

## Effectiveness of a school-based life skills program on emotional regulation and depression among elementary school students: A randomized study



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### ABSTRACT

The first peak of emotional distress is during teenage, when children have limited abilities to address challenges following major biopsychosocial changes. In this study, we examined the preliminary effectiveness of a life skills training (LST) program modified on the basis of Taiwan school characteristics and children's life experiences compared to lectures oriented curriculum. We used the posttest-only control group design with 39 elementary schools, 21 randomly assigned to the experimental group, which received LST, and 18 to the control group, which received education as usual (EAU). There were 8 units in the LST, which consisted of 27 sessions. Demographics, depression, and emotional regulation were measured. Results show that students in the LST group reported significantly higher scores on cognitive reappraisals than those in the EAU group. Furthermore, LST was associated with reduction of depressive symptoms among males but not females. LST and its implications in the East Asian socio-cultural context, development of gender-responsive preventive programs, and the validity of the LST for helping children, are discussed.

### 1. Introduction

Children are prone to internalizing problems, such as depression, from childhood to adulthood, due to rapid biological, cognitive, and social changes (Rudolph & Hammen, 1999; Wu & Lee, 2020). A national survey in the U.S. indicates that the depression rate was 14.4% for children under 18, equal to approximately 3.5 million children (Substance Abuse and Mental Health Services Administration, 2018). Similarly, a study in Taiwan shows 16.3% of children ages 12–18 reporting moderate depressive symptoms (Wang & Chen, 2008). The development of internalizing problems such as depression, emotional disturbance, and anxiety among children can be overlooked due to their unrecognized, implicit characteristics and the differences in symptoms between children and adults (Son & Kirchner, 2000). If unaddressed, internalizing problems may lead to externalizing behavior such as acting out, substance use, or suicide (Wild, Flisher, & Lombard, 2004).

These problems might persist, recur, and continue into adulthood, leading to crime and psychiatric symptoms (Aronen & Soininen, 2000; Gladstone & Beardslee, 2009), which may severely influence the well-being of the individual as well as the society.

Prevention approaches in the past two decades have been focused on acknowledging the importance of promoting motivation and social-emotional competence in children to prevent both internalizing and externalizing problems (Botvin & Griffin, 2014; Hung et al., 2019). The World Health Organization (1999) suggested life-skills education as a way to promote social and emotional development and thus to prevent health and social problems. They proposed nine core life skills: (1) problem solving, (2) stress management, (3) assertiveness, (4) social adjustment, (5) pressure resistance, (6) decision making, (7) critical thinking, (8) interpersonal skills, and (9) effective communication. The United Nations defines life skills as a large group of psychosocial and interpersonal skills that can help people make informed decisions,

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communicate effectively, and develop coping and self-management skills, which can lead to a healthy and productive life (United National Children's Fund, 2012).

A systematic review study revealed that Botvin Life Skills Training (LST) is a widely researched and applied program in the United States for prevention of substance use (Hopfer et al., 2010). It is a school-based program designed to prevent adolescent substance use by teaching personal self-management skills (e.g., problem-solving skills, anger management, ways to enhance self-esteem), general social skills (e.g., overcoming shyness, communicating clearly, building relationships, avoiding violence) and drug-resistance skills (e.g. effective defenses against pressure to use tobacco, alcohol, and other drugs). Results of some large-scale randomized controlled trials (RCTs) indicate that LST can effectively prevent adolescent substance use by enhancing their abilities to regulate their emotions and cope with difficulties (Botvin et al., 1990, 1995). Furthermore, long-term preventative effects of LST have been demonstrated in RCTs (Botvin, Schinke, Epstein, Diaz, & Botvin, 1995; Botvin, 2000). Few skills-based intervention studies have been carried out aiming to improve life skills in elementary school children, although the results of one study suggested that LST for elementary school students 3rd grade and above is promising (Botvin, Griffin, Paul, & Macaulay, 2003).

### 1.1. Effectiveness of life skills training across countries

The effectiveness of LST has been examined in diverse populations and across countries. A study targeting students in Iran suspected of mental health disorders found decreased anxiety, depression, and stress in the LST intervention group (Sobhi-Gharamaleki & Rajabi, 2010). From a pseudo-experimental study in Iran with 160 high school students, the authors concluded that LST promotes social, cognitive, and emotional abilities (Maryam, Davoud, & Zahra, 2011). In an empirical study in India, the researchers found that both the emotional and educational adjustment of 60 students ages 15–17 improved after LST intervention (Yadav & Iqbal, 2009). However, a study evaluating a combined LST and mindfulness middle school program in China yielded mixed results (Huang, Chen, Greene, Cheung, & Wei, 2019). Although the findings of a study in China demonstrated a significant increase in total life skills and resilience after the mindfulness and LST intervention, surprisingly, the increase in assertiveness was associated with more externalizing and internalizing problems (Huang et al., 2019). This finding suggests that the assertiveness widely encouraged in Western society may be seen as disrespectful or “showing off” in a collectivist society and thus may contribute to undesirable outcomes for children. Therefore, modifications are essential to ensure positive effects of programs and practices.

### 1.2. Social-cultural context and education system in Taiwan

Our study was innovative in that it adapted an LST curriculum to Chinese culture, the education setting, and the target population. Specifically, we examined a modified Botvin LST in more than 2,500 students from 39 elementary schools in Taiwan, where the social-cultural context and education system are very different from those in the U.S. Compared to the emphasis on children's autonomy and independence in Western society (Liu et al., 2005; Wu et al., 2002), the socialization of children in Taiwan focused on self-in-relation, a process based on traditional Chinese Confucian teachings on status and authority in social relationships and interactions (Chuang & Su, 2009; Park & Chesla, 2007). Previous studies have documented that the Chinese tend to endorse the use of coercive and high-powered teaching techniques and emphasize child obedience more than their Western counterparts (Chao, 1994; Chen, Liu, & Li, 2000; Wang & Liu, 2014). The Chinese approach significantly attenuates children's emotional expression and awareness, thus contributing to their internalizing problems (Yap, Pilkington, Ryan, & Jorm, 2014). The academic

pressure in Taiwan schools aggravates the situation; children spend the majority of their time studying and doing homework, leaving little time to acquire other necessary life skills. For example, in a cross-cultural study, Chinese children were found to have poorer communication with their parents and friends than their Western counterparts (Li, Delvecchio, Lis, Nie, & Di Riso, 2015), interfering with their emotional development (Wimsatt, Fite, Grasseti, & Rathert, 2013; Ying et al., 2018).

Additionally, education in Taiwan is characterized by examinations and cramming, with its primary focus being rote learning (Cheng, 2017; Lin & Huang, 2009). Average class size is twice that in the U.S. To ensure that an interactive teaching model that includes an LST program utilizing “learning-by-doing” pedagogy, which incorporates task-based information to orient students toward an immersive environment (Anzai & Simon, 1979; Dede, 1995), can be implemented in Taiwan, we collaborated with school authorities and teachers to modify the Botvin LST curriculum. In doing so, we took into account the school's characteristics and students' life experiences in Taiwan. Furthermore, the new curriculum adapts socially appropriate behaviors to the collectivist social-culture context of East Asia. This study aims to examine the effectiveness of this adapted LST programs. More details are provided in the Methodology section.

### 1.3. Gender differences in mental health and coping strategies

Gender differences in internalizing and externalizing problems are well-documented in adolescents (Leadbeater, Blatt, & Quinlan, 1995; Verhulst et al., 2003). With cross-cultural consistency, girls have been found to have higher scores on measures of internalizing problems, whereas boys have higher scores on externalizing problems (e.g. Besser & Blatt, 2007; Leadbeater, Kuperminc, Blatt, & Hertzog, 1999; Natsuaki et al., 2009; Sourander & Helstelä, 2005; Tambelli, Laghi, Odorisio, & Notari, 2012; Verhulst et al., 2003). To be more specific, girls reported higher levels of depression (Cyranowski, Frank, Young, & Shear, 2000; Rudolph, 2009) with the likelihood of depressive symptoms being two to three times higher among girls than boys in both population-based and clinical samples (Hyde, Mezulis, & Abramson, 2008; Rudolph, 2009; Wichstrøm, 1999). A study targeting Taiwanese adolescents found that female adolescents reported significantly higher levels of both internalizing problems and psychosomatic symptoms than male adolescents (Yeh, Bedford, Wu, Wang, & Yen, 2017).

Whittle, Yücel, Yap, and Allen (2011) found that girls engaged more in emotional than cognitive processing in response to stressful stimuli whereas boys did the opposite. Males usually recover faster than females, because their regulatory mechanisms lessen their affective reactions sooner (Williams et al., 2005). Natsuaki et al. (2009) likewise found that girls reacted to interpersonal challenges more strongly than boys. These characteristics may contribute to greater vulnerability to mental health distress in female children than in male children. Differences in coping strategies also lead to more severe affective symptoms in girls than boys. For instance, girls tend to have more repetitive and unproductive thoughts about their failings, which results in more rumination (Johnson & Whisman, 2013; Nolen-Hoeksema, 1991).

Rumination is considered a maladaptive coping strategy, because it involves repetitive thinking about the causes, consequences, and symptoms of negative behavior without the person taking action to change the situation or relieve the distress (Nolen-Hoeksema, 1991). Thus, more rumination is a possible explanation for more severe depressive symptoms in girls (Ge, Lorenz, Conger, Elder, & Simons, 1994; Hankin & Abramson, 2002; Hankin et al., 1998). Additionally, girls are more likely to use social support as a coping mechanism, although social-support seeking has been found to be associated with more internalizing problems in girls, but not in boys (Brittian, Toomey, Gonzales, & Dumka, 2013; Wu & Lee, 2020). Grant (2000) suggested that the influence of stress on boys' externalizing behavior can be mitigated by avoidance coping; to the contrary, avoidance coping strengthens the

relation between daily hassles and internalizing symptoms in girls. Because of these gender differences with respect to biological function and coping strategies, different programs dealing with internalizing and externalizing problem behaviors seem to have different effects in males and females.

The current study was a preliminary evaluation of an innovative preventive intervention program provided to children in Taiwan elementary schools. We replaced a lectures-only method with a practice regimen providing students with culturally appropriate interactive skills as a way to prevent mental health problems. We hypothesized that (a) our adapted LST program improves children's emotional regulation; (b) it decreases their depressive symptoms; and (c) its preliminary effects differ by gender.

## 2. Methodology

### 2.1. Study procedures

We approached the city of Keelung during the academic year 2017–2018 to implement and examine the preliminary effectiveness of our LST program. After approval by the city's Department of Education, school principals and teachers were asked if they were interested in joining the study and employing the life skills curriculum; 39 schools indicated a willingness to participate.

The schools were then assigned to the LST intervention group or a control group used a simple randomization procedure. The principal from each elementary school drew a ball from a box (red = LST group and blue = EAU group). If their school was assigned to the LST group, we informed the parents of the intended introduction of the life skills program and explained it to them. For this group, between December 2017 and May 2019 LST was provided to regular elementary school classes of 25 or more children by the same teachers in 45-minute sessions with 10-minute breaks between sessions. Students in the control group received education as usual (EAU) during the study period.

### 2.2. Participants and data

We employed a posttest-only control group design (Frey, 2018). Post-test assessment was carried out in May and June of 2019. Data were collected from 18 schools for the EAU group and 21 schools for the LST group, which resulted in a total sample of 2,552 10- to 12-year-old students in the study (Fig. 1). Participants received no compensation for the study.

### 2.3. Adapted life skills training (LST)

With the permission of Dr. Gilbert J. Botvin, his LST program that we adapted was introduced in schools in Taiwan. The training was for communication skills, decision making, social skills, advertisement analyzing, smoking information, self-esteem, stress adjustment, and assertiveness. It consisted of 27 class sessions over three academic semesters. We employed a collaborative work model that involved researchers, authorities, and teachers in developing and implementing the LST protocol and curriculum. The translated curriculum was collaboratively reviewed by the school principals and teachers, and their suggestions were adapted by the researchers for PowerPoint presentations and training activities. The content of the curriculum was revised several times, and then the researchers worked with the school teachers in the LST groups to present three half-day LST workshops. The teachers were provided with a detailed, structured teacher's manual that included a discussion of how to adapt the curriculum to the teachers' demonstration, modeling, students' role play scenarios and the jointly created PowerPoints. The LST was conducted in the Integrative Activities, Health, and Physical Education classes. A social media group (the online discussion forum LINE, the most popular app in Taiwan) was created to ensure the fidelity of teaching LST in the class. When an

LST module was presented by a teacher in his/her class, the student activities consisted of photo assessments of exerting skills by students and assignments that were uploaded to the LINE forum so that the teachers could share information and interact with one another and the researchers about how to successfully implement the module and how the students would respond to it.

The LST curriculum was translated/back-translated into Mandarin by two professors (psychology and public health). The aim of LST, which is based on social influence and competence-enhancement models of prevention, is to fill in the gaps between learning and doing by using interactive game-based activities. The LST program is focused on self-esteem, decision-making, relevant substance-use health education, advertising, stress, communication skills, social skills, building and maintaining relationships, and assertiveness (Botvin & Griffin, 2014).

The elements of the program were refined and/or revised using Taiwan-based life-experience scenarios so they would be familiar to Taiwanese pupils and implementable in a school/classroom environment. The refined or revised elements included awareness of personal emotions such as anxiety, personal interests (individualism) versus group benefits (collectivism), living environment situations such as having a sandwich versus congee as breakfast, and autonomy versus following orders/regulations of authorities. These eight modules include the following.

#### 2.3.1. Communication skills (3 sessions)

Students practiced strategies to use both verbal and nonverbal communication skills. Active listening techniques were facilitated through role play in pairs according to scenarios given in the LST training program, such as: (a) when you get a bad grade and worried about being punished by parents or (b) when you were misunderstood by a best friend for talking behind his/her back and you don't know what to do. Feelings and active listening techniques were discussed and reinforced positively after the role play. Teachers were also encouraged to select scenarios relevant to students' daily life.

#### 2.3.2. Decision making (2 sessions)

Students discussed how to make a decision and how decisions are influenced by other people. In order to make effective decisions, the three steps of decision-making (stop-think-go) were introduced and practiced.

#### 2.3.3. Social skills (4 sessions)

The primary goal was for students to learn how to resolve conflicts efficiently with proper interaction techniques in four successive class sessions. Students learned three common reactions to conflict (strike back, give in, and negotiate) and three likely kinds of outcomes (win-win, win-lose, and lose-lose). In the last class session, students practiced strategies to resolve conflicts described by the scenarios and reinforced these strategies through small group role plays.

#### 2.3.4. Media literacy (4 sessions)

The aims of this unit were to build students' ability to identify the purposes of advertisements and be aware of the messages they're sending. Using group discussions and activities, students identified and analyzed common advertising techniques and developed proper responses, especially to advertisements of cigarettes, alcohol, and on-line gaming.

#### 2.3.5. Smoking information (3 sessions)

Students learned basic knowledge about cigarettes and discussed the effects of smoking in the first session. In the following two sessions, students practiced the stop-think-go strategies they acquired in the previous module to decline others' invitations to smoke. Articles were introduced relevant to protecting children and adolescents from the negative effects of smoking and other types of substance use, in ways

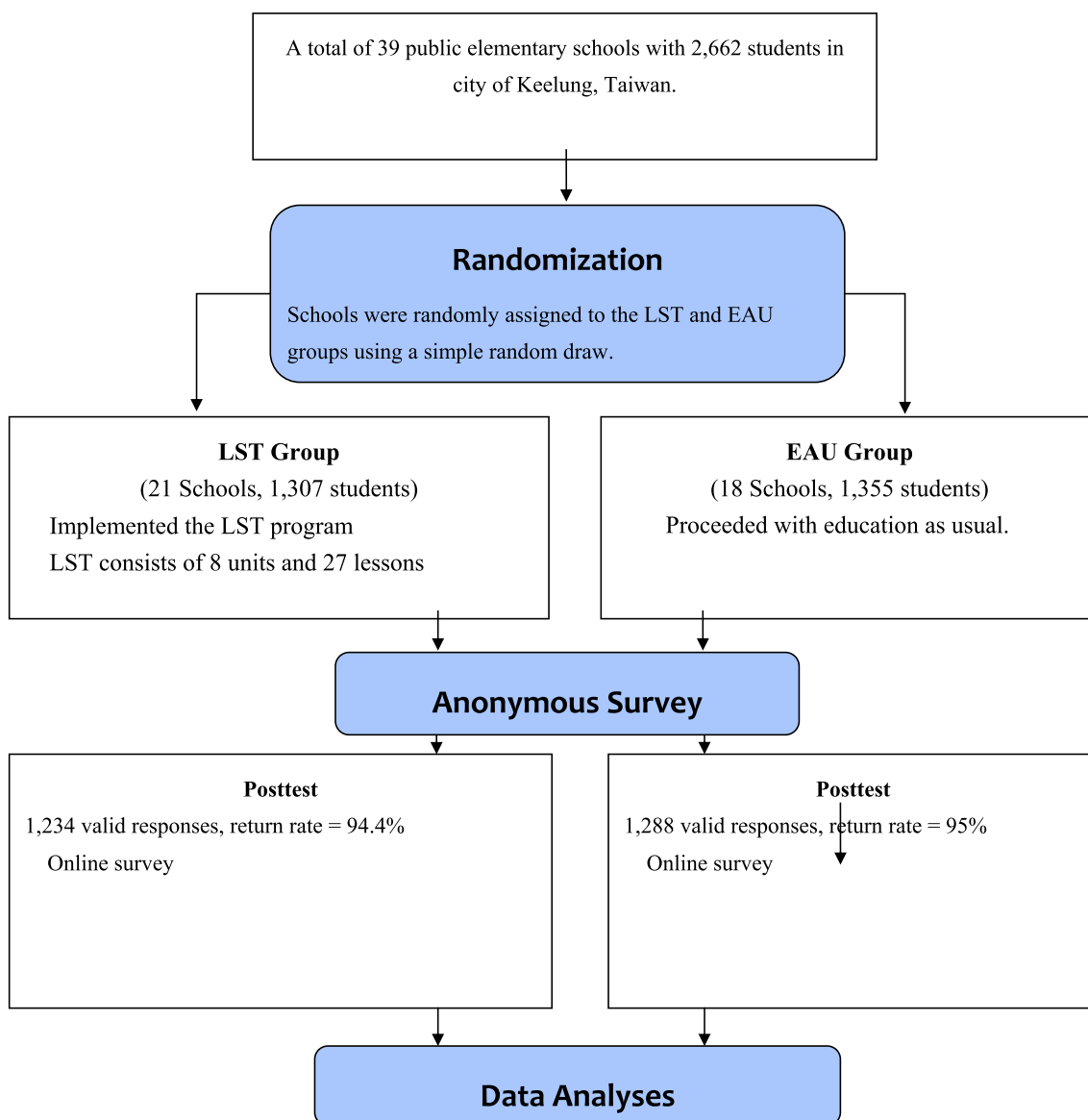


Fig. 1. Flow chart of randomization and intervention procedure.

outlined in the Protection of Children and Adolescents Welfare and Rights Act for Students. Students were asked to work in small groups to create advocacy programs for a smoke-free environment.

2.3.6. *Self-esteem (3 sessions)*

Students learned about self-esteem and how to promote it. The following famous quote from the *Analects of Confucius* was explained to them and practiced in the class: “There is always a teacher among three random people (三人行必有我師)”. Students formed groups of three and the task was to identify each member’s uniqueness and merits. In the following session students were encouraged to recognize both their uniqueness, merits and commonality with peers.

2.3.7. *Stress coping (4 sessions)*

Students learned various sources of stress and were encouraged to express stressful feelings appropriately. Students were taught to distinguish positive and negative coping strategies and the positive ones, such as mindfulness and relaxation, were taught and practiced in class.

2.3.8. *Assertiveness (4 sessions)*

Students learned to identify situations in which they needed to be

assertive and the components of assertiveness. Both verbal and non-verbal assertive skills, such as I-message, were taught and practiced in small group during class.

2.4. *Education as usual (EAU)*

The EAU classes consisted of lectures and readings providing information about stress, social relationships and communication, substance use and advertising, and the effects of substance on the body.

2.5. *Measures*

After the completion of LST, participants were administered a posttest consisting of a web-based structured questionnaire. The questionnaire was administrated anonymously during a regular 45-minute class period. Seminars on administering the questionnaire were held for the teachers to assure data quality. The questionnaire contained items on demographics, emotion regulation, and internalizing problems. The demographics were age, gender, and family economic status.

### 2.5.1. Emotional regulation scale (ERS)

The ERS (Gross & John, 2003) is a 10-item self-report scale designed to assess two strategies for regulating emotions: (1) cognitive reappraisal and (2) expressive suppression. Participants respond to each item on a 7-point Likert-type scale ranging from 1 (“strongly disagree”) to 7 (“strongly agree”). Cognitive reappraisal involves thinking differently about a situation to change its meaning so as to alter one’s emotional experience. Expressive suppression involves decreasing the outward expression of emotion. Six items contribute to the Cognitive Reappraisal subscale (Cronbach alpha = 0.89), and four items contribute to the Expressive Suppression subscale (Cronbach alpha = 0.72). Scores for each strategy (reappraisal and suppression) are added up respectively to form a continuous measure (Gullone & Taffe, 2012). The scale used in this study was translated into Chinese by the corresponding author, TSHL, and reviewed by the research team.

### 2.5.2. Center for epidemiologic studies depression scale for children (CES-DC)

The CES-DC was developed by Radloff (1977) as a 20-item questionnaire with a 4-point scale ranging from 0 (“never or few”) to 3 (“usually”) and were examined to be an appropriate tool among children (Roberts, Andrews, Lewinsohn, & Hops, 1990). The scale consists of four subscales: Depressive Affect, Somatic Complaints, Interpersonal Problems, and Positive Affect (Shahid, Wilkinson, Marcu, & Shapiro, 2011; Weissman, Orvaschel, & Padian, 1980). Depressive Affect includes 7 items, such as feeling down and unhappy, feeling scared, and feeling sad. Somatic Complaints includes 7 items, such as not feeling like eating, feeling too tired to do things, and being more quiet than usual. Interpersonal Problems includes 2 items, namely, feeling that other kids are not being friendly and feeling disliked by people. Positive Affect includes 4 items, such as feeling as good as other kids, feeling happy, and having a good time. The possible range of scores is 0–60, with higher scores indicating more symptomatology of depression. Some items were reverse coded. We used the adapted and translated Chinese version (Chien & Cheng, 1985). Cronbach alpha was 0.85 from this study sample.

### 2.6. Analytic strategy

Independent *t*-tests were conducted to compare differences between the LST (experimental) group and the EAU (control) group in scores on emotion regulation and mental health development. Two-way ANOVAs were conducted to examine the main effects of LST and gender on the dependent variables. The interaction between gender and LST indicated potential gender differences between conditions. Bonferroni multiple comparison corrections were applied when multiple statistical procedures were performed on the CES-DC subscales. The missing cases for each dependent variable were less than 5% and these missing cases were list-wise deleted. The alpha level for significance was set at 0.05.

## 3. Results

### 3.1. Demographic and posttest measures

A total of 2522 students were included in the analyses: 1288 (53%) were in the EAU group, and 1234 (49%) were in the LST group. All participants were recruited and received LST training in fifth grade and then finished the LST evaluation in sixth grade. There were 1288 students in the EAU group and 681 (52.9%) were males; 1234 students were in the intervention group and 664 (53.9%) were males. No significant differences were found between the LST and EAU groups on age, gender, or family economic status. A chi-square test showed the proportions of males and females did not differ by group,  $\chi^2(1, N = 2522) = 0.26, p = .63$ . Family economic status was measured by a question asking students whether their family has enough money (1–10 points). There was no significant difference in the scores for the EAU

**Table 1**

Posttest differences between the EAU and LST groups for males and females on emotional regulation and depression measures.

Outcomes	EAU			LST			df	t
	N	M	SD	N	M	SD		
<i>Cognitive Reappraisal</i>								
Total	1288	29.64	7.77	1234	30.47	7.64	2518	2.72**
Female	607	30.11	7.20	569	30.49	7.30	1167	0.90
Male	681	29.21	8.22	665	30.45	7.93	1344	2.81**
<i>Expressive Suppression</i>								
Total	1288	16.65	5.21	1234	16.45	5.21	2515	-0.97
Female	607	16.81	5.05	569	16.57	4.99	1171	-0.81
Male	681	16.51	5.34	665	16.34	5.40	1342	-0.56
<i>CES-DC full scale</i>								
Total	1288	11.72	8.62	1234	11.24	8.27	2520	-1.42
Female	607	11.80	8.00	569	12.12	9.03	1135	0.63
Male	681	11.64	9.14	665	10.49	7.47	1344	-2.52**
<i>Depressed Affect</i>								
Total	1288	2.87	4.22	1234	2.72	3.98	2519	-0.97
Female	607	3.06	4.04	569	3.38	4.46	1144	1.29
Male	681	2.71	4.37	665	2.14	3.43	1344	-2.62**
<i>Somatic Complaints</i>								
Total	1288	2.21	2.90	1234	2.16	2.71	2519	-0.40
Female	607	2.04	2.51	569	2.26	2.74	1174	1.46
Male	681	2.36	3.20	665	2.08	2.69	1344	-1.74
<i>Interpersonal Problems</i>								
Total	1288	0.77	1.37	1234	0.73	1.27	2518	-0.84
Female	607	0.80	1.31	569	0.85	1.35	1163	0.75
Male	681	0.75	1.41	665	0.62	1.20	1344	-1.83
<i>Absence of Positive Affect</i>								
Total	1288	6.14	3.34	1234	6.37	3.31	2517	1.73
Female	607	6.09	3.17	569	6.37	3.17	1169	1.55
Male	681	6.18	3.49	665	6.35	3.43	1344	0.94

\**p* < .05. \*\**p* < .01.

(*M* = 3.79, *SD* = 1.07) and intervention groups (*M* = 3.81, *SD* = 1.04); *t*(2520) = -0.57, *p* = .57.

As shown in Table 1, for the posttest measures, students in the LST group scored significantly higher on cognitive reappraisal (*M* = 30.47, *SD* = 7.64) than the EAU group (*M* = 29.64, *SD* = 7.77); this was especially true for boys. Boys in the LST group had significantly lower total CES-DC scores and lower Depressed Affect scores (*M* = 10.49, *SD* = 7.47; *M* = 2.14, *SD* = 3.43, respectively) than those in the EAU group (*M* = 11.64, *SD* = 9.14; *M* = 2.71, *SD* = 4.37, respectively).

### 3.2. Effects of life skills training

Results from the two-way ANOVAs show a significant intervention effect of LST on Cognitive Reappraisal, *F*(1,2518) = 6.92, *p* < .01, but not on Expressive Suppression (Table 2). Post hoc analyses using Tukey’s HSD indicate that students who received LST had higher Cognitive Reappraisal scores (*M* = 30.47, *SD* = 7.64) than students who received EAU (*M* = 29.64, *SD* = 7.77). There was a significant main effect of gender on total CES-DC scores, *F*(1, 2518) = 7.16, *p* < .01, but no significant main effect of LST on these scores. However, there was a significant interaction between LST and gender, *F*(1, 2518) = 4.74, *p* < .05.

#### 3.2.1. Effects of gender

There were significant main effects of gender on the full CES-DC scores, *F*(1,2518) = 7.16, *p* < .01 as well as on two of the four CES-DC subscales: Depressed Affect, *F*(1, 2518) = 23.91, *p* < .01, and Interpersonal Problems, *F*(1, 2518) = 7.69, *p* < .01. A significant interaction between LST and gender was observed for total CES-DC, *F*(1,2518) = 4.74, *p* < .05 and Depressed Affect, *F*(1, 2518) = 7.32, *p* < .05. These results show that the effects of LST on students’

**Table 2**  
Two-way ANOVAs for the effectiveness of LST compared to EAU on emotional regulation and depression.

Source of variance	SS	df	MS	F	p	Post hoc <sup>a</sup>
<i>Cognitive Reappraisal</i>						
Gender	139.58	1	139.58	2.35	0.125	NS
LST	410.71	1	410.71	6.92**	0.009	LST > EAU
Gender × LST	115.45	1	115.45	1.95	0.163	NS
Error	149374.17	2518				
Total	150072.84	2521				
<i>Expressive Suppression</i>						
Gender	42.30	1	42.30	1.56	0.212	NS
LST	25.48	1	25.48	0.93	0.333	NS
Gender × LST	0.83	1	0.83	0.03	0.861	NS
Error	68335.03	2518				
Total	68404.10	2521				
<i>CES-DC</i>						
Gender	509.15	1	509.15	7.16**	0.008	F > M
LST	109.21	1	109.21	1.54	0.215	NS
Gender × LST	336.85	1	336.85	4.74*	0.030	
Error	179063.34	2518				
Total	180033.69	2521				
<i>Depressed Affect</i>						
Gender	398.95	1	398.95	23.91***	less than 0.001	F > M
LST	9.14	1	9.14	0.55	0.459	NS
Gender × LST	122.11	1	122.11	7.32*	0.004	
Error	42009.50	2518				
Total	42536.65	2521				
<i>Somatic Complaints</i>						
Gender	3.061	1	3.06	0.39	0.533	NS
LST	0.493	1	0.49	0.06	0.802	NS
Gender × LST	39.838	1	39.84	5.06	0.025	NS
Error	19835.74	2518				
Total	19880.41	2521				
<i>Interpersonal Problems</i>						
Gender	13.39	1	13.39	7.70**	0.006	F > M
LST	0.82	1	0.82	0.47	0.492	NS
Gender × LST	5.63	1	5.63	3.23	0.072	NS
Error	4682.76	2518				
Total	4402.62	2521				
<i>Positive Affect</i>						
Gender	0.46	1	0.463	0.04	0.838	NS
LST	33.85	1	33.85	3.06	0.081	NS
Gender × LST	1.91	1	1.91	0.17	0.678	NS
Error	27904.69	2518				
Total	27940.12	2521				

<sup>a</sup> Tukey's HSD.

depressive symptoms and depressed affect depended on their gender (see Table 2). Specifically, the LST intervention results show that male students scored significant lower on CES-DC and Depressed Affect after receiving the training (Table 1); in other words, LST helped to decrease symptoms of depression only among male students (see Table 2).

#### 4. Discussion

In this study, we examined the preliminary effectiveness of an LST program, modified according to the characteristics of school setting and social-cultural context in Taiwan, for elementary school (5th and 6th grade) students. The intervention was innovative in that LST was modified to fit the age-appropriate life experience of Taiwanese elementary school children in the collectivist Chinese culture. Results partially supported the hypothesis that LST can enhance children's emotional regulation and lower children's depressive symptoms, compared to students who receive education as usual. The hypothesis of gender differences in program effectiveness was also partially supported. To be specific, results indicate that the adapted LST program effectively helped both female and male adolescents develop cognitive reappraisal ability, but only male adolescents reported lower depressive symptoms after participating in the program. The different results for

male and female adolescents suggest the need for gender-responsive interventions.

The findings that students as young as 10 years old in this study can benefit from the modified LST program is consistent with Botvin and colleagues' empirical study demonstrating LST effectiveness in reducing substance use and increasing self-esteem in elementary school students (Botvin et al., 2003). Another longitudinal empirical study found that LST enhanced self-esteem and lowered social anxiety in middle school students (Botvin, Baker, Dusenbury, Tortu, & Botvin, 1990). Huang et al. (2019) also found that middle school students showed increased refusal skills, assertiveness, and self-control after participating in an LST program. Our study findings add to the literature that LST can improve cognitive reappraisal in elementary school children.

This is particularly encouraging since cognitive reappraisal has been identified as a promising strategy for regulating emotion (Mayer, Salovey, Salovey, & Sluyter, 1997) but it is not present in the academically-concentrated curriculum in Taiwan. An emotionally aware individual is able to label the emotion and recognize the chain from emotion to action (Mayer et al., 1997). Our modified LST curriculum includes scenarios that are highly relevant to Taiwanese life experiences and teach students reframing strategies through challenging their original perceptions and encouraging them to evaluate the pros and cons

of their reactions to certain events. These role play and small-group discussions can help participants raise their emotional awareness and reframe their emotions. According to Gross and John (2003), cognitive reappraisal encourages children to recognize their emotions and to learn skills to reframe the initial perception of an event and alter the emotional stimulus before activation of an emotional response. Whereas Chinese teachings emphasize restriction of emotion in children (Chao, 1994; Chen et al., 2000), cognitive reappraisal sessions helped our participants become more aware of their emotion and the following impacts and may potentially prevent mental distress (Eastabrook, Flynn, & Hollenstein, 2014; Lanteigne, Flynn, Eastabrook, & Hollenstein, 2014).

The nonsignificant finding on expressive suppression should be interpreted differently than comparable findings from research in Western societies. Reducing expressive suppression is a desirable outcome in Western societies, where accumulating research suggests that expressive suppression is a costly coping strategy and is associated with negative psychological outcomes (Betts, Gullone, & Allen, 2009; Gross, 2014) and impaired interpersonal communication (Butler et al., 2003). On the other hand, a study in Taiwan suggests the benefits of activating both cognitive reappraisal and expressive suppression in children (Yeh et al., 2017). In a social context that values obedience, emotion suppression is important for maintaining relationships and may be more socially appropriate than expressing emotion. Many East Asian countries, namely, Taiwan, Japan, Korea, and China, share a social context that encourages emotion suppression rather than emotion expression as a way to harmoniously handle interpersonal conflicts (Matsumoto, Yoo, & Nakagawa, 2008); for instance, Huang et al. (2019) unexpectedly found an association in adolescents between assertiveness and greater mental health distress, suggesting that assertiveness in contrast to obedience and may create interpersonal conflicts. Therefore, cross-cultural program evaluation and adaptation of programs developed in Western countries are necessary to accommodate the characteristics and social norms of the East Asian social-cultural context. The adaptive LST program employed in the current study equips adolescents with cognitive reappraisal skills that are ignored in regular education. It can diversify children's emotional regulation strategies in conjunction with cognitive reappraisal and expressive suppression. East Asian countries that share similar social-cultural contexts and educational approaches with Taiwan can use the adaptive LST program employed in the current study to inform their program development.

The gender differences found in this study indicate that LST can be of help in lowering depressive symptoms, but only among boys. This finding implies that the risk factors relevant to male adolescent depressive symptoms can be mitigated through the development of better life skills, such as emotional regulation, problem-solving, assertiveness, and communication skills. The nonsignificant outcomes for girls call for further exploration of coping strategies as a function of gender. Biologically, girls applied more emotional than cognitive processes under stressful situations (Whittle et al., 2011) and males' mechanism lessen their emotional reactions faster than females (Williams et al., 2005). Natsuaki et al. (2009) likewise found that interpersonal challenges have stronger impact on girls than boys. In other studies, the researchers found that female adolescents used more social support to cope with stress than male adolescents, but social-support seeking was positively associated with internalizing problems for girls, but not for boys (Brittian et al., 2013; Wu & Lee, 2020). Grant (2000) also found that avoidance is a helpful stress-coping strategy for boys but is detrimental for girls. These findings indicate that although boys and girls apply the same coping strategies, differences in mechanisms and patterns lead to different mental health profiles. A more sophisticated processing perspective is necessary when examining the effects of life-skills training by gender.

For instance, a recent study distinguished adaptive and maladaptive elements in rumination and the authors suggesting interventions to reduce brooding and develop active self-reflection (Burwell & Shirk,

2006). Further examination of coping strategies and the processes can provide information for future LST program development to fulfill the aims of a gender-responsive curriculum.

## 5. Strengths and limitations

To our knowledge, our study is the first in East Asia to implement LST on a large scale, utilizing 39 elementary schools with more than 2500 participants in elementary schools. The strength of this study is not only that we employed a collaborative work model that involved authorities, researchers, teachers, and students, but also that we addressed issues involving administration, cultural influences, and the current life experiences of elementary school students. We worked closely with teachers and school authorities to modify the original LST curriculum and delivery process by adapting characteristics of class/school size, student-teacher ratio, and the socio-cultural context in Taiwan. Another strength is that we were aware of potential implementation fidelity, so we required the teachers to attend LST workshops as well as report their teaching and student homework every month so we could give feedback.

This study has several limitations that should be noted. First, the outcomes relied on self-report data, which may have contributed to social desirability response bias. However, the outcomes on emotion regulation and depressive symptoms may not have been associated with social desirability bias as much as with substance use or externalizing problems. Second, the EAU group received lectures on emotional regulation, which may have created background effects on the study outcomes leading to a small effect size. However, in the EAU condition there was no skills practice or class activities, thus the weak but significant effects potentially indicate the effectiveness of interactive teaching. Third, although we have confidence in our randomization procedure and fidelity in implementation, the posttest-only study design lacked internal validity control. Additional research is needed to determine the effectiveness of this prevention program.

### 5.1. Conclusions

We successfully collaborated with school authorities and teachers to modify Botvin LST program with respect to education characteristics as well as children's life experiences in the relationship-oriented social-cultural context of Taiwan. The results of employing this modified LST program demonstrate the effectiveness of enabling children in the 5th and 6th grades to recognize their emotional reactions and reframe these reactions in positive and socially appropriate ways. The study's results should awaken educational authorities to the need for learning by doing and thus influence elementary education through pedagogy. The study findings, with a large sample size and randomization, are encouraging and may be applicable to other East-Asian countries that have a similar education system and social-cultural context to Taiwan.

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### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.childyouth.2020.105464>.

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