CrossMark

Examining the Mediating Roles of Strengths Knowledge and Strengths Use in a 1-Year Single-Session Character Strength-Based Cognitive Intervention

Wenjie Duan[1,2] · **He Bu**[2,3] · **Jinli Zhao**[2] · **Xiaolong Guo**[2]

Abstract

Character strength-based interventions are an effective positive psychology approach in increasing happiness and reducing depression. However, little is known about whether the character strength-based interventions remain effective over an extended time period of 1 year, and why these activities (e.g., *Identifying signature strengths* and *Using signature strengths in a new way*) work. To address these issues, a 1-year randomized controlled intervention was conducted to examine the serial mediating role of strengths knowledge and strengths use. A hundred first-year students were randomly assigned into the intervention and the waiting-list control groups. The intervention group participated in four activities within a 90-min course and was encouraged to continue self-practice of the strengths-related activities after the intervention period. Immediate, short-term (i.e., 1 week), and long-term (i.e., 1 year) effectiveness were examined. Participants in the intervention group showed significant increase in thriving and decrease in negative emotional symptoms in the short term, but no effect was found for the control group. The long-term effects of thriving and negative emotional symptoms were insignificant for two experimental groups. Strengths use partially mediated the effectiveness of the intervention, but strengths knowledge did not significantly predict the outcomes. In conclusion, the character strength-based intervention can be an effective approach to improve the mental health of the first-year students. More attention should be paid to strengths use when practitioners design a character strength-based intervention.

Keywords Positive psychology · Character strength · Long-term effects · Strengths knowledge · Strengths use · Mediator

✉ Wenjie Duan
   duan.w@outlook.com

1   Pedagogy of Life & Practice Institute, Wuhan University, Wuhan, China

2   Wuhan University, Wuhan, China

3   City University of Hong Kong, Hong Kong, China

Ⓢ Springer

1 Introduction

Character strength is defined as a family of widely-valued positive traits for feeling, thinking and behaving with the purpose of achieving fulfillment and happiness (Quinlan et al. 2012; Peterson and Seligman 2004). The main strategies of character strength-based interventions involve the identifying and applying of an individual's signature strengths (Seligman et al. 2005). As a widely-used positive psychology approach, character strength-based interventions can reliably promote wellbeing and reduce negative emotions. For example, Duan et al. (2014) conducted a character strength-based intervention to promote life satisfaction among Chinese undergraduates. Results showed significant increase in life satisfaction of participants at both short-term (9-week) and long-term (18-week) follow-up tests. Proyer et al. (2015a) found that both using signature strengths and using lesser strengths can increase happiness at the post-measure as well as at the 3-month follow-up. Wellenzohn et al. (2016) designed an *applying humor* intervention and found that this intervention is effective in enhancing happiness for up to 6 months and was also effective for reducing depression during the 1-month follow-up. Proyer et al. (2014) found that the *Using signature strengths in a new way* strategy was associated with an increase in happiness in 6-month follow-up test. Overall, many empirical studies supported that character-strength-interventions indicate desirable short- and long-term effects on increasing happiness and reducing negative emotions. However, little is known about whether the character strength-based interventions remain effective over an extended time period of 1 year, and why these activities (e.g., *Identifying signature strengths* and *Using signature strengths in a new way*) work.

Previous studies indicated that participants' continued self-practice after intervention period is a critical factor that causes the long-term effectiveness. Seligman et al. (2005) suggested participants' adherence to intervention and continued exercises mediates the positive outcomes at follow-up tests. Proyer et al. (2015b) also demonstrated that continued self-practice predicts the increases in happiness and decreases in depressive symptoms 3.5 years after completing the intervention. Therefore, participants who spontaneously engaged in the intervention activities beyond the required intervention period can continue to benefit from the intervention activities (Seligman et al. 2005). Although the character strength-based intervention is time-limited and defined, it allows participants to make behavioral changes on their own which can lead to sustainable changes in outcomes. Expecting that the character strength-based intervention remains effective 1 year later is realistic. This study reported short—(i.e., 1 week) and long-term (i.e., 1 year) follow-up tests of participants from a successful single-session character strength-based cognitive (SCBC) intervention (Duan and Bu 2017b). We encouraged participants to continue the self-practice of intervention activities after the intervention so that we could examine the long-term effectiveness of the character strength-based intervention.

Another critical topic is the mechanism by which the character strength-based intervention works. After demonstrating the effectiveness of character strength-based interventions, some researchers have already started to ask "How does intervention work?" rather than "Does intervention work?" (Linley et al. 2010). Existing studies used *Strengths Knowledge* and *Strengths Use* as possible active ingredients of the character strength-based intervention. Strengths knowledge refers to the "awareness and recognition of one's strengths" (Govindji and Linley 2007), whereas strengths use refers to the extent to which people "use their strengths in a variety of settings". Niemiec (2013) concluded an "Aware-Explore-Apply" model of character strength-based intervention.

Basically, three steps are used in character strength-based intervention: (1) An instructor helps clients become increasingly aware of their existing character strengths; (2) the instructor assists clients to dig deep in exploring their strengths; (3) The participants apply an action plan or goal targeted to improve a particular strength. The model shows that identifying strengths serves as a "launching point" (Shankland and Rosset 2017) for the other strength-based activities. Strengths knowledge likely functions as a necessary pre-condition for strengths use. Previous studies showed that both strengths knowledge and strengths use are significantly associated with each other and with wellbeing (Govindji and Linley 2007). A pilot study ($N = 18$) showed that raising awareness of strengths and using strengths produced significant increases in psychological wellbeing and engagement (Minhas 2010; Govindji and Linley 2007). Another intervention helps students elevate their life satisfaction by developing strengths knowledge, identifying their own strengths and spotting others' strengths (Proctor et al. 2011). A later study demonstrated that self-determination theory and goal theory can possibly explain the mechanisms of strength-based interventions (Quinlan et al. 2012). Self-determination theory holds that strengths knowledge and strengths use can satisfy an individual's psychological needs, raise self-motivation and enhance engagement and well-being (Quinlan et al. 2012; Ryan and Deci 2000). Goal theory indicates that valued goal-setting can encourage strengths use (Quinlan et al. 2012). However, these studies did not sufficiently distinguish the role of strengths knowledge and strengths use in different stages of character strength-based interventions (i.e., identifying one's strengths vs. using one's strengths).

The Cognitive Behavioral Therapy (CBT) terms may provide an alternative perspective to understand the mechanisms of character strength-based interventions. CBT is a problem-focused and action-oriented therapy aiming at helping participants change maladaptive cognitions (e.g., thoughts, beliefs, and attitudes), developing enduring skills, and then causing changes in behaviors (Karwoski et al. 2006; Schacter et al. 2010). The CBT model uses six phases: (1) psychological assessment, (2) reconceptualization, (3) skills acquisition, (4) skills consolidation and application training, (5) generalization and maintenance, and (6) post-treatment assessment follow-up (Gatchel and Rollings 2008). The process of character strength-based intervention is in accordance with the CBT model. The activities of character strength-based intervention reflect the CBT core contents and skills (e.g. cognitive restructuring, setting goals, and scheduling pleasant activities). For example, a single-session Character strength-based Cognitive Intervention (Duan and Bu 2017b) clearly divides the intervention into two successive but separated sections (i.e., cognition section and behavior section). The first section assists participants in promoting cognition of their own character strengths and the second one focuses on using character strengths in their daily life. The results demonstrated that the intervention helps first-year students promote wellbeing and alleviate negative affect (Duan and Bu 2017b). Both interventions highlights the effectiveness of cognition and behavior during the process. It can be found that character strength-based intervention and CBT share some conceptual and technical overlap.

The current study aimed at examining the 1-year long-term effectiveness of the SCBC intervention and the mechanisms by which it worked. Based on the preceding rationale and previous findings, we further hypothesized that the effectiveness of this intervention on outcomes were sequentially mediated by strengths knowledge and strengths use. The results can shed light on potential mechanisms of character strength-based interventions. The results will help researchers and practitioners obtain an improved understanding of the maintenance and mechanisms of the intervention. This study will also offer a compelling rationale to conduct quality interventions in an academic setting.

2 Method

2.1 Participants

A power analysis was performed to determine the sample size needed to assess the effect of the intervention. A previous meta-analysis of positive psychology interventions (PPIs) indicates that medium-sized effects are observed for wellbeing ($r = 0.29$) and depression ($r = 0.31$) (Sin and Lyubomirsky 2009). Thus, the total sample should consist of at least 98 participants who complete four measurements with an alpha of 0.05 and a power of 0.80.

Participants were 100 first-year students [age: $M = 18.12$, $SD = 0.72$, $F(1, 98) = 1.70$, $p = 0.20$; gender ratio: $\chi(1, N = 100) = 0.04$, $p = 0.84$] from Wuhan University, China, majoring in sociology. All participants were in good health without severe psychotic symptoms or substance abuse and had not taken part in any other similar interventions before they volunteered for this intervention. All participants were single and lived on campus. Computerized random number generators were used to assign participants to the intervention group (IG) and waiting-list control group (CG). All students were asked to take pre-test, post-test, as well as 1-week and 1-year follow-up tests, but 24% of students dropped out during the intervention period. Thus, the total sample used to perform mediation analysis were 76 first-year students (37 for IG, 39 for CG). No age and gender differences were found between IG and CG [age: $M = 18.22$, $SD = 0.65$, $F(1, 74) = 0.17$, $p = 0.25$; gender ratio: $\chi(1, N = 76) = 3.37$, $p = 0.07$]. One-year follow-up data of the 38 participants were collected (19 for each group) to test for long-term effectiveness. No age and gender differences were found between the IG and CG [age: $M = 18.29$, $SD = 0.61$, $F(1, 36) = 0.67$, $p = 0.43$; gender ratio: $\chi(1, N = 38) = 0.95$, $p = 0.33$]. Ethics approval was provided by Wuhan University. Figure 1 illustrated the flow chart of the intervention.

2.2 Procedures

Full details of the procedures and methods of the randomized trial can be found in Duan and Bu (2017b). A brief description is provided in this study. One week before the intervention, participants were asked to take a baseline test and completed an inventory to assess character strengths (i.e. Chinese Virtues Questionnaire and a short Three-dimensional Inventory of Character Strengths) (Duan and Bu 2017a; Duan et al. 2012). This pre-test could be considered as the psychological assessment phrase of the CBT model.

The intervention was a 90-min course including four parts. The first part was called *Identifying Character Strengths* (Duan and Bu 2017b). In this part, the instructor introduced the definition and meaning of each character strength, so that participants would develop their cognition and knowledge of character strengths. The second part was called *Character Strengths* 360° (Duan and Bu 2017b), during which participants identified their top five strengths with the help of outside observers. In the third part (i.e., *Signature Character Strengths*) (Duan and Bu 2017b), the individualized report of the inventory results was provided to participants. On the basis of the first parts and their individualized reports, participants were asked to choose one or two strengths as their signature strengths. In the fourth part (i.e., *Nominate Goals*) (Duan and Bu 2017b), the instructor introduced activities that students could conduct in their daily life to consolidate their character strengths. Then they were asked to set goals and chose activities related to their signature strengths. The 90-min course could be regard as a cognition stage. The course focused on individual character strengths exploitation and aimed at assisting participants in setting goals and
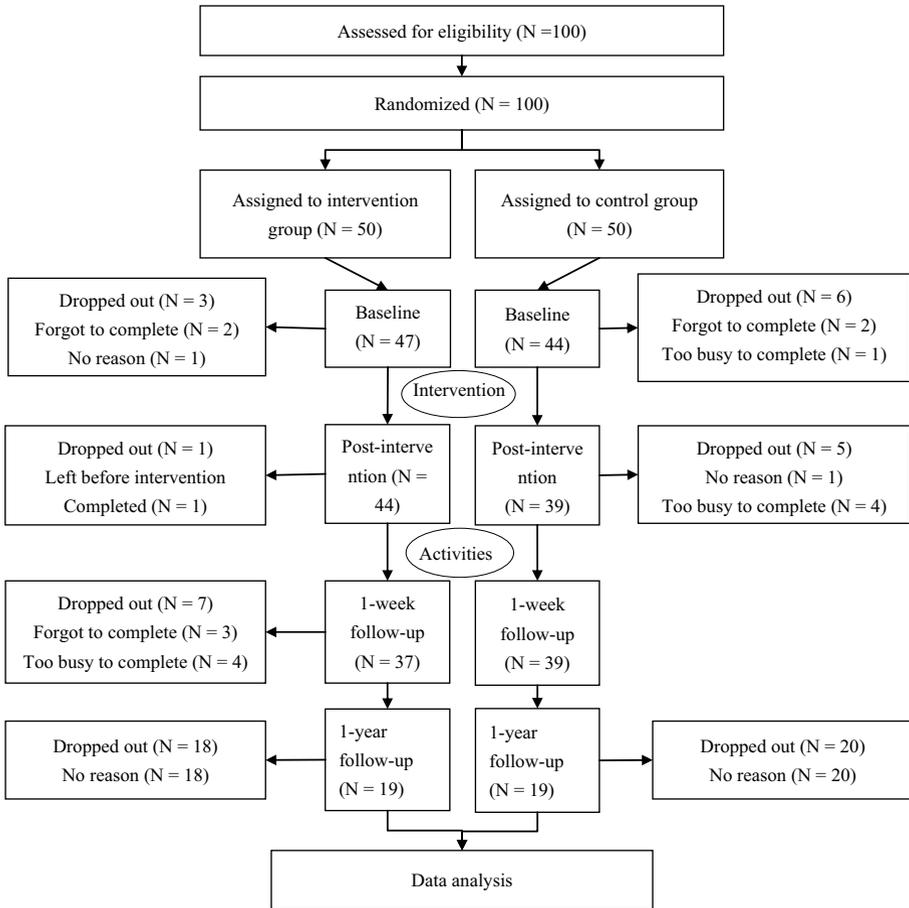
Fig. 1 Flow chart of the intervention procedure

structuring daily activities. This stage reflected the reconceptualization and skills acquisition phrases of the CBT model.

At the end of the course, participants took the post-test immediately, and they were asked to use their signature strengths for 1 week. In the following week, they were free to ask the instructor if they had any questions about their activities. The following week was the behavioral stage, during which students implemented activities and fulfilled their goals. The behavioral stage reflected the fourth and fifth phrases of the CBT model (i.e. skills consolidation and application training, and generalization and maintenance). After they completed the 1-week follow-up test, the students were also encouraged to continue the activities in their daily life. The post-test and follow-up test could be taken as the post-treatment assessment follow-up phrase of CBT model.

Students in the CG did not participate in the 90-min course, nor did they engage in any other similar intervention. They were told that they would participate in the intervention next year. They continued on their routine courses and engaged in the normal activities offered by the school. The school counselor communicated with all students in both

groups regularly to track their psychological conditions. The intervention was conducted by a properly trained social work student with practical experiences in running group work and PPIs. The instructor followed the intervention protocol to ensure the intervention sufficiency. The entire intervention was supervised by the first author, an associate professor specializing in character strengths and positive psychology.

2.3 Measures

2.3.1 Strengths Knowledge and Strengths Use

Strengths Knowledge Scale (SKS) and Strengths Use Scale (SUS) were employed to measure the awareness and use of participants' character strengths (Govindji and Linley 2007). The 8-item SKS (e.g., "I know when I am at my best") and 14-item SUS (e.g., "I always try to use my strengths") are in form of a 7-point Likert scale ranging from strongly disagree to strongly agree. Both SKS (Cronbach's alpha = 0.89) and SUS (Cronbach's alpha = 0.95) exhibited a high internal consistency (Govindji and Linley 2007). The Chinese version excluded an item from the original version of SKS because that item (i.e., "I have to think hard about what my strengths are") indicated insignificant loading on the strengths knowledge factor (loading = − 0.007) (Duan et al. 2017). The 7-item SKS and 14-item SUS also showed good psychometric characteristics (internal consistency reliability for the SKS [ω = 0.925] and SUS [ω = 0.959]) (Duan et al. 2017). In the present study, the Cronbach's alphas of SKS and SUS were more than 0.86 and 0.83, respectively.

2.4 Thriving

Brief Inventory of Thriving (BIT) was used to evaluate the level of thriving, a concept of comprehensive wellbeing (Su et al. 2014). This 10-item (e.g., "What I do in life is valuable and worthwhile") self-report scale is in form of a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The total score of all items represents the level of thriving. A high score means a high level of thriving. BIT showed a good internal consistency coefficient (more than 0.90) (Su et al., 2014), and the Chinese version also exhibited good psychometric characteristics (Cronbach's alphas > 0.85) (Duan et al. 2016). In the present study, the Cronbach's alpha was more than 0.83.

2.5 Negative Emotional Symptoms

Depression Anxiety Stress Scale of 21-items (DASS-21) (Lovibond and Lovibond 1995b) is a self-report measure 1-week state negative emotions. Each item is in the form of a 4-point Likert scale (0 = did not apply to me at all, 3 = applied to me very much). This scale consists of three 7-item subscales, which assess the depression, anxiety and stress symptom (e.g., "I couldn't seem to experience any positive feeling at all"). The DASS manual suggests that adding the three DASS scores is a possible and sensible means to generate a composite measure of negative emotional symptoms (Lovibond and Lovibond 1995a). The factor structure of the subscales are stable, and they show good psychometric characteristics (0.82 for depression, 0.90 for anxiety, and 0.83 for stress) (Henry and Crawford 2005). The Chinese version among the college population also indicates high internal consistency (0.83, 0.80, and 0.82 for the depression, anxiety, and stress subscales, respectively) (Wang

et al. 2015). In the present study, the Cronbach's alpha of the composite DASS scale and all subscales was more than 0.83.

3 Results

3.1 Long-Term Effectiveness of the Intervention

A total sample of 38 participants was employed to test the effectiveness of the intervention. Means and standard deviations for thriving and negative emotional symptoms at pre-(T1), post- (T2), and 1-week follow-up (T3) tests were listed in Table 1. Repeated-measures analyses were performed with thriving and negative emotional symptoms set as dependent variables at the four time points (with-subject factor) and two groups as the between-subject factor (Table 1). Post-hoc tests were used to estimate specific between-group differences. A series of paired sample t-tests were conducted for testing specific within-group differences separately for the IG and CG. The significance level was set at $p < 0.05$, and the measure of effect size was partial eta-squared (η_p^2).

For *thriving*, the thriving level of the IG increased after the intervention but decreased after 1 year, whereas the thriving level of the CG stayed relatively stable and at a lower level than the IG (Fig. 2). Repeated-measures analyses showed a substantial effect for group [$F (1, 36) = 4.46$, $p = 0.04$, $\eta_p^2 = 0.02$], suggesting that the thriving of the IG changed more significantly than that of the CG. The post hoc test indicated significant differences between the experimental conditions at post-test [$F (1, 36) = 10.71$, $p = 0.002$, $\eta_p^2 = 0.23$] and 1-week follow-up test [$F (1, 36) = 5.08$, $p = 0.03$, $\eta_p^2 = 0.13$] but no significant differences between the experimental conditions in 1-year follow-up test [$F (1, 36) = 0.61$, $p = 0.44$, $\eta_p^2 = 0.02$]. Repeated-measures analyses showed no significant effect for time [$F (1, 36) = 0.69$, $p = 0.56$, $\eta_p^2 = 0.02$], and the interaction between time and group [$F (1, 36) = 1.87$, $p = 0.14$, $\eta_p^2 = 0.05$] was also insignificant. Nevertheless, the results of paired sample t-tests revealed a significant effect for the IG, wherein participants in this group scored significantly higher on the thriving at T2 [$M = 3.90$, $SD = 0.47$, $t(18) = -3.73$, $p = 0.002$] and T3 [$M = 3.92$, $SD = 0.45$, $t(18) = -2.38$, $p = 0.03$] compared with T1 ($M = 3.70$, $SD = 0.47$). However, no significant results of t test on the thriving of the IG were found between T1 and T4 [$M = 3.66$, $SD = 0.46$, $t(18) = 0.49$, $p = 0.63$]. No significant difference was found for the CG on the thriving at T2 [$M = 3.47$, $SD = 0.39$, $t(18) = 0.99$, $p = 0.33$], T3 [$M = 3.44$, $SD = 0.46$, $t(18) = 0.82$, $p = 0.54$] and T4 [$M = 3.50$, $SD = 0.79$, $t(18) = 0.25$, $p = 0.80$] compared with T1 ($M = 3.55$, $SD = 0.44$). Overall, the results showed that this intervention had immediate and short-term effectiveness for promoting wellbeing of first-year students, but the effectiveness were not maintained for a long time.

For *negative emotional symptoms*, the negative emotional level of the IG declined after the intervention but increased to a higher level after 1 year. On the contrary, the negative emotional level of the CG was maintained at a higher level than the IG with fluctuations (Fig. 3). Repeated-measures analyses yielded a significant group effect [$F (1, 36) = 5.89$, $p = 0.02$, $\eta_p^2 = 0.14$], suggesting that the negative emotional symptoms of the IG changed more significantly than that of the CG. The post hoc test indicated a significant difference between the experimental conditions at post-test [$F (1, 36) = 0.47$, $p = 0.01$, $\eta_p^2 = 0.17$] and 1-week follow-up test [$F (1, 36) = 17.55$, $p < 0.01$, $\eta_p^2 = 0.33$] but no significant difference at 1-year follow-up test [$F (1, 36) = 0.05$, $p = 0.83$, $\eta_p^2 < 0.01$]. The results of repeated-measures analyses indicated that the interaction

Table 1 Descriptive statistics of the variables with effect size and repeated-measures analyses of the variables in experimental groups for intervention effectiveness analysis (N=38)

	Baseline		Posttest		1-week follow-up		1-year follow-up		Main time effect			Main group effect			Time×group interaction effect		
	M (SD)	d	M (SD)	d	M (SD)	d	M (SD)	d	F	η_p^2	$1-\beta$	F	η_p^2	$1-\beta$	F	η_p^2	$1-\beta$
Thriving																	
IG	3.70 (0.47)	0.33	3.90 (0.39)	1.10	3.92 (0.45)	1.05	3.66 (0.46)	0.25	0.69	0.02	0.50	4.64*	0.11	0.54	1.87	0.05	0.91
CG	3.55 (0.44)		3.47 (0.39)		3.44 (0.46)		3.50 (0.79)										
Negative emotional symptoms																	
IG	1.57 (0.32)	−0.38	1.42 (0.30)	−0.88	1.30 (0.31)	−1.36	1.71 (0.55)	−0.1	3.57*	0.09	0.74	5.89*	0.14	0.65	6.71**	0.16	0.96
CG	1.71 (0.41)		1.74 (0.42)		1.84 (0.47)		1.76 (0.50)										

Time = tests of within-subjects effects; Group = tests of between-subjects effects; Time×Group = the interaction effects between time and group
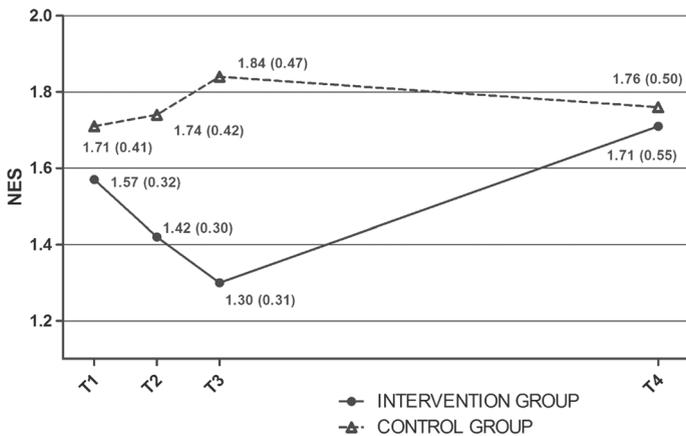
IG Intervention Group; *CG* Control Group

*$p < 0.05$

**$p < 0.01$
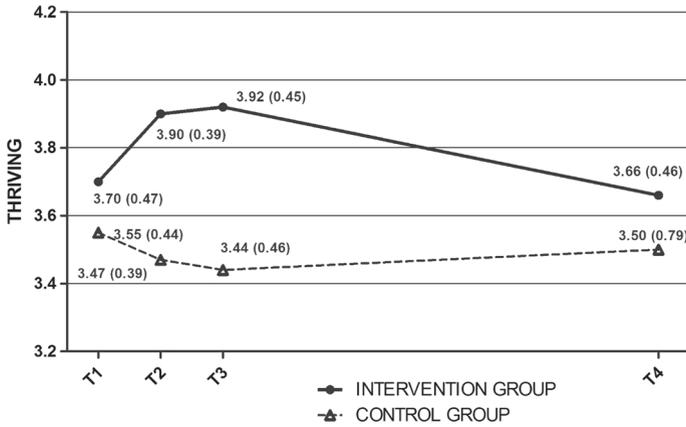
Fig. 2 Levels of thriving in the experimental conditions at the four time points. *Notes*: T1 = Pre-test T2 = post-intervention test; T3 = 1-week Follow-up test; T4 = 1-year Follow-up test

Fig. 3 Levels of negative emotional symptoms (NES) in the experimental conditions at the four time points. *Notes*: T1 = Pre-test T2 = post-intervention test; T3 = 1-week Follow-up test; T4 = 1-year Follow-up test

effect (Group × Time) [F (1, 36) = 6.71, $p < 0.01$, $\eta_p^2 = 0.16$] was also significant, suggesting that the changes in negative emotions in the IG significantly exceeded those in the CG during the intervention period. Repeated-measures analyses yielded a significant time effect [F (1, 36) = 3.57, $p = 0.02$, $\eta_p^2 = 0.09$] as well. The results of paired sample t-tests revealed a significant effect for the IG, wherein participants in this group scored significantly lower on the negative emotions at T2 [$M = 1.42$, $SD = 0.30$, $t(18) = 3.60$, $p = 0.002$] and T3 [$M = 1.30$, $SD = 0.31$, $t(18) = 5.07$, $p < 0.001$] compared with T1 ($M = 1.57$, $SD = 0.32$). However, no significant results of t test on the negative emotions of the IG were found between T1 and T4 [$M = 1.73$, $SD = 0.44$, $t(18) = -2.14$, $p = 0.05$]. No significant difference was found for the CG on the negative emotional symptoms at T2 [$M = 1.74$, $SD = 0.42$, $t(19) = 1.85$, $p = 0.07$], T3 [$M = 1.84$, $SD = 0.47$, $t(19) = 0.42$, $p = 0.68$] and T4 [$M = 1.76$, $SD = 0.50$, $t(18) = -0.56$, $p = 0.58$] in comparison with T1

($M = 1.71$, $SD = 0.41$). Overall, the results suggested that this intervention had a robust immediate and short-term effectiveness for ameliorating negative emotional symptoms of first-year students, but the effectiveness deteriorated over a long period.

3.2 Preliminary Analyses

Given that the intervention only indicated immediate and short-term effectiveness, mediation analysis was conducted based on data from T1 to T3. A total sample of 76 participants was employed to test the mediation effects of the intervention. Means and standard deviations for thriving, negative emotional symptoms, strengths knowledge, and strengths use at T1, T2, and T3 were listed in Table 2. The results of ANOVA indicated no significant difference in the pre-assessment variables between the two groups (Table 2). Following the above discussion, the intervention was made up of two stages; thus, we calculated changes in total strengths knowledge from T1 to T2 and changes in total strengths use from T1 to T3 (Table 3). These scores of changes were used to reflect the increment of strengths knowledge and strengths use in the cognitive and behavioral stages, respectively. We calculated Pearson correlation coefficients to examine the association among thriving (T3) and negative emotional symptoms (T3), changes in strengths knowledge (T1 to T2), and changes in strengths use (T1 to T3). The results demonstrated no significant correlation between changes in strengths knowledge and the outcomes (for thriving, $r = -0.004$, $p = 0.97$; for negative emotional symptoms, $r = -0.09$, $p = 0.44$). However, changes in strengths use were significantly correlated with the outcomes (for thriving, $r = 0.51$, $p < 0.01$; for negative emotional symptoms, $r = -0.45$, $p < 0.01$) (Table 3).

Table 2 Descriptive statistics of the variables with effect size and ANOVA for the baseline variables in intervention and control group for mediation analysis (N = 76)

	Baseline		Post-intervention		1-week follow-up		ANOVA for the baseline		
	M (SD)	d	M (SD)	d	M (SD)	d	F	p	η^2
Thriving									
IG	3.66 (0.43)	0.36	3.82 (0.49)	0.55	3.89 (0.51)	0.66	2.56	0.11	0.03
CG	3.50 (0.46)		3.57 (0.41)		3.50 (0.67)				
Negative emotional symptoms									
IG	1.66 (0.38)	−0.46	1.56 (0.38)	−0.46	1.38 (0.37)	−1.01	4.00	0.05	0.05
CG	1.86 (0.49)		1.73 (0.36)		1.83 (0.51)				
Strength knowledge									
IG	5.13 (0.75)	0.23	5.51 (0.62)	0.68	5.40 (0.68)	0.48	0.99	0.32	0.01
CG	4.97 (0.71)		5.10 (0.59)		4.99 (0.99)				
Strength use									
IG	4.82 (0.66)	0.30	5.10 (0.71)	0.48	5.24 (0.70)	0.96	1.56	0.22	0.02
CG	4.65 (0.48)		4.79 (0.58)		4.48 (0.87)				

IG Intervention Group, *CG* Control Group

Table 3 Changes between results on strengths knowledge and strengths use and pearson correlations (N = 76)

	M (SD)		d	1	2	3	4
	Intervention group	Control group					
1. Δ Strengths knowledge	0.38 (0.80)	0.13 (0.59)	0.36	1	0.23*	−0.004	0.09
2. Δ Strengths use	0.42 (0.78)	−0.17 (0.76)	0.77		1	0.51**	−0.45**
3. Thriving (T3)	3.99 (0.51)	3.43 (0.77)	0.86			1	−0.67**
4. Negative emotional symptoms (T3)	1.38 (0.37)	1.83 (0.51)	−1.01				1

T1 = Pre-test T2 = Post-intervention test; T3 = Follow-up test; ΔStrengths Knowledge = changes between results on strengths knowledge at T1 and results on strengths knowledge at T2; Δ Strengths use = changes between results on strengths use at T1 and results on strengths use at T3

*$p < 0.05$

**$p < 0.01$

3.3 Mediation Effects Analyses

The mediation effect was analyzed by the PROCESS program (Hayes 2013). We used Model 6 to estimate regression models to test the mediation and serial mediation effects. The significance level was set at $p < 0.05$, and the analysis was conducted with 5000 bootstrap samples. Considering the small sample size of this study, we adopted the percentile bootstrap CI for inference about the indirect effect, because its performance is relatively invulnerable to outliers (Creedon and Hayes 2015). We examined the significance of the direct, indirect, and total effects of the independent variable (group, i.e., intervention = 1 vs. control = 2) on the dependent variables (thriving and negative emotional symptoms at T3), via the proposed mediators (changes in strengths knowledge and strengths use).

For *thriving*, the total indirect effect was significant (Coeff. = −0.19, 95% CI: −0.40 to −0.04). Two paths of the indirect effect were insignificant, as follows: Group → Δstrengths knowledge → thriving (Coeff. = 0.03, 95% CI: −0.02 to 0.10); and Group → Δstrengths knowledge → Δstrengths use → thriving (Coeff. = −0.02, 95% CI: −0.07 to 0.01). By contrast, one path of the indirect effect was significant: Group → Δstrengths use → thriving (Coeff. = −0.20, 95% CI: −0.42 to −0.06). The direct effect of the intervention on thriving was insignificant (Coeff. = −0.20, 95% CI: −0.46 to 0.07, $p = 0.14$). The total effect of the intervention on thriving was significant (Coeff. = −0.39, 95% CI: −0.66 to −0.11, $p = 0.01$). Consequently, these results suggested that changes in strengths use could predict the promotion of thriving, but changes in strengths knowledge could not.

For *negative emotional symptoms*, the total indirect effect was insignificant (Coeff. = 0.10, 95% CI: −0.01 to 0.23). Two paths of the indirect effect were insignificant: Group → Δstrengths knowledge → NES (Coeff. = −0.04, 95% CI: −0.12 to 0.01); and Group → Δstrengths knowledge → Δstrengths use → NES (Coeff. = −0.01, 95% CI: −0.00 to 0.04). By contrast, one path of the indirect effect was significant: Group → Δstrengths use → NES (Coeff. = 0.13, 95% CI: 0.03–0.26). The direct effect of the intervention on thriving was significant (Coeff. = 0.35, 95% CI: 0.15–0.55, $p = 0.001$). The total effect of the intervention on thriving was significant (Coeff. = 0.45, 95% CI: 0.25–0.66, $p < 0.001$). Consequently, these results suggested that changes in strengths use could predict the reduction of negative emotional symptoms, but changes in strengths knowledge could not.

All the results suggested that strengths use was important in the total effect of the character strength-based intervention on thriving and negative emotional symptoms. The detailed models with coefficients of each path are presented in Fig. 4.

4 Discussion

The main aim of the present study was to estimate long-term effectiveness of a character strength-based intervention and the mediating role of strengths knowledge and strengths use on the SCBC intervention outcomes. The results showed that the SCBC intervention is an effective means for participants to improve wellbeing and reduce negative emotions. However, the effectiveness of this SCBC intervention may diminish in a long period. The results of mediation analysis partly confirmed our hypotheses that strengths use could mediate the effect of the promotion of thriving and reduction of negative affect after the behavioral stage. However, strengths knowledge did not indicate significant correlations with the outcomes.

Our findings shared the common viewpoints and results of many previous studies demonstrating that the short-term effects of character strength-based intervention are desirable. For instance, Proyer et al. (2016) conducted a self-administered online character strength-based intervention that addressed the appreciation of beauty and excellence on happiness and depression. They found short-term effects (1 month) for the intervention. Meyers and van Woerkom (2017) found that participating in a strength intervention created short-term increases in employee positive affect, but the effects deteriorate in the following month. The results also indicated that participants who engaged in self-practice activities benefit from them, without any instruction to do so. However, the effectiveness is not durable; it does not remain effective after 1 year. We believe that two main reasons explain this result. First, although we encouraged participants
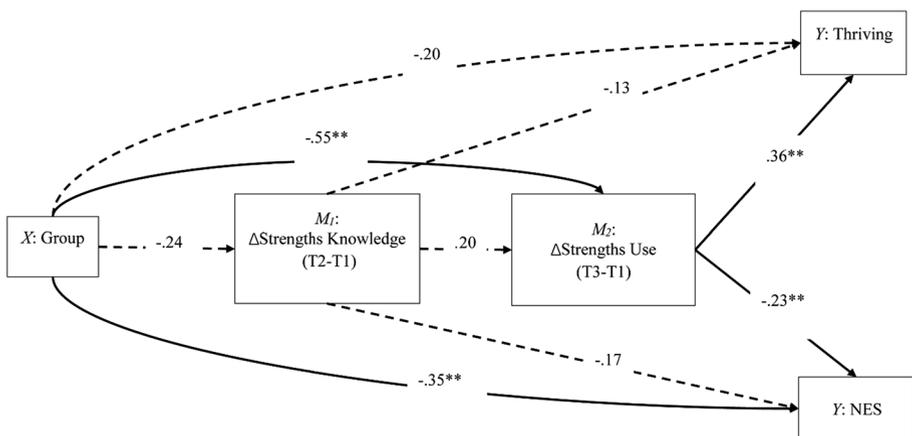
Fig. 4 The model of the intervention effect on thriving and negative emotional symptoms (NES) concerning the mediating role of strengths knowledge and strengths use with coefficients of each path. *Notes*: T1 = Pre-test T2 = Post-intervention test; T3 = 1-week Follow-up test; ΔStrengths Knowledge = changes between results on strengths knowledge at T1 and results on strengths knowledge at T2; ΔStrengths use = changes between results on strengths use at T1 and results on strengths use at T3; NES = negative emotional symptoms (i.e., depression, anxiety and stress). *p < 0.05; **p < 0.01

to continue intervention activities, we did not ask them whether they had indeed continued the activities for more than 1 week on their own. A few students might not use their strengths after the intervention, greatly affecting the level of strengths use and the long-term effectiveness. Another reason for the limited duration of effectiveness may lie in the interval of follow-up tests. Specifically, the test for long-term effectiveness was conducted 1 year after the intervention. During this period, participants could experience various good or bad experiences, which would affect their thriving and negative emotions. Future research over long periods should be conducted to find whether the character strength-based intervention is an enduring approach, and how the adherence to intervention influences effectiveness.

We found that strengths use mediated the effectiveness of the SCBC intervention, but strengths knowledge did not. Given that the CBT model merges the basic principles from behavioral and cognitive therapies (Beck 2011), some therapies are cognition oriented, whereas others are more behavior oriented. Character strength-based intervention is likely to be behavior oriented. A previous empirical study indicated that after character strength-based intervention, a remarkable increase in strengths use and life satisfaction is found but no difference in strengths knowledge (Dubreuil et al. 2016). Waters (2015) found that strengths use is a strong positive predictor of life satisfaction. Jach et al. (2017) also found that strengths use is a significant independent predictor of subjective wellbeing that partially mediates the relationship between strength-based parenting and subjective wellbeing. All these studies, as well as ours, have shown that strengths use is more important than strengths knowledge such that participants of character strength-based interventions benefited more from the use of strengths. However, for negative emotional symptoms, the upper bound of 95% CI of the sequent indirect path (i.e., Group → Δstrengths knowledge → Δstrengths use → NES) was nearly equal to 0 (95% CI: −0.00 to 0.04), at the edge of the threshold for significance, and strengths knowledge was significantly related to strengths use. Thus, although considerable studies focused on the "use" facet of character strengths, considering the role and function of strengths knowledge is valuable. The same cannot be said about identifying strengths and using strengths because strengths knowledge is "binary," whereas strengths use is "continual." Specifically, strengths use can be practiced and developed over time and therefore can be expected to deliver sustainable benefit. However, strengths knowledge can only move from "no strengths knowledge" to "having strengths knowledge" and therefore should be expected to deliver an initial benefit. Future studies can set strengths knowledge as a new binary variable to investigate the effectiveness of the intervention and whether changes of strengths knowledge mediate the effectiveness of the character strength-based intervention. Specifically, researchers can set "no strengths knowledge" ($SKS = 0$) at pretest and "having strengths knowledge" ($SKS = 1$) at posttest. Overall, more studies are needed to explore the role of strengths knowledge and dig deep into the interplay between strengths knowledge and strengths use.

Limitations of the present study should be considered. First, the accuracy of data may be affected by recall bias and exclusive use of self-reported data. Second, the sample size is a core limitation of the study. Although studies using moderate sample size and conducting meditation analysis were acceptable (for example, Rahimnia and Hassanzadeh (2013), which used a sample of 100 participants and Cortini et al. (2016), which used a sample of 61 participants), future research using more informant data and large sample will be more valuable. Third, all participants were university students, limiting the generalizability of the findings to other populations. Future research should replicate the present research findings with a more heterogeneous population. Fourth, many other factors are believed to affect the efficacy, such as warmth and empathy of the instructor (Driessen and Hollon

2010), duration and sufficiency of the intervention (Bloom 2001). Researchers should interpret the findings with caution.

Despite these limitations, the present study discussed two critical but significantly under-researched topic of character strength-based intervention. The findings offered an important addition to the literature on long-term effectiveness and mechanisms of character strength-based intervention. The findings provided an alternative perspective (i.e., the CBT model) to obtain a clear understanding of the stages of character strength-based interventions. Strengths use plays a mediating role in the intervention effect. Uncovering the interplay of the variables can assist the design of effective interventions. First, enhancing strengths use of participants should be regarded as a laudable goal of strength-based interventions. After raising strengths knowledge to participants, instructors should increase the time and effort to promoting strengths use. Second, CBT is action oriented (Schacter et al. 2010), implying that the ultimate goal of CBT is replacing an individual's maladaptive behaviors with adaptive ones (Gatchel and Rollings 2008) by changing the individual's unhelpful patterns of cognition, emotion, and behavior. Therefore, designing self-satisfying activities for participants and helping participants commit activities and skills of strengths use into habits and routines are crucial for a successful SCBC intervention. Finally, substantial evidence exists for the remarkable short-term effectiveness of single-session interventions. For example, previous studies showed that single-session interventions can positively affect depression of female college students (Sundstrom 1993), reduce the risk of anxiety and depression in adolescence (Schleider and Weisz 2016), and improve wellbeing and prevent depression in careers (Read et al. 2016). However, efficacy for now does not correspond to efficacy forever. Long-lasting effectiveness is challenged. Thus, a reliable approach for clinical use of the single-session model is to "take deliberate advantage of the social clinical leverage associated with the initial session by trying to establish and achieve its objectives within that session, while at the same time welcoming participants to return for additional brief episodes of treatment as needed" (Bloom 2001).

References

Beck, J. S. (2011). *Cognitive behavior therapy: Basics and beyond* (2nd ed.). New York: The Guilford Press.

Bloom, B. L. (2001). Focused single-session psychotherapy: A review of the clinical and research literature. *Brief Treatment and Crisis Intervention, 1*(1), 75–86. https://doi.org/10.1093/brief-treatment/1.1.75.

Cortini, M., Pivetti, M., & Cervai, S. (2016). Learning climate and job performance among health workers. A pilot study. *Frontiers in Psychology, 7*(1644), 1–6. https://doi.org/10.3389/fpsyg.2016.01644.

Creedon, P. J., & Hayes, A. F. (2015). *Small sample mediation analysis: How far can we push the bootstrap?* Paper presented at the Annual conference of the Association for Psychological Science, New York.

Driessen, E., & Hollon, S. D. (2010). Cognitive behavioral therapy for mood disorders: Efficacy, moderators and mediators. *Psychiatric Clinics of North America, 33*(3), 537–555. https://doi.org/10.1016/j.psc.2010.04.005.

Duan, W., & Bu, H. (2017a). Development and initial validation of a short three-dimensional inventory of character strengths. *Quality of Life Research, 26*(9), 1–13. https://doi.org/10.1007/s11136-017-1579-4.

Duan, W., & Bu, H. (2017b). Randomized trial investigating of a single-session character-strength-based cognitive intervention on freshman's adaptability. *Research on Social Work Practice*. https://doi.org/10.1177/1049731517699525.

Duan, W., Guan, Y., & Gan, F. (2016). Brief inventory of thriving: A comprehensive measurement of wellbeing. *Chinese Sociological Dialogue, 1*(1), 15–31. https://doi.org/10.1177/2397200916665230.

Duan, W., Ho, S. M. Y., Bai, Y., Tang, X., Zhang, Y., Li, T., et al. (2012). Factor structure of the chinese virtues questionnaire. *Research on Social Work Practice, 22*(6), 680–688. https://doi.org/10.1177/1049731512450074.

Duan, W., Ho, S. M. Y., Tang, X., Li, T., & Zhang, Y. (2014). Character strength-based intervention to promote satisfaction with life in the chinese university context. *Journal of Happiness Studies, 15*(6), 1347–1361. https://doi.org/10.1007/s10902-013-9479-y.

Duan, W., Li, J., & Mu, W. (2017). Psychometric characteristics of strengths knowledge scale and strengths use scale among adolescents. *Journal of Psychoeducational Assessment*. https://doi.org/10.1177/0734282917705593.

Dubreuil, P., Forest, J., Gillet, N., Fernet, C., Thibault-Landry, A., Crevier-Braud, L., et al. (2016). Facilitating well-being and performance through the development of strengths at work: Results from an intervention program. *International Journal of Applied Positive Psychology, 2016*(1), 1–19. https://doi.org/10.1007/s41042-016-0001-8.

Gatchel, R. J., & Rollings, K. H. (2008). Evidence-informed management of chronic low back pain with cognitive behavioral therapy. *The Spine Journal, 8*(1), 40–44. https://doi.org/10.1016/j.spine.2007.10.007.

Govindji, R., & Linley, P. A. (2007). Strengths use, self-concordance and well-being: Implications for strengths coaching and coaching psychologists. *International Coaching Psychology Review, 2*(2), 143–153.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (Methodology in the social sciences)*. New York: Guilford Press.

Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Psychology, 44*(2), 227–239. https://doi.org/10.1348/014466505X29657.

Jach, H. K., Sun, J., Loton, D., Chin, T. C., & Waters, L. E. (2017). Strengths and subjective wellbeing in adolescence: Strength-based parenting and the moderating effect of mindset. *Journal of Happiness Studies, 1–20,* 1. https://doi.org/10.1007/s10902-016-9841-y.

Karwoski, L., Garratt, G. M., & Ilardi, S. S. (2006). On the integration of cognitive-behavioral therapy for depression and positive psychology. *Journal of Cognitive Psychotherapy, 20*(2), 159–170. https://doi.org/10.1891/088983906780639763.

Linley, P. A., Nielsen, K. M., Gillett, R., & Biswas-Diener, R. (2010). Using signature strengths in pursuit of goals: Effects on goal progress, need satisfaction, and well-being, and implications for coaching psychologists. *International Coaching Psychology Review, 5,* 6–15.

Lovibond, P. F., & Lovibond, S. H. (1995a). *Manual for the depression anxiety stress scales*. Sydney: The Psychology Foundation of Australia Inc.

Lovibond, P. F., & Lovibond, S. H. (1995b). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335–343. https://doi.org/10.1016/0005-7967(94)00075-U.

Meyers, M. C., & van Woerkom, M. (2017). Effects of a strengths intervention on general and work-related well-being: The mediating role of positive affect. *Journal of Happiness Studies, 18*(3), 671–689. https://doi.org/10.1007/s10902-016-9745-x.

Minhas, G. (2010). Developing realised and unrealised strengths: Implications for engagement, self-esteem, life satisfaction and well-being. *Assessment and Development Matters, 2,* 12–16.

Niemiec, R. M. (2013). *Mindfulness and character strengths: A practical guide to flourishing*. Göttingen: Hogrefe Publishing GmbH.

Peterson, C., & Seligman, M. E. P. (2004). *Character strengths and virtues: A handbook of classification*. New York: Oxford University Press.

Proctor, C., Tsukayama, E., Wood, A. M., Maltby, J., Eades, J. F., & Linley, P. A. (2011). Strengths gym: The impact of a character strengths-based intervention on the life satisfaction and well-being of adolescents. *The Journal of Positive Psychology, 6,* 377–388. https://doi.org/10.1080/17439760.2011.594079.

Proyer, R. T., Gander, F., Wellenzohn, S., & Ruch, W. (2014). Positive psychology interventions in people aged 50–79 years: Long-term effects of placebo-controlled online interventions on well-being and depression. *Aging and Mental Health, 18*(8), 997–1005. https://doi.org/10.1080/13607863.2014.899978.

Proyer, R. T., Gander, F., Wellenzohn, S., & Ruch, W. (2015a). Strengths-based positive psychology interventions: A randomized placebo-controlled online trial on long-term effects for a

signature strengths-vs. a lesser strengths-intervention. *Frontiers in Psychology, 6,* 456. https://doi.org/10.3389/fpsyg.2015.00456.

Proyer, R. T., Gander, F., Wellenzohn, S., & Ruch, W. (2016). Nine beautiful things: A self-administered online positive psychology intervention on the beauty in nature, arts, and behaviors increases happiness and ameliorates depressive symptoms. *Personality and Individual Differences, 94,* 189–193. https://doi.org/10.1016/j.paid.2016.01.028.

Proyer, R. T., Wellenzohn, S., Gander, F., & Ruch, W. (2015b). Toward a better understanding of what makes positive psychology×interventions work: Predicting happiness and depression from the person intervention fit in a follow-up after 3.5 years. *Applied Psychology. Health and Well-Being, 7*(1), 108–128. https://doi.org/10.1111/aphw.12039.

Quinlan, D., Swain, N., & Vella-Brodrick, D. A. (2012). Character strengths interventions: Building on what we know for improved outcomes. *Journal of Happiness Studies, 13*(6), 1145–1163. https://doi.org/10.1007/s10902-011-9311-5.

Rahimnia, F., & Hassanzadeh, J. F. (2013). The impact of website content dimension and e-trust on e-marketing effectiveness: The case of Iranian commercial saffron corporations. *Information and Management, 50*(5), 240–247. https://doi.org/10.1016/j.im.2013.04.003.

Read, A., Mazzucchelli, T. G., & Kane, R. T. (2016). A preliminary evaluation of a single session behavioural activation intervention to improve well-being and prevent depression in carers. *Clinical Psychologist, 20*(1), 36–45. https://doi.org/10.1111/cp.12084.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68.

Schacter, D. L., Gilbert, D. T., & Wegner, D. M. (2010). *Psychology* (2nd ed.). New York: Worth Publishing Ltd.

Schleider, J., & Weisz, J. (2016). Reducing risk for anxiety and depression in adolescents: Effects of a single-session intervention teaching that personality can change. *Behaviour Research and Therapy, 87*(2016), 170–181. https://doi.org/10.1016/j.brat.2016.09.011.

Seligman, M. E. P., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist, 60*(5), 410–421. https://doi.org/10.1037/0003-066X.60.5.410.

Shankland, R., & Rosset, E. (2017). Review of brief school-based positive psychological interventions: A taster for teachers and educators. *Educational Psychology Review, 29*(2), 363–392. https://doi.org/10.1007/s10648-016-9357-3.

Sin, N. L., & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: A practice-friendly meta-analysis. *Journal of Clinical Psychology, 65*(5), 467–487. https://doi.org/10.1002/jclp.20593.

Su, R., Tay, L., & Diener, E. (2014). The development and validation of the Comprehensive Inventory of Thriving (CIT) and the Brief Inventory of Thriving (BIT). *Applied Psychology. Health and Well-Being, 6*(3), 251–279. https://doi.org/10.1111/aphw.12027.

Sundstrom, S. M. (1993). *Single-session psychotherapy for depression: Is it better to focus on problems or solutions?.* Ames: Iowa State University.

Wang, K., Shi, H. S., Geng, F. L., Zou, L. Q., Tan, S. P., Wang, Y., et al. (2015). Cross-cultural validation of the Depression Anxiety Stress Scale-21 in China. *Psychological Assessment, 28*(5), e88–e100. https://doi.org/10.1037/pas0000207.

Waters, L. E. (2015). Strength-based parenting and life satisfaction in teenagers. *Advances in Social Sciences Research Journal, 2*(11), 158–173. https://doi.org/10.14738/assrj.211.1551.

Wellenzohn, S., Proyer, R. T., & Ruch, W. (2016). Humor-based online positive psychology interventions: A randomized placebo-controlled long-term trial. *The Journal of Positive Psychology, 11*(6), 584–594. https://doi.org/10.1080/17439760.2015.1137624.