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A single-session positive cognitive intervention on first-year students’ mental health: Short-term effectiveness and the mediating role of strengths knowledge

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ABSTRACT

Objective: To better understand the effectiveness of a single-session positive cognitive intervention and uncover the possible mechanisms. Participants: Participants were 79 first-year students (aged 17–21) who volunteered for the intervention during the 2016 fall semester. Methods: Participants were randomly assigned into the intervention group and the control group. All participants completed pretest, post-test, 1 week, and 3-month follow-up tests. Thriving, negative emotional states, strengths knowledge were assessed. Results: Results showed significant increases of thriving in the intervention group at post-test and after 1 week, and significant decreases of negative emotions at the post-test and after 1 week and 3 months. Strengths knowledge fully mediated the intervention effect on thriving at post-test. Conclusions: The single-session positive cognitive intervention could be a responsive and effective approach to promote first-year students mental health. More attention should be paid to mechanisms of the single-session positive cognitive intervention so as to optimize the effects of the single-session positive cognitive intervention.

ARTICLE HISTORY

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KEYWORDS

Positive psychology intervention; character strengths; short-term effectiveness; strengths knowledge; mediator

The transition to university places first-year students at risk of mental health problems (e.g. depression, anxiety, stress).1 Among first-year students, experiencing mental health problems has been found to be related to problem drinking, poor academic functioning, and unhealthy relationship behaviors.2,3 Despite proximal adverse outcomes, mental health problems in early adulthood are also associated with long-term negative consequences in later adulthood, such as physical health problems, relationship dysfunction, and labor market marginalization.5 In view of this situation, it has become an obligation for school mental health professionals to find effective approaches to address the need of first-year students for mental health services. A recent study points out that historical approaches like cognitive and behavioral therapies (CBT) are effective but limited.4 Typical CBT mainly focus on pathology but lack attention on participants’ strengths, abilities, and resources.7 Further, the therapeutic period of traditional CBT lasts several weeks which is too long to meet the demand of first-year students who need a rapid psychological adjustment.4

Single-session positive cognitive intervention

Duan and Bu create a single-session positive cognitive intervention to address abovementioned issues.4 This intervention draws on theory and practice of positive psychology, CBT and single session model. Character strength is a center topic of positive psychology and is defined as a family of positive traits (e.g. humor, zest, love, self-control, creativity, and hope), which are manifested in individuals’ thoughts, feelings, and behaviors.5 Each trait offers one of many alternative ways to well-being. For example, humor means the ability to make other people laugh and to see the light side of adversity in a cheerful view.6 To foster humor, one can read comics, jokes, watching funny movies and keep humor journal.7 With the purpose of shifting the focus from what is wrong with students to what is right with students, the single-session positive cognitive intervention employed some strengths-based activities to help participants raise awareness of their positive traits. Single session model is one of the in-vogue models of brief interventions. Each single-session intervention focuses on identifying one or two key issues of participants within a 90-minute...
The single-session positive cognitive intervention is designed in line with the “Aware-Explore-Apply” framework and comprise four core activities to raise awareness of character strengths on first-year students, that is, (1) Identifying Character Strengths, (2) Character Strengths 360°, (3) Signature Character Strengths, and (4) Nominate Goals (see Method section). This framework highlights three steps to character-strength-based interventions: “Aware” (i.e. strengths identification), “Explore” (i.e. strengths exploration) and “Apply” (i.e. strengths use). More specifically, the first step, strengths identification, is about raising awareness of character strengths by means of strengths survey, strengths introduction (i.e., Identifying Character Strengths), feedback from third people (i.e. Character Strengths 360°), and some other activities. The second step, strengths exploration, is about connecting the strength labels in a deeper way to participants themselves by means of asking participants what strengths they tend to use in various situations of their past, present and future life. Typically, participants specify five strengths as their signature strengths (i.e., Signature Character Strengths). The third step, strengths use, is about using strengths and embedding character strengths into the life routine. Typically, participants are asked to set goals and make concrete action plans in which they specify how to use their strengths (i.e. Nominate Goals).

Prior study estimates 1-week effectiveness of the single-session positive cognitive intervention and demonstrates that the single-session positive cognitive intervention can reliably enhance thriving and reduce depression, anxiety and stress of first-year students. However, previous study has yet to track its effectiveness. Therefore, based on the available research evidence indicating that the effectiveness of strengths-based interventions sustains in the short-term (e.g. 18 weeks and 3 months), we hypothesized the following:

Hypothesis 1 Compared with the control group, the intervention group was expected to indicate benefits 3 months after the intervention, including lower level of negative emotions and higher level of wellbeing.

Method

Participants

A total of 79 first-year students enrolled in the study. Eligible individuals were required to be full-time first-year undergraduate students, without severe mental disorders or substance abuse, residing on campus and having not attended in any other similar counseling services or therapy. A computer-generated randomization protocol was used to assign eligible participants (N = 79; Mage = 18.18, SD = 0.64) to either an intervention group (N = 39; Mage = 18.08, SD = 0.62) or a control group (N = 40; Mage = 18.29, SD = 0.64). Intervention and control group did not differ significantly on sex (χ2[1, N = 79] = 1.03, p = .31) and age (F[1, 77] = 1.94, p = .17). Nor did the groups differ on all measures collected at pretest (see Table 1). The flow of participants’ enrollment, randomization, and analysis is shown in Figure 1.

Study design and procedure

Intervention and control group

This study used a randomized controlled design. Eligible students were invited to complete the pretest (T1) at the beginning of the academic year. Students of the intervention group were offered the 90-min single-session positive cognitive intervention. Participants completed all measures online at post-test (T2), 1-week (T3) and 3-month (T4) follow-up tests.
Table 1. Descriptive analysis with effect size and ANOVA for outcome measures (N = 36).

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Post-intervention</th>
<th>1-week Follow-up</th>
<th>3-month Follow-up</th>
<th>ANOVA for the pretest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>D</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Thriving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IG</td>
<td>3.69</td>
<td>0.48</td>
<td>0.33</td>
<td>3.83</td>
<td>0.45</td>
</tr>
<tr>
<td>CG</td>
<td>3.54</td>
<td>0.45</td>
<td></td>
<td>3.47</td>
<td>0.41</td>
</tr>
<tr>
<td>Negative emotional symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IG</td>
<td>1.59</td>
<td>0.32</td>
<td>0.32</td>
<td>1.42</td>
<td>0.31</td>
</tr>
<tr>
<td>CG</td>
<td>1.71</td>
<td>0.42</td>
<td></td>
<td>1.74</td>
<td>0.43</td>
</tr>
<tr>
<td>Strength Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IG</td>
<td>5.38</td>
<td>0.69</td>
<td>0.38</td>
<td>5.53</td>
<td>0.58</td>
</tr>
<tr>
<td>CG</td>
<td>5.11</td>
<td>0.74</td>
<td></td>
<td>5.03</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Note. IG = Intervention Group; CG = control group.

Figure 1. Flow chart of the intervention procedure.

Students randomized to the control group did not participate in the 90-minute course. They were contacted for post-test and follow-up tests.

Procedure
Before the 90-min the single-session positive cognitive intervention begins, participants were asked to complete a strengths survey, which aimed to uncover their most dominant strengths and establish their strengths files. The strengths file was a report presenting their top 5 (5 highest-score) character strengths as signature strengths and providing related activities of each strength. The first activity of the 90-min single-session positive cognitive intervention was Identifying...
Character Strengths which aimed to help participants understand the language of strengths and see some of the strength labels as being attributed to oneself. This activity lasted about 25 minutes during which the instructor introduced the definition of each character strength according to the handbook of character strengths. The second activity, Character Strengths 360°, aimed to connect participants themselves to the strength labels with the help of external observers. Participants could call their parents, talked to them about character strengths, and then got feedback about their own character strengths from parents. This activity lasted about 25 min. The third activity, Signature Character Strengths, assisted participants to confirm their signature strengths. This activity required participants to choose one or two strengths as their signature strengths. They can use their strengths files and others’ comments as a reference. This activity lasted about 10 min. The last activity, Nominate Goals, was future-oriented and was aimed at preparing for strengths use after the intervention. This activity lasted about 25 min during which participants were suggested to set goals and make concrete action plans in the following week. For example, for those who choose humor as their signature strengths, they can set a goal as “keep laughing everyday”. They can make such a plan: I will consciously be aware of people’s sense of humor, interesting situation, funny jokes and clever comments, and keep them in a daily journal. After the 90-min intervention, the instructor encouraged students to engage the activities related to their strengths to achieve their goals in the following week or more. More detailed description of the intervention procedure can be found in previous study.4

Manipulation check
We conducted manipulation check to verify the effect of intervention manipulation. The single-session positive cognitive intervention contained four core activities that emphasized the “cognition” portion of CBT. Thus, we estimated changes in their awareness and cognitive of strengths, that is, the increment of strengths knowledge from T1 to T2, which was brought about by the intervention.

Measures

Strengths knowledge
The Chinese version of Strengths Knowledge Scale (SKS) was employed to assess strengths knowledge.15,16 It consists of seven items assessing people’s awareness and recognition of their strengths (e.g. “I am aware of my strengths” and “I know the things I do best”).15,16 Response options range from 1 (strongly disagree) to 7 (strongly agree). The scale has a high internal consistency (α = 0.925)16 and it was reliable in the present study (Cronbach’s alpha > .86).

Thriving
Thriving is a concept of comprehensive wellbeing, which can be assessed by Brief Inventory of Thriving (BIT).17,18 BIT consists of 10 items describing an individual’s thriving (e.g. “I am achieving most of my goals” and “I am optimistic about my future”).17,18 Response options ranges from 1 (strongly disagree) to 5 (strongly agree). The Chinese version of BIT has good psychometric characteristics (Cronbach’s alphas > .85).17 The measure was reliable in the present study (Cronbach’s alpha > .83).

Negative emotional states (NES)
The negative emotional states of depression, anxiety and stress were measured using the 21-item Depression Anxiety Stress Scale (DASS-21),19 which asks participants how well the items describe themselves during the past week (e.g. “I found myself getting agitated” and “I felt down-hearted and blue”). The response options ranges from 0 (did not apply to me at all) to 3 (applied to me very much). The Chinese version among the college population has satisfying psychometric properties.20 In this study, the scale was reliable (Cronbach’s alpha > .86).

Data analysis
Differences in demographics and pretest between the two experimental conditions were analyzed using chi square statistics and one-way ANOVA. Independent sample t-test was carried out for manipulation check, with Δ strengths knowledge (i.e. changes in total strengths knowledge from T1 to T2) as the dependent variable and the experimental conditions (Group: intervention versus control) as independent variable. For testing effectiveness of the intervention, the outcome data were estimated in several converging ways. First, to assess changes over 3 months, a 2 (Group: intervention versus control) × 4 (Time: pretest versus post-test versus 1-week follow-up versus 3-month follow-up) analysis of variance with repeated measures was performed. Second, multivariate analyses of variance (MANOVAs) were conducted at each time points for thriving and NES. This way allowed us to retain all participants who completed all measures at four time points. Effect size was estimated using the partial eta squared (η²) and
Table 2. Short-term effects of intervention on thriving and negative emotional states (N = 36).

<table>
<thead>
<tr>
<th>Effect</th>
<th>Thriving</th>
<th>Negative emotional states</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Differences Over 3 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>F (1,34) = 5.15, p = 0.03, $\eta^2 = .13$</td>
<td>F (1,34) = 11.91, p = 0.002, $\eta^2 = .26$</td>
</tr>
<tr>
<td>Time</td>
<td>F (3,102) = 1.95, p = 0.13, $\eta^2 = .05$</td>
<td>F (3,102) = 2.57, p = 0.06, $\eta^2 = .07$</td>
</tr>
<tr>
<td>Group x Time</td>
<td>F (3,102) = 1.14, p = 0.34, $\eta^2 = .03$</td>
<td>F (3,102) = 5.95, p = 0.001, $\eta^2 = .15$</td>
</tr>
<tr>
<td>IG T1 vs T2</td>
<td>t (17) = -1.17, p = 0.26</td>
<td>t (17) = 3.92, p = 0.001</td>
</tr>
<tr>
<td>IG T1 vs T3</td>
<td>t (17) = -2.32, p = 0.03</td>
<td>t (17) = 4.83, p = 0.001</td>
</tr>
<tr>
<td>IG T1 vs T4</td>
<td>t (17) = -2.22, p = 0.04</td>
<td>t (17) = 5.17, p = 0.001</td>
</tr>
<tr>
<td>CG T1 vs T2</td>
<td>t (17) = 0.77, p = 0.45</td>
<td>t (17) = -0.30, p = 0.55</td>
</tr>
<tr>
<td>CG T1 vs T3</td>
<td>t (17) = 0.29, p = 0.77</td>
<td>t (17) = -0.66, p = 0.52</td>
</tr>
<tr>
<td>CG T1 vs T4</td>
<td>t (17) = -0.19, p = 0.85</td>
<td>t (17) = -0.62, p = 0.77</td>
</tr>
<tr>
<td>Group differences at each assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2 IG versus CG</td>
<td>F (1,34) = 6.51, p = 0.02, $\eta^2 = .16$</td>
<td>F (1,34) = 6.51, p = 0.02, $\eta^2 = .16$</td>
</tr>
<tr>
<td>T3 IG versus CG</td>
<td>F (1,34) = 4.82, p = 0.04, $\eta^2 = .12$</td>
<td>F (1,34) = 15.46, p = 0.001, $\eta^2 = .31$</td>
</tr>
<tr>
<td>T4 IG versus CG</td>
<td>F (1,34) = 2.98, p = 0.09, $\eta^2 = .08$</td>
<td>F (1,34) = 18.57, p = 0.001, $\eta^2 = .35$</td>
</tr>
</tbody>
</table>

Note. Time = tests of within-subjects effects; Group = tests of between-subjects effects; Time x Group = the interaction effects between time and group; IG = Intervention Group; CG = control group; T1 = Pre-test; T2 = Post-intervention test; T3 = 1-week Follow-up test; T4 = 3-month Follow-up test.

Cohen’s $d$. The significance level was set at 0.05. For testing mediation effect, we employed Model 4 of the PROCESS program to estimate regression models. The significance level was set at 0.05 and the analyses were also conducted with 5000 bootstrap samples. If zero is not within the 95% confidence intervals (CIs) of the estimated effect, the estimated effect was statistically significant. All data analyses were performed with the SPSS 25.

Results

Effectiveness of the intervention

Sample characteristics

The repeated measure analyses only included those who completed all measure at four time points. Thus, the total sample used to estimate the 3-month effectiveness of the intervention was 36 students (age: $M = 18.31$, $SD = 0.62$, $F[1, 34] = 0.53$, $p = .43$; gender ratio: $\chi^2[1, N = 36] = 1.00$, $p = .32$). Descriptive analysis with effect size for thriving and negative emotional states (NES) of experimental groups at four time point were showed in Table 1. The thriving level of the intervention group continually increased from T1 to T4, while that of the control group stayed in the lower level with some fluctuations. The negative emotions states of the intervention group showed a downward trend from T1 to T4, while that of the control group showed an upward trend.

Manipulation check

Manipulation check revealed that strengths knowledge of the intervention group increased from T1 ($M = 5.38$, $SD = 0.69$) to T2 ($M = 5.55$, $SD = 0.58$), while that of the control group decreased from T1 ($M = 5.11$, $SD = 0.74$) to T2 ($M = 5.03$, $SD = 0.75$). There was a significant difference of $\Delta$ strengths knowledge between the two experimental conditions ($F[1,64] = 2.47$, $p = .01$). These results suggested that during the 90-min intervention, strengths knowledge of the intervention group increased. Thus, the effect can be attributable to the intervention.

Group differences Over 3 months

There was a significant Group x Time effect for NES ($F[3,102] = 5.95$, $p = .001$, $\eta^2 = .15$), suggesting that from T1 to T4 NES scores in the intervention group reduced more than that of the control group. A marginally significant time effect ($F[3,102] = 2.57$, $p = .06$, $\eta^2 = .07$) was found for NES. We further conducted paired sample $t$-test to reveal specific within-group differences separately for the two experimental groups. Results indicated that there were significant changes in NES at T2, T3 and T4 compared with T1 (see Table 2). Insignificant results of $t$-test on NES was found for the control group at each time point. No significant time effect ($F[3,102] = 1.95$, $p = .13$, $\eta^2 = .05$) and interaction effect ($F[3,102] = 1.14$, $p = .34$, $\eta^2 = .03$) were found for thriving, suggesting that the change in thriving from T1 to T4 was comparable between groups. However, paired $t$-test showed that there were significant changes in thriving scores at T2 and T3 compared with T1. Insignificant results of $t$-test on thriving were found for the control group at each time points.

Group differences at each assessment

Group Effects for NES and thriving were both significant (NES: $F[1,34] = 11.91$, $p = .002$, $\eta^2 = .26$; thriving: $F[1,34] = 5.15$, $p = .03$, $\eta^2 = .13$). Further MANOVA analyses represented significant between-group differences in NES at T2, T3 and T4 (see Table 2). Significant between-group differences for thriving were found at T2 and T3 (see Table 2).
results showed that thriving and negative emotional states of the intervention group changed more significantly than those of the control group.

Overall, the results showed the single-session positive cognitive intervention can reliably promote mental health of first-year students. The intervention had robust immediate, 1-week and 3-month effectiveness for NES. As for promoting wellbeing, the intervention only had significant immediate and 1-week effectiveness.

### Mediating effects

Building forth on the results of the repeated measures analyses, we conducted five simple mediation analyses with Group (i.e. intervention = 1 versus control = 2) as the independent variable, Δ strengths knowledge as the proposed mediator, and NES (T2, T3, and T4) and thriving (T2 and T3) as dependent variables respectively. As shown in Table 3, these analyses revealed that changes in strengths knowledge fully mediated the effect of the single-session positive cognitive intervention on thriving at T2, as the direct effect of the intervention on thriving at T2 was not significant (Coeff = −.21, CI: [−0.4251, 0.0083]) while the indirect effect (Coeff = −.08, CI: [−0.1851, −0.0002]) and total effect (Coeff = −.29, CI: [−0.4999, −0.0753]) were significant. The tested model explained 10.27% of the variance in change of thriving at T2, adjusted $R^2 = 0.10, F (1, 64) = 7.32, p = .01$. However, as zero was within the 95% CIs of the estimated indirect effects, Δ strengths knowledge failed to mediate the effects of the single-session positive cognitive intervention on other outcomes. Overall, the results partly confirm our hypothesis that the effectiveness of this intervention on thriving was mediated by strengths knowledge.

### Comment

Fusing CBT, positive psychology and single session model, the single-session positive cognitive intervention can be offered as a solution to negative foci and the lengthy therapeutic period of prior mental health services for first-year students. The present study was aimed to investigate the 3-month short-term effectiveness of the single-session positive cognitive intervention and reveal its potential mechanisms.

In line with the previous study,4 we found support for the notion that the single-session positive cognitive intervention can trigger immediate and 1-week increases in wellbeing and decreases in negative emotions among the first-year students. The favorable effect of negative emotions had been maintained until 3 months after the intervention, while that of thriving had not been sustained. Limited duration of effectiveness might be explained by the research model and characteristics of the participants. First, the fundamental principles of single session model indicate that the therapeutic gains of single-session interventions are accelerated in the initial session and then slows down in subsequent sessions.8 Second, this single-session positive cognitive intervention highlighted the “cognitive” portion but downplayed the “behavioral” portion. For example, researchers did not track whether students had used their strengths after the intervention. Previous study points out that the long-term effectiveness is fully mediated by participants’ self-practice of the intervention activities,22 which means using strengths in daily life has a strong influence on the long-term effectiveness of the intervention. Third, previous research indicates that participants who have higher score in character strengths reported a stronger increase in happiness and a decrease in depressive symptoms after the intervention.13 Accordingly, interventions may also result in different effects on different characteristics of the participants. Moreover, it is noted that three months are only comparatively short time periods. According to a meta-analysis, only 25% interventions follow participants over 3 months. Thus, compared with most PPIs, the interval of follow-up test of the current study has covered a relatively longer period.

### Table 3. Mediating analysis for effects of the intervention on outcomes concerning the mediating role of strengths knowledge.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Indirect effect</th>
<th>Direct effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thriving (T2)</td>
<td>66</td>
<td>Coeff = −0.08*</td>
<td>Coeff = −0.21</td>
<td>Coeff = −0.29*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CI: [−0.1851, −0.0002]</td>
<td>CI: [−0.4251, 0.0083]</td>
<td>CI: [−0.4999, −0.0753]</td>
</tr>
<tr>
<td>Thriving (T3)</td>
<td>66</td>
<td>Coeff = −0.05</td>
<td>Coeff = −0.31*</td>
<td>Coeff = −0.37**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CI: [−0.1645, 0.0254]</td>
<td>CI: [−0.5883, −0.0411]</td>
<td>CI: [−0.6294, −0.1082]</td>
</tr>
<tr>
<td>Negative emotional states (T2)</td>
<td>65</td>
<td>Coeff = −0.01</td>
<td>Coeff = −0.22*</td>
<td>Coeff = −0.21*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CI: [−0.1073, 0.0725]</td>
<td>CI: [0.0079, 0.4286]</td>
<td>CI: [0.0126, 0.4086]</td>
</tr>
<tr>
<td>Negative emotional states (T3)</td>
<td>65</td>
<td>Coeff = −0.03</td>
<td>Coeff = 0.39**</td>
<td>Coeff = 0.35**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CI: [−0.1415, 0.0436]</td>
<td>CI: [0.1678,0.6031]</td>
<td>CI: [0.1459, 0.5578]</td>
</tr>
<tr>
<td>Negative emotional states (T4)</td>
<td>36</td>
<td>Coeff = −0.003</td>
<td>Coeff = 0.54**</td>
<td>Coeff = 0.54**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CI: [−0.1198, 0.1073]</td>
<td>CI: [0.2692,0.8088]</td>
<td>CI: [0.2832, 0.7889]</td>
</tr>
</tbody>
</table>

Note. T2 = Post-test; T3 = 1-week follow-up test; T4 = 3 months follow-up test; CI = 95% confidence interval; Coeff = coefficient.

* $p < 0.05$.

** $p < 0.001$. 

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$\text{Indirect effect} = \text{Coeff} \\  \text{Direct effect} = \text{Coeff} \\  \text{Total effect} = \text{Coeff}$
According to CBT model\textsuperscript{14} and the Aware-Explore-Apply framework\textsuperscript{11}, we further hypothesized that the effectiveness of the single-session positive cognitive intervention would be mediated by strengths knowledge. Results of mediating analyses revealed that changes in strengths knowledge from pretest to posttest mediated the relationship between the experimental conditions and thriving at post-test. Contrary to our expectations, there were no mediating effects of the intervention on other outcomes. Instead, only direct effects of the intervention on thriving at T3, and NES at T2, T3, and T4 were found. These direct effects can be explained by the fact that the single-session positive cognitive intervention employed many other predictors of wellbeing and negative affect such as goal process and need satisfaction.\textsuperscript{9}

It is worth noting that although the single-session positive cognitive intervention only had short-term effectiveness, it is also beneficial. First, previous studies of PPIs establish evidence that PPIs are worthwhile endeavors. However, little is known about the mechanisms by which PPIs, especially character-strength-based interventions, might lead to desirable outcomes. Results of the current study provides evidence that strengths knowledge is a possible “active ingredient” of the strengths intervention. Thus, results of this study add to the growing literature on PPIs.\textsuperscript{9} Second, the single-session positive cognitive intervention can quickly enhance wellbeing and alleviate negative emotions within 1 week, which reduces delays for first-year students who need rapid psychological adjustment to university. Thus, although the effectiveness is not long-lasting, it needs to be highlighted that the single-session positive cognitive intervention could contribute to offering a more responsive service for first-year students. Third, the single-session positive cognitive intervention may have high acceptability by young people due to the fact that this intervention helps participants identify their existing positive resources, choose the enjoyable activities and deal with problems on their own, which is consistent with young people’s preference and is more attractive to them.\textsuperscript{8} Finally, the single-session positive cognitive intervention would not incur high financial cost and would not take up too much resources of schools, such as classroom time and professional intervention instructors.

**Limitations**

First, the current study would suffer from a small sample size in comparison to many other PPIs. It is possible that the statistically nonsignificant results of time effect and Group $\times$ Time effect could be attribute to the low power. And the analyses also can be influenced by outliers. Second, some students of intervention group were in the same class as those of control group. Students of the intervention group may share experiences of the single-session positive cognitive intervention with those of the control group, which can cause control contamination and influence the group effects. Future study should employ larger sample and conduct cluster randomization so as to compensate for low power, drop-out rate and selection bias. Third, the current study did not distinguish heterogeneous subgroups among participants. Some participants may at higher risk and have lesser strengths than others. Different character strengths subgroups may have different reaction to the intervention. Future study should identify the high-risk participants and further offer more targeted interventions. Forth, although our results indicated that the effect of the single-session positive cognitive intervention can be mediated by strengths knowledge, whether such interventions work by changing cognitions is still ambiguous. Previous study has shown that strengths knowledge cannot predict subjective wellbeing but strengths use can.\textsuperscript{15} More studies should be conducted to reveal the role of strengths knowledge in character-strength-based intervention, and concern more about other factors (e.g. strengths use) which can mediate, optimize or diminish the effect of PPIs so as to uncover the underlying mechanisms of the single-session positive cognitive intervention.

**Conclusion**

To better understand the effectiveness of a single-session character-strength-based cognitive intervention and uncover the mechanisms of the single-session positive cognitive intervention, we conducted a randomized controlled trial of the single-session positive cognitive intervention and tracked its effectiveness after 3 months. We found that the single-session positive cognitive intervention is an effective approach for first-year students to quickly improve wellbeing and decrease negative emotions. The effectiveness of reducing negative emotions can be maintained for 3 months. Strengths knowledge fully mediated the effects of intervention on thriving at post-test. Although the single-session positive cognitive intervention only has short-term effectiveness, this kind of brief interventions are flexible enough to be widely delivered.
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Ethical statements

All procedures performed in studies involving human participants were in accordance with the ethical standards of Wuhan University Institutional Review Board.

Conflict of interest disclosure

No potential conflict of interest was reported by the authors.

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References