM. The above research pointed out that the effect of students perceived autonomy support (PAS) from teachers on IM to do PA. They haven't used the PA level for the measurement after the intervention. They used questionnaires to measure their IM for doing physical activity. Hence, my project will use the PA level for one of the measurements after the intervention. Also, there was no experimental research about the effect of autonomy support teaching on the IM of students doing PA in Hong Kong.

Purpose

This study hypothesized that the autonomy-supportive guidelines are effective to enhance the usage of AST by teachers during PE. The purpose of this study was to investigate whether guiding PE teachers to adopt autonomy-supportive teaching could enhance i) students' physical activity level and ii) their motivation, and iii) perceived autonomy-support in PE lessons.

Methodology:

Participants

The sample consisted of 92 primary students (44 males and 48 females; age: 9.53 ± 0.65 years) from two primary schools were recruited in Hong Kong. Four male teachers have the average of 20.25 years teaching experience. The range of teaching experience ranged from 16 to 24 years. Prior to data collection, we gained permission from the principal and PE teachers at the school to conduct the study. The consent forms from all participants and their parents were obtained before participating in the study. All participants are required to have good health conditions that enable them to join safely in the PE lesson. This study was approved by the Human Research Ethics Committee of the Education University of Hong Kong. The demographic data of participants characteristics are presented in Table 1.

Table 1. Participants characteristics

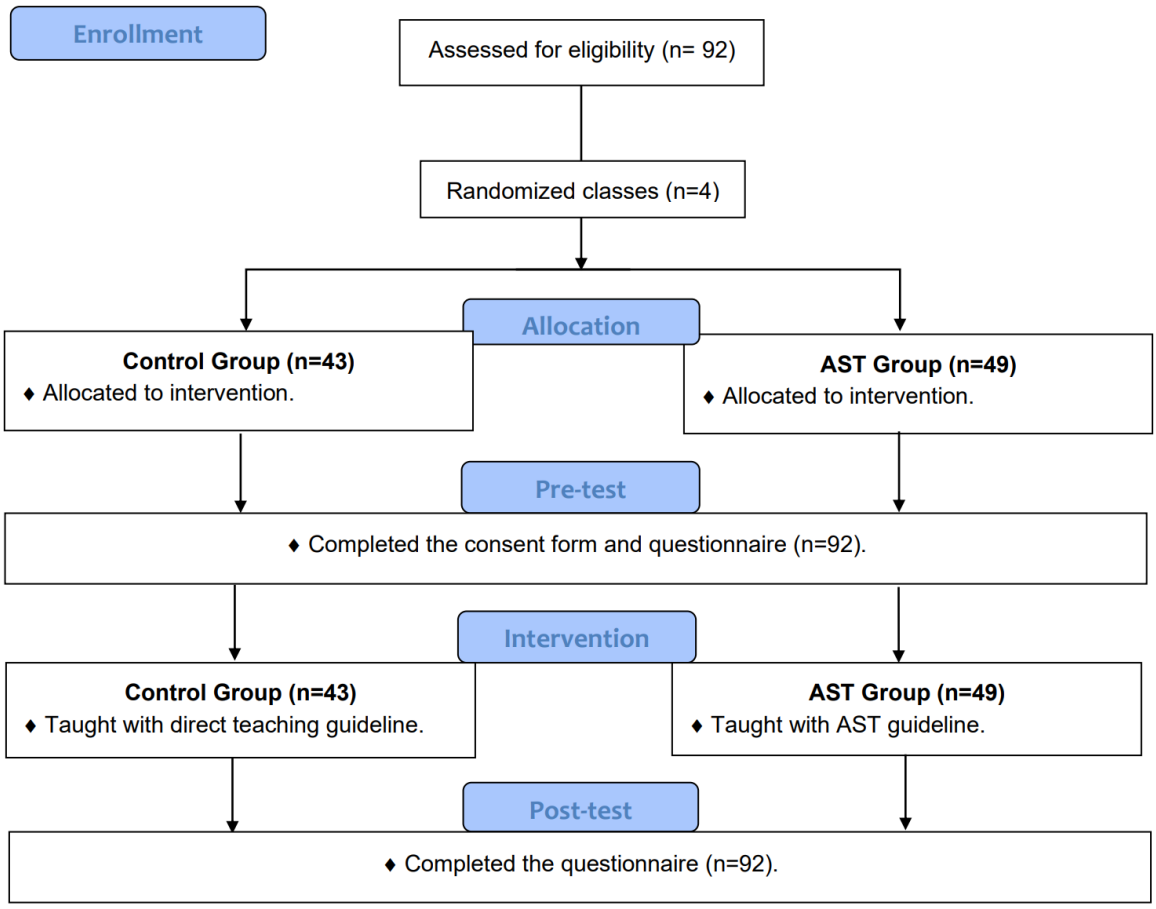
	AST Group	Control Group	Total	*p*-value
Student participants	49	43	92	/
Age	9.49(0.68)	9.58(0.63)	9.53(0.65)	0.506
Gender (Male/Female)	24/25	20/23	44/48	0.813
Teacher participants	2	2	4	/
Age	43(2.83)	44(2.83)	43.5(2.38)	/
Gender (Male/Female)	2/0	2/0	4/0	/
Teaching Experience Years	22(2.83)	18.5(3.54)	20.25(3.3)	/

Means (with standard deviations) are presented.

Procedure

The flow chart of the study is shown in Figure 1. It was the randomized controlled trial (RCT). The whole experiment period was longed for 6 weeks. A total of 92 primary students from two schools were recruited. They were Primary 4 and Primary 5 students. Due to the class structure of school, they were in the fixed class every day. We randomly assigned the whole class to either the autonomy-supportive teaching (AST) group (n= 2, 49 participants) or control group (n= 2, 43 participants). Students completed the questionnaire before the PE lesson intervention (Appendix 1: The questionnaire). We had a 45-minute briefing session with four PE teachers. PE teachers received AST or direct teaching guidelines for the lessons. Teachers were not allowed to discuss with other teachers during the intervention to avoid the effect of different guidance of teaching. Teachers' verbal instruction in both groups were recorded during the lessons for further evaluation. During the three-week intervention, students had PE lessons over a unit which was basketball or athletics. The duration of PE lesson of two schools were either 25minutes or 50 minutes. After the intervention, students filled in the same questionnaire as in the pre-test.

Figure 1. Flow of the study. AST = Autonomy-supportive teaching.



Autonomy-supportive teaching (AST) intervention

Teachers in the autonomy supportive intervention group adopted AST guideline. The AST guidelines was based on the Cheon et al. (2012) and Reeve & Jang (2006) (Appendix 2: The guideline). They designed different levels for practice, provided explanatory rationales and used non-controlling language. For example, designing progressive passing distances in basketball. Students could choose to pass the ball from yellow line or disc area. Moreover, the autonomy-supportive teachers offered hints, provided encouragement and skill-based feedback (Reeve & Jang, 2006). For instance, teachers said: "When you shoot the ball, you can use which part to generate more power?", "Almost," and "You're close". They also gave the rationale of the rules and learning activity. The AST teacher said that "It is important to take two steps after jumping. If not, your result will not be recorded" during the long jump lesson. The meaningful rationales could help students understand why a particular request or activity (Cheon et al., 2012) (Appendix 2: The guideline).

For the control group, teachers gave the health and safety guidance to enhance the students' awareness. Teachers emphasized the teaching points to students during the lesson such as "Your hands should be straight when you release the ball". Giving directions and instructions to students to practice for ensuring their engagement. When students correctly completed the movements and follow the guidance from teachers, teachers gave confirmation to them. Moreover, the teachers reminded students to follow the rules when they are not disciplined. For example, teacher told student that "You should not do the bounce pass" (Appendix 2: The guideline).

Teachers' instructions were recorded through auto-tracking × video camera during the PE lessons for further evaluation. Teaching language used in the lessons were translated to text after class to verify whether autonomy support was to make self-motivated learning behavior provided. The teachers received the guidance to use either AST or direct teaching. The recording assessed the number of words of using AST guidelines over the whole lesson.

Measurements

Three questionnaires were administered to assess the students' PA level, motivation, and PAS support from teachers.

The Chinese version of the Global Physical Activity Questionnaire (GPAQ) was used to measure the PA level of students (Appendix 1: Questionnaire). It is scored by calculating moderate to

vigorous MET minutes per week and per day according to the WHO GPAQ analysis guidelines (WHO, 2002). The sum of the total MET minutes of activity was calculated. The first part of the questionnaire changed from work situation to school situation. It consists of four parts with 16 questions including PE activity in school, traveling, recreation activities, and sedentary behaviors. This research (Herrmann et al., 2013) conducted two studies (87 participants) which lasted for 10 days and 3 months for the reliability and validity of this questionnaire. Coefficients for the reliability (10 days) ($r = 0.83 – 0.96$) while long-term reliability (three months) ($r = 0.53 – 0.83$). It also reflected "low to moderately-high validity ($r = 0.25 – 0.63$) against measures of physical fitness, body composition, and objective (accelerometer, pedometer) and subjective measures of PA (IPAQ)." The result indicated that GPAQ is a valid and acceptable reliability measurement of MVPA. Moreover, Stelmach (2018) said "Comparing to IPAQ, using the GPAQ focuses mainly on three general domains of one's activity involving efforts made at work while being active and while resting. These features increase its applicability."

The Chinese version of Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) (Appendix 1: Questionnaire) was used to assess student's autonomous motivation towards leisure-time physical activity (Markland & Ingledew, 2007). It consists of 19 items with a 5-point Likert scale which ranges from 0 (not true for me) to 4 (very true for me). It measures IM, identified regulation (ID), introjected regulation (IJ), external regulation (ER), and amotivation (AM) established by Deci and Ryan's (1991) continuum framework of relative autonomy. The mean score of each subscale was calculated. Liu et al. (2020) have done a study (204 participants) examining the reliability and validity of the Chinese version of BREQ-2 in China. The Cronbach α coefficient of BREQ-2 result was 0.78 and indicated good consistency for the reliability of BREQ-2. It also showed the validity among AM (4 items), ER (4 items), IJ (3 items), ID (4 items) and IM (4 items) of this questionnaire (I-CVI: .83 to 1.00 and S-CVI: .97).

The Chinese version of the Perceived Autonomy Support in Physical Education Scale (Liu, Bartholomew & Chung, 2017) was employed to assess the PAS (Appendix 1: Questionnaire). It is a 7-point Likert scale which ranging from 1 (strongly disagree) to 7 (strongly agree). The score (i.e., 1 to 7) is converted by the 7-point Likert scale. It calculated the mean score. Abula et al. (2020)

indicated the reliability of this questionnaire. It had the internal consistency (Cronbach's alpha) was 0.92.

Statistical Analysis

The data analysis was analyzed with the IBM SPSS Statistics (Version 27, IBM Corp). The continuous and categorical (e.g., gender) demographic data, respectively, of the AST and control groups was compared by the independent t test and chi-square test. Two-way (Groups × Time) repeated ANOVA was used for analyzing the differences between the AST group and control group from pre-test to post-test. All data were presented in mean and standard deviation. The significance level was set as $p \leq 0.05$.

Results:

Participants

A total of 4 male PE teachers (mean age: 43.5 ± 2.38 years; mean teaching experience: 20.25 ± 3.3 years) participated in the study. The total number of the study were 92 students (mean age: 9.53 ± 0.65). Their age ranged from 8 to 11 years old. 49 students in the AST group (24 males and 25 females; mean age: 9.49 ± 0.68 years) and 43 students in the control group (20 males and 23 females; mean age: 9.58 ± 0.63 years) completed the study. There were no significant differences between the age ($p = 0.506$) and gender ($p = 0.813$) of the two groups (Table 1).

Teachers' verbal instruction

The means and standard deviations of the teachers' verbal instruction over the unit for the two groups are shown in table 2. The total number words of verbal instruction in the teachers of control group (5804 words) were more than the AST group (4679 words). The AST group was 25% of using AST language higher than the control group was 10%. It reported that AST group teachers had higher usage of AST verbal instruction in the PE lessons than the control group.

Primary Outcomes of Students' MVPA

The descriptive data, mean scores of MVPA among two groups in both pre-test and post-test are presented in table 3. The two-way repeated ANOVA revealed that no significant interaction (group × time) and group effect between two group among MVPA of PE lessons ($p = 0.416$) and daily

activities (p = 0.596). However, there were a significant time effect of PE lessons (p = 0.001) and daily activities (p = 0.048).

Primary Outcomes of Students' self-determined motivation and PAS

The mean and standard deviations of self-determined motivation and PAS in pre-test and post-test is displayed in table 4. No significant group-by-time interactions effect associated with AM, ER, IJ, ID, IM, and PAS (P >0.05). It also found no significant change over time and group effect in the mean of study variables (P >0.05).

Table 2. Means (standard deviations) and sentence of verbal instruction over the unit.

Outcome measure	AST Group (n=2)	Control group (n=2)
Number of words (sentences) in the Unit	4679(616)	5804(673)
Number of words (sentences) using Autonomy-supportive teaching language	1182 (132)	663(67)
Percentage of Mean (SD) using Autonomy-supportive teaching language	25% (0.1)	10% (0.01)

Table 3. Means (standard deviations) and correlations of MVPA during PE lessons and daily activities.

Outcome measure	AST Group (n = 49)		Control Group (n=43)		Time effect	Group effect	Interaction effect
	AST-Pre	AST-Post	Con-Pre	Con-Post	*P*	*P*	*P*
MET-minutes/week (PE lessons)	145.47 (202.93)	260.41 (372.26)	141.30 (189.05)	329.67 (416.68)	0.001*	0.49	0.416
Total PA MET-minutes/day (Daily activities)	344.70 (295.04)	477.35 (433.89)	374.99 (418.86)	451.97 (566.07)	0.048*	0.974	0.596

The mean (SD) scaled scores of Global Physical Activity Questionnaire (GPAQ). MET: Metabolic equivalent of task. PA: Physical Activity

*Time effect: $p < .05$; #group effect: $p < .05$; ^ Interaction effect

Table 4. Means (standard deviations) and correlations of self-determined motivation and perceived autonomy support.

Outcome measure	AST Group (n = 49)		Control Group (n=43)		Time effect	Group effect	Interaction effect
	AST-Pre	AST-Post	Con-Pre	Con-Post	*P*	*P*	*P*
Amotivation (AM)	0.30 (0.63)	0.43 (0.93)	0.42 (0.82)	0.46 (0.65)	0.308	0.567	0.551
External Regulation (ER)	0.85 (0.85)	0.73 (1.02)	1.17 (1.08)	1.00 (1.02)	0.073	0.131	0.746
Introjected Regulation (IJ)	1.04 (1.08)	1.21 (1.25)	1.26 (1.12)	1.49 (1.35)	0.053	0.284	0.762
Identified Regulation (ID)	2.70 (0.64)	2.78 (0.69)	2.71 (0.76)	2.76 (0.8)	0.334	0.96	0.856
Intrinsic Motivation (IM)	3.40 (0.66)	3.49 (0.72)	3.40 (0.81)	3.31 (0.84)	0.954	0.537	0.103
Perceived Autonomy Support (PAS)	32.14 (7.87)	32.51 (8.24)	34.02 (7.72)	33.35 (9.53)	0.83	0.395	0.468

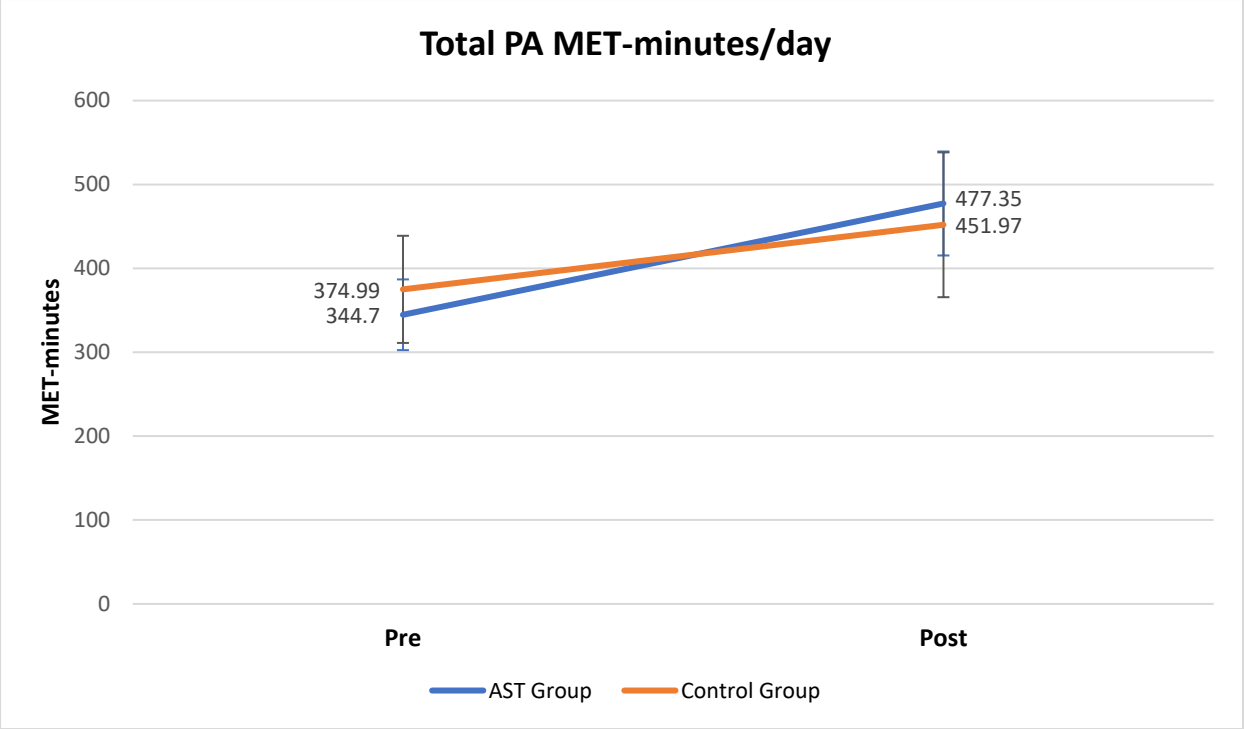
The mean (SD) scaled scores of Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) and Chinese version of the Perceived Autonomy Support in Physical Education Scale (CPAS).

*Time effect: $p < .05$; #group effect: $p < .05$; ^ Interaction effect

MVPA

The findings of total PA MET minutes/ day of students are presented in figure 2. There was no significant interaction and group effect of total PA MET-minutes/day between AST group and control group ($P > 0.05$). However, the result of time effect was significant ($p = 0.048$). AST group increased (pre-test vs. post-test: 344.7 ± 295.04 vs. 477.35 ± 433.89) after the intervention. The control group also increased (pre-test vs. post-test: 374.99 ± 418.86 vs. 451.97 ± 566.07). From the figure 2, it seems that the increase was more pronounced in the AST group ($d = 0.26$) than in the control group ($d = 0.158$).

Figure 2. Total Physical Activity (PA) MET-minutes/day with means.

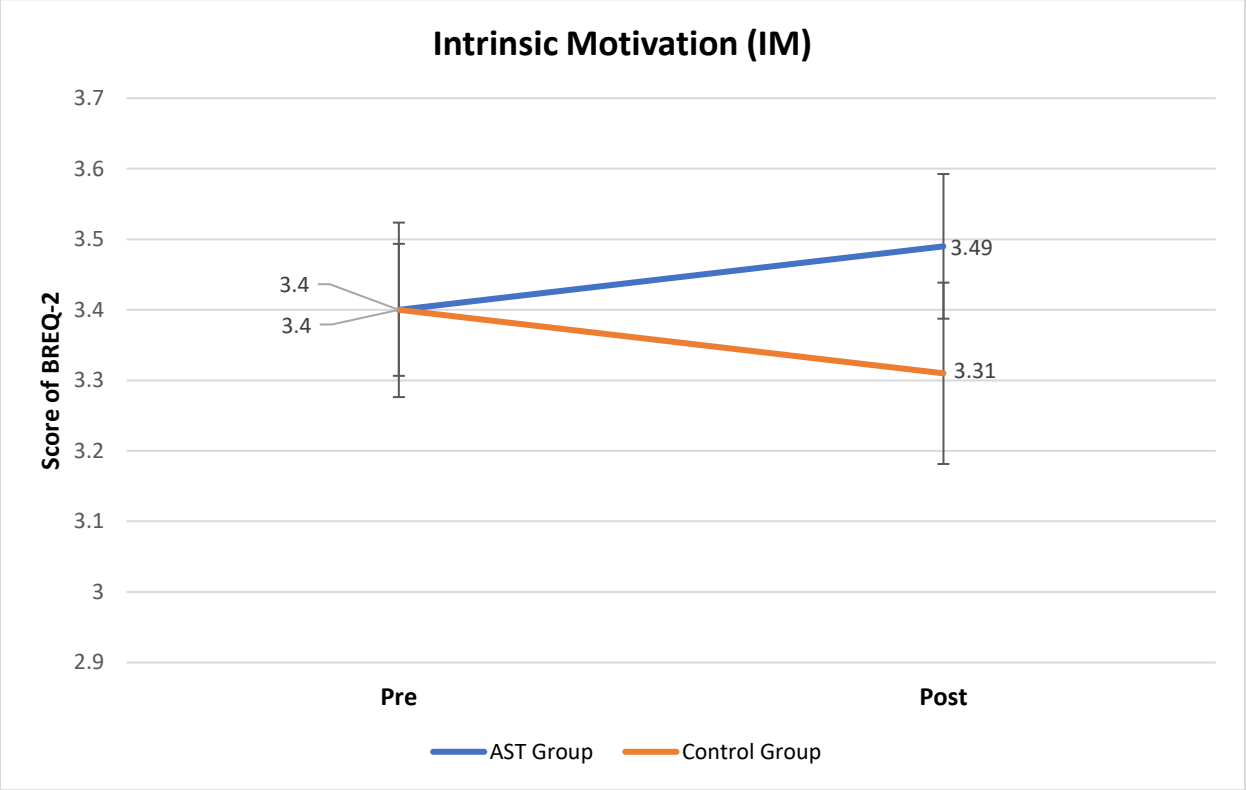


MET: Metabolic equivalent of task, PA: Physical Activity.

Intrinsic motivation (IM)

The result of the IM improved slightly in the AST group after three-week intervention (pre-test vs. post-test: 3.40 ± 0.66 vs. 3.49 ± 0.72) but the control group decreased (pre-test vs. post-test: 3.40 ± 0.81 vs. 3.31 ± 0.84). The effect size of AST group was increased (d = 0.189) and the control group decreased (d = -0.158). However, it did not receive significant interaction among two groups (F (1, 90) = 2.711, p = 0.103) (Figure 3). There were no significant time and group effect between two group (P > 0.05).

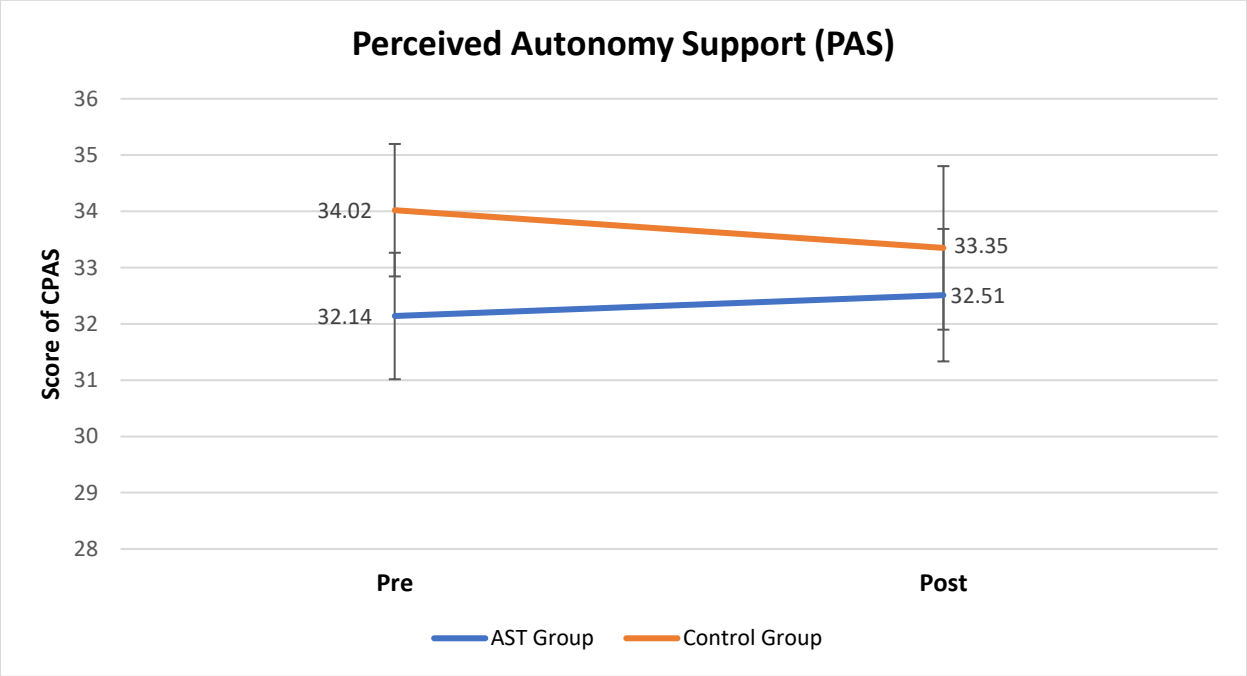
Figure 3. Intrinsic Motivation of Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) with means.



Perceived Autonomy Support (PAS)

The outcome of PAS is shown in figure 4. Compared with the pre-test, the mean score of PAS increased slightly in the AST group (pre-test vs. post-test: 32.14 ± 7.87 vs. 32.51 ± 8.24) but the control group decreased (pre-test vs. post-test: 34.02 ± 7.72 vs. 33.35 ± 9.53). The effect sizes of AST group were increased (d = 0.068) and the control group decreased (d = -0.082). There was no statistically significant group-by-time interaction effect on PAS (F (1,90) = 0.531, p = 0.468). The group and time effect were also no significant difference (P > 0.05).

Figure 4. Chinese version of the Perceived Autonomy Support in Physical Education Scale (CPAS) with means.



Discussion:

Overall

This research demonstrated the implementation of AST in Hong Kong primary schools. The design of RCT enabled the researcher to compare and evaluate the outcomes between the experimental and control groups. Contrary to our research hypothesis, no significant results for enhancing students' physical activity level, their motivation and perceived autonomy-support in PE lessons. It seems that the short duration led to the slowly increasing of the data. However, the main finding of this study is that the AST intervention could train AST teachers to apply the AST for the PE lessons. The finding showed that the increasing trend of fostering the MVPA, IM and PAS of students.

Students' MVPA

The finding of this study was associated with no significant level of MVPA among two groups. For the total PA MET-minutes per day, although both groups increased slightly, AST group increased more than control group. It is inconsistent with other experimental research, which suggests that the foster of doing MVPA is likely to occur when applying AST in PE lessons. According to the SDT, the high involvement of exercise behavior may occur when people have the IM (Standage & Ryan, 2012). The research (Chatzisarantis & Hagger, 2009) found that the effect of AST intervention during PE lessons on MVPA of students among high school students. The PAS of students had the direct effect with students' MVPA. According to the study (Gillison, Standage & Skevington, 2006), the IM toward PA of people being shown to positively predict self-reported PA. It indicates that the students' MVPA have the association with their PAS during PE lessons and IM of doing leisure-time PA. It maybe important to have the autonomy-supportive environment for supporting students to nurture their IM and PAS which increase the leisure-time PA.

Students' IM

The AST could slightly increase of the IM of the students. Referring to the result figure, AST group were increase and control group decreased after the post-test. It reflected that the AST could provide the subtle difference to the IM of students. There were no significant different of the interaction. It seems likely that too small of the time span time led to the none of the meaningful

changes in IM because of the interventions. This finding is supported by Lonsdale et al. (2013) study in which 4 weeks of intervention. The study provided choices of activities and partners for students within 4-week PE lessons. The result showed that it cannot significantly increased IM of students. However, AST may need to be beneficial to students in long-term period. There is much substantial evidence that the IM is influenced by the AST over time. The research of Chang et al. (2016) provided 40-minute-long PE classes twice per week for six weeks interval of time. Chatzisarantis & Hagger (2009) offered one 45-minute PE lesson per week over a five-week intervention. The students of AST group reported that PE was important and enjoyable to them. They had the increase of IM towards doing PA during leisure-time. Both studies successfully significantly enhanced the IM of students after the longer intervention. Regarding AST strategies, autonomy-supportive teachers convey an interpersonal message of supporting and trying to understand and adopt the perspective of students (Reeve, 2015). It motivities students to do PA inside and outside of the school. Specifically, the AST of the PE lessons in that supporting the students' need of autonomy can obviously impact students' IM. It suggests that the AST can be a powerful strategy to enhance the IM of students in a long duration of intervention.

The students' IM may have the relationship with PAS from teachers. The results showed that students had slowly increase of the PAS and IM of students. Due to the PE curriculum of the two schools in this study, students only learnt one sport in three weeks of PE lessons. Also, the learning activities were designed by the teachers during the PE lessons. Therefore, students could perceive limited autonomy support during the intervention. They followed the teacher's guidance for the learning activities. They felt limited autonomy support from teacher may cause to the slowly increasing of IM. It can be supported by Chang et al. (2016), which found that the relationship between AST intervention, PAS and IM of students. They allowed students to choose partners and the learning activities. The students in AST group had increased of the perceived autonomy-support from teachers after the intervention but the students in the control group decreased. It revealed that significant interaction of group and time ($F(1,124) = 30.62$, $p = 0.001$, partial $\eta 2 = 0.20$). They felt higher enjoyment and greater intention towards doing PA in daily life than the control group. The research (Lonsdale et al., 2013) found that students' interest of a particular activity cannot increase from the course of a unit of PE. Students may feel bored for learning specific activity with the limited provision of autonomy-support. For example, they cannot have choice of the learning

activity during the lessons. Those studies highlighted that the association of AST environment, PAS, and IM of students. The AST strategy is a viable strategy to increase the IM of students with the provision of supporting students' autonomy.

Students' PAS

The PAS of students is associated with the provision of autonomy-supportive environment. From the result figure and table, the post-data in PAS increased in AST group but dropped in control group. However, no significant interaction result showed among two groups. The low percentage of AST during the PE lessons may be the factor of the students' PAS. During the PE lessons, AST teachers only provided limited choices such as choosing practice levels and neglected the acceptance of students' negative affect for the efficient teaching. The grouping of students was fixed every time. It contradicts research indicating that the autonomy-supportive environment provides many choices and understand the feeling of students (Perlman & Webster, 2011). Therefore, teachers mainly used the direct teaching for the classes and provided the limited autonomy-support. As such, it is possible that the limited provision of autonomy-supportive environment cannot enhance the PAS of students. The study (Lonsdale et al., 2013) highlighted that provide number of options for warm up activities and two application activities games could increase the students' PAS. Taiwan study (Chang et al., 2016) allowed students to choose their own partners and the sequence of the PE content. Comparing with control group, the students in the intervention group experienced high level of PAS from teachers. Including many choices under the structure and supporting students' autonomy needs may be an important strategy to enhance the PAS of students. Teachers are actively encouraged to be more autonomy-supportive so students could have positive learning experiences in classes.

Students' PAS are also associated with the content of the lessons. During the intervention, the content of the PE lessons was fixed due to the planning teaching curriculum of the school. Teachers only taught the basketball and athletics for their students. Under the safety concern, teachers had the high awareness of the students' behaviors during the athletics lessons. For example, teachers had to keep telling students to throw and pick up the bean bags carefully during the athletic lesson. Teachers could not offer many choices for students to choose to prevent the dangers. Therefore,

the high frequency of instruction of safety is adopted which is one of the controlling strategies (Ince et al., 2010). Students might have the low PAS regarding the safety of the learning activities.

The teachers' verbal instruction

The impact of AST guideline to teachers. The purpose of this study is to autonomy-supportive guidelines are effective to enhance the usage of AST by teachers during PE. According to the result table, the AST group teachers have 25 % of usage of AST guideline which higher than the control group (10%). It showed that the AST guideline could have an impact to the AST teachers. They tried to use the AST verbal instruction to provide autonomy-support to students. However, more than half of the instruction was using the direct teaching during the intervention. It seems likely that teacher cannot apply fully in the three-week intervention. It might be linked with the teacher' characters. The long teaching experience of the teachers in this study have developed their teaching strategy. Their own personality disposition translates their teaching style towards students (Van den Berghe et al., 2013). For instance, they are oriented to demand themselves, so they also use controlling and pressuring methods to students. It revealed that the personality of teachers can contribute to their teaching strategy. Moreover, the teacher' belief is related to the low usage of AST. As in other intervention studies (Reeve, 1998; Reeve et al., 2014), the teachers could adopt the AST when they believe that it is effective and easy-to-implement. However, the briefing session with teacher might not be the effect training program in this study. We only organized the 45-minutes meeting with the teachers about what is the AST and some examples of AST but didn't include the skill-based training program. According to the meta-analysis research of Su & Reeve (2011), they demonstrated that the effective AST training program should have longer length and involve the skills-based training program. It revealed that the 3hours training were most effective. The skill-based training program can benefit to teachers for the implementation of AST. For example, having the role play for AST for 3-day training with 3 hours per session could enhance teachers' belief and their AST orientation (Chatzisarantis & Hagger,2009). Teachers could acknowledge the provision of autonomy-support towards students. Another research (Abula et al., 2020) in Beijing provided 3 days workshop during the intervention. 5 PE Teachers of AST group discussed together and had role play for the strategy of applying AST. Teachers could successfully be trained in AST style and increased the students' PAS and IM of doing leisure-time PA. Also, skill-based training could increase teachers' beliefs that autonomy support is both effective and

easy-to-implement (Reeve & Cheon, 2016). These findings suggests that an effective AST training program is vital for developing teachers' belief and guiding teachers' implementation of AST in PE education.

Limitation:

There are some limitations in this study. We invited only two schools with 4 teachers and 96 students. It done with a narrow sample of size of the intervention. It may not generalize to other type of schools in Hong Kong. Further studies may conduct the variety of schools to have the stronger results. We used questionnaire for measurement of the students. It relied on the self-report of students. Further work is needed to examine effects of intervention on objectively measured MVPA during PE lessons and outside of school. Lonsdale et al. (2013) and Perlman (2013) used accelerometer to measure the level and intensity of PA during the PE lessons. The accelerometer can benefit to the data of students' engagement. The study also examined the short-term effects of the AST without the follow-up afterward. Therefore, future studies may attempt to examine the long-term effects of AST towards teachers and students. Our research included the adoption of several components of AST such as offering choices, informational feedback, and meaningful rationales. Further study can examine the one of components might have the effect on students' PAS and IM. Moreover, experimental research suggested that the IM of children can not only increased by teachers, but also the parents. Parents have the influence on children's intentions to engage in PA in leisure-time (Hagger et al., 2009). Based on the above research, researchers may investigate whether the parents have the effect on the children's IM of doing leisure-time PA.

Conclusions:

This study contributes to the discussion and impact of Autonomy-supportive teaching in PE lessons towards teachers and students. PE teachers are the important role to foster the actively lifestyle of children. Guided by the framework of the SDT, this study could manipulate the AST in PE lessons by guiding teachers to support more autonomy support to students. It benefits to current and the future PE teachers in Hong Kong can adopt AST for supporting the psychology needs of students. AST of PE in school have the potential to positively impact the children' perceived autonomy support, intrinsic motivation and MVPA. Future research is encouraged to design and evaluate AST interventions in primary schools of various characteristics in Hong Kong.

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Appendix 1: The questionnaire

運動習慣和體育課問卷

請回答於下列問題，注意每題只有一個答案，請留意您的書寫。

感謝你填寫這一份問卷。本問卷目的是探討你的身體活動量、做運動和上體育課的感受。你可以按照自己真實感受填寫。本份問卷的內容將會被保密，只會應用在我們研究目的上，不會提供給其他單位。感謝你的支持和協助。

第一部分：

請回答於下列問題，注意每題只有一個答案，請留意您的書寫。

1. 姓名：_____
2. 年齡：_____歲
3. 就讀班別：_____
4. 性別：

第二部分：

以下我們將體力活動分為"劇烈"或"中等強度"。

對體力要求甚高，令呼吸和心跳劇烈加速的為劇烈體力活動。

對體力要求一般，令呼吸和心跳稍微加速的為中等強度體力活動。

與上體育課相關的活動

1	你在上體育課時需要連續進行劇烈活動（令呼吸和心跳劇烈加速）十分鐘以上嗎？（例如跑步、足球等)	請選一個打勾 ✔： ❑ 需要 ❑ 不需要（跳至 2）
通常一週內有多少日上體育課時會進行上述劇烈活動？		____天（1-7）
在那幾日的上體育課時，你每日通常花幾多時間做上述劇烈活動？		____小時____分鐘
2	你在上體育課時需要連續進行中等強度體力活動（令呼吸和心跳稍微加速）十分鐘以上嗎？（例如游泳、排球等）	請選一個打勾 ✔： ❑ 需要 ❑ 不需要（跳至 3）
通常一週內有多少日上體育課時會進行上述中等強度體力活動？		_____天（1-7）
在那幾日的上體育課時，你每日通常花幾多時間做上述中等強度體力活動？		____小時____分鐘

與交通往來相關的體力活動

下一步是交通往來的通常方式，例如去上課、購物等，但並不包括已提及的，上體育課時的體力活動。

3	來往不同地方時，你會連續步行或踩單車十分鐘以上嗎？	請選一個打勾 ✔： ❑ 會 ❑ 不會（跳至 4）
來往不同地方時，通常一週內有多少日你會連續步行／踩單車十分鐘以上？		_____天（1-7）
你每日來往不同地方時通常花幾多時間步行／踩單車？		____小時____分鐘

康樂活動

下一步是康樂活動，例如下課後興趣班、校隊訓練等的時間、但並不包括已提及的上體育課和交通相關的活動。

4	你會連續做劇烈運動、健身或康樂活動（令呼吸和心跳劇烈加速）十分鐘以上嗎？（例如跑步、足球等）	請選一個打勾 ✔： ❑ 會 ❑ 不會（跳至 5）
通常一週內有多少日會進行上述劇烈康樂活動？		_____天（1-7）
在那幾日，你每日通常花幾多時間做上述劇烈的康樂活動？		____小時____分鐘
5	你會連續做中等強度運動、健身或康樂活動（令呼吸及心跳稍微加速）十分鐘以上嗎？（例如游泳、排球等）	請選一個打勾 ✔： ❑ 會 ❑ 不會（跳至 6）
通常一週內有多少日會進行上述中等強度體力康樂活動？		_____天（1-7）
在那幾日，你每日通常花幾多時間做上述中等強度體力的康樂活動？		____小時____分鐘

靜態行為

最後是關於靜態行為（包括上課時的坐／臥、乘搭私家車／巴士／鐵路／電車來往不同地方、做功課、與朋友一起坐、上網、打機、看電視等) 的時間，但不包括睡眠時間。

6	你每天通常坐／臥多久？	____小時____分鐘

第三部分：

請回答下列關於你對於運動的個人感受，選出最符合你的情況，圈出相應的數位，請注意每題只能圈一個答案。

	完全不適合		有時適合我		非常適合我
圈一個答案:（例子）	0	1	2	3	4
1. 我會運動，是因為別人認為我應該運動。	0	1	2	3	4
2. 我不運動時會有罪惡感。	0	1	2	3	4
3. 我重視運動帶來的益處。	0	1	2	3	4
4. 我運動是因為運動很有趣。	0	1	2	3	4
5. 我不認為我應該要運動。	0	1	2	3	4
6. 我去運動，是因為朋友／家人／伴侶說我應該要運動。	0	1	2	3	4
7. 當我缺席了一次運動，我會感到羞愧。	0	1	2	3	4
8. 對我而言，規律地做運動是很重要的	0	1	2	3	4
9. 我實在不認為為什麼要運動。	0	1	2	3	4
10. 我非常喜歡我的運動。	0	1	2	3	4
11. 我去運動是因為如果我不運動，別人會感到不高興。	0	1	2	3	4
12. 我不覺得運動有什麼重要性。	0	1	2	3	4
13. 當一段時間沒做運動，我會覺得自己像試過失敗的人。	0	1	2	3	4
14. 我認為努力地維持規律運動是很重要的。	0	1	2	3	4
15. 我覺得運動是個充滿樂趣的事情。	0	1	2	3	4
16. 我感受到來自朋友或家人的壓力，促使我去運動。	0	1	2	3	4
17. 我如果不規律地做運動會感到煩躁不安。	0	1	2	3	4
18. 我從參與運動中，獲得快樂和滿足。	0	1	2	3	4
19. 我認為做運動是浪費時間的行為。	0	1	2	3	4

第四部分：

請根據你在體育課中的經歷和感受，回答以下問題。請仔細閱讀以下句子，圈出最能代表你的感受的數字。1= 非常不同意，7= 非常同意

在體育課中，	非常不同意						非常同意
圈一個答案:（例子）	1	2	3	4	5	6	7
1. 我覺得老師為我提供了很多選擇。	1	2	3	4	5	6	7
2. 我覺得老師是理解我的。	1	2	3	4	5	6	7
3. 老師對我的能力有信心。	1	2	3	4	5	6	7
4. 老師會鼓勵我多問問題。	1	2	3	4	5	6	7
5. 老師會聽取我的意見。	1	2	3	4	5	6	7
6. 老師在提供建議前會試圖瞭解我的看法。	1	2	3	4	5	6	7

Appendix 2 The AST guideline

《自主支持教學對學生提升身體活動量的成效》

教學策略

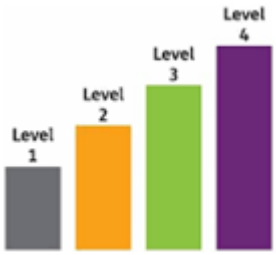
教學策略一

課堂情況：	教學指引：	例子：
1. 活動設計 	- 活動設計針對學生的能力	- 例子（足球－腳內側傳球）因為學生眼睛與腳協調能力不足，導致支撐腳擺放位置太前或太後，因而影響傳球表現不穩定。訓練 1－在雪糕筒旁擺支撐腳，讓學生多次練習，正確地擺放支撐腳和記住動作要點。
2. 講解安全和衛生指引 	- 讓學生留意安全和衛生指引。	- 說：「各位同學應與人保持最少 1.5 米距離。」 - 說：「大家必須時刻注意個人衛生，在體育課前後須洗手。」
3. 教授技能 	- 強調動作的要點。	- 說：「拍球時，盡力控球遠離防守球員，舉起另外一隻手與防守球保持距離」
4. 學生練習時 	- 指令學生做練習，確保學生的參與度。 - 提醒學生動作的要點。 - 說出練習剩餘的時間，令學生留意時間。	- 說：「開始練習。」 - 例子（足球－腳內側傳球） 支撐腳擺放在球的正旁邊（一隻腳的距離）。 - 說：「還有兩分鐘，努力練習！」

教學策略一

課堂情況：	教學指引：	例子：
5. 給回饋時 	- 糾正學生的錯誤動作 - 讓學生知悉老師說的動作要點。	- 說：「同學應該這樣舉高手。」 - 說：「同學不應該垂低手。」
6. 學生不聽從指令時 	- 提醒學生，可以聆聽老師的話。	- 說：「同學需要這樣做……」 - 說：「留心聽我說……」
7. 學生做正確動作時 	- 當學生做正確的動作和跟從老師的指示，讚賞他們。	- 說：「這樣做是對的」 - 說：「做對了，這個就是老師說的動作要點。」

教學策略二

課堂情況：	教學指引：	例子：
1. 活動設計 	- 針對學生的興趣、能力和學習難點。 - 活動設計可以分不同難度，讓學生選擇適合自己的難度。	- 例子（足球－腳內側傳球）學生可選擇直線傳球的距離： o 2米、4米和6米 - 說：「各位同學可以選擇哪一段長度的距離是可以挑戰的。」
2. 講解安全和衛生指引 	- 認真地講解安全和衛生指引和背後原因。	- 說：「為什麼會有這些規則？其實是為了保護大家的安全，避免會受傷。」
3. 教授技能	- 講出動作的要點。	- 說：「因為……」

	- 解釋做指定練習的原因和好處。	- 例子（足球－腳內側傳球） - 說：「因為支撐腳影響整個動作，所以讓各位同學首先練習正確地擺放支撐腳。」
4. 學生練習時 	- 給學生嘗試和思考空間。 - 給予鼓勵，多鼓勵學生嘗試做和投入參與。 - 給予建議，可以選擇怎樣改善動作。	- 說：「做得很好，可以做得更好嗎？」 - 說：「那太好了，這是你的最好表現吧！？」 - 說：「差不多成功，有更好的方法嗎？」 - 說：「接近了，做足了所有動作嗎？」 - 說：「大家都可以做到的，誰的方法更有效？」
5. 給回饋時 	- 給含有資訊回饋，提供信息性的建議。	- 說：「我建議……」， - 「同學可以試著這樣做。」 - 「我注意到同學做動作時有些不平衡，知道為什麼會這樣嗎？」
6. 學生不聽從指令時 	- 願意溝通，嘗試理解學生的想法。 - 給予學生選擇	- 說：「是的，我知道這是一個困難的練習，但大家可以做到的。」 - 學生有情緒時，給他選擇，可以在旁邊休息一會兒和觀察別人的動作，也可以繼續上課。
7. 學生做正確動作時 	- 讚賞學生 - 給學生選擇難度更高的練習，挑戰自己。	- 說：「做得很好」 - 例子（足球－腳內側傳球） - 說：「可以挑戰更長的距離，或可以用另一腳傳球。」