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The cognitive and socioemotional effects of a short-term light painting intervention

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We investigated the cognitive and socioemotional effects of a light painting intervention, which is a new type of creative arts therapy. Participants were 60 university students, 30 of whom were assigned to the light painting (LP) group and attended 5 light painting sessions for 1 hour every other day, and 30 of whom were assigned to the control group and engaged in classroom self-study on the same schedule. Both groups completed a spatial orientation task and the Positive Affect and Negative Affect Schedule before and after the intervention. Compared to the control group, the LP group showed significant improvement in speed of performing the spatial orientation task. Moreover, the LP group reported increases in imagination, creativity, emotional and mental health, and social skills. Our findings provide preliminary empirical evidence supporting the positive effect of LP in some cognitive and socioemotional domains, and indicate that LP could be a promising creative arts therapy intervention for treating psychiatric disorders.

Keywords
light painting; creative arts therapy; emotional health; spatial orientation; mental rotation; creativity; mental health

Creative arts therapy (also called expressive arts therapy) is an umbrella term referring to the overall practice of different types of arts therapies, such as art therapy, music therapy, dance therapy, drama therapy, poetry therapy, and psychodrama (Dunphy, Mullane, & Jacobsson, 2013; van Westrhenen & Fritz, 2014). Scholars have demonstrated that creative arts therapies can have positive effects for the individual. For example, art therapy (e.g., painting) spans the relationships between body, soul, and spirit, and provides a healing paradigm (Schnetz, 2004). Khadar, Babapour, and Sabourimoghaddam (2013) found that after 12 sessions of painting therapy, elementary school boys with symptoms of separation anxiety disorder showed more adaptive behaviors and emotions—specifically, their communication ability clearly improved and they tended to share their feelings more—whereas the control group showed no significant differences on these measures. In another study the researchers found that after four sessions of famous painting appreciation and four sessions of creative artwork generation, patients receiving radiotherapy treatment for cancer expressed significantly less cancer-related anxiety and fewer depressive symptoms (Lee et al., 2017). Slayton, D'Archer, and Kaplan (2010) conducted a review of art therapy efficacy and concluded that art therapy is effective in treating people in different age groups with different symptoms and disorders. Researchers have suggested that the use of art therapy may help to improve psychosocial and emotional well-being in patients being treated for both psychiatric and neurological illnesses and disorders (Brown, Shella,

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& Pestana-Knight, 2018), as the four components of art therapy (client, therapist, art product, and art making) can interact with each other and facilitate adaptive responses (Kaimal, 2019).

Dance/movement therapy represents an embodied, action-oriented creative arts therapy that can enhance the connection between mind and body (Koch & Fischman, 2011). In a randomized controlled trial of dance/movement therapy conducted with individuals with autism spectrum disorder, Hildebrandt, Koch, and Fuchs (2016) observed an encouraging trend toward reductions in negative symptoms. Further, Devereaux (2012) showed that taking part in dance/movement therapy increased the empathy and self-awareness of children with autism spectrum disorder, and Scharoun, Reinders, Bryden, and Fletcher (2014) reported that taking part in dance/movement therapy provided both physical and psychological benefits for children with autism spectrum disorder. It has been suggested that the core of the therapeutic process of this type of therapy is the close connection and direct relationship between body and emotion (Winters, 2008).

As creative arts therapies have provided a means to cope with language and social barriers associated with conditions such as autism spectrum disorder (Khadar et al., 2013), there is increasing recognition by psychologists and therapists of the importance of this form of therapy (van Westrhenen & Fritz, 2014). In addition, a multimodal approach has emerged in which a range of art forms is employed (e.g., visual arts, dancing, music), and this approach is now becoming widely used (Dunphy et al., 2013). For example, a multimodal intervention combining dance/movement and music therapy was found to lead to improvements in regulation/behavioral variability, imitation, disorders associated with instinct, emotional disorders, and social interaction disorders in adults diagnosed with severe autism (Mateos-Moreno & Atencia-Doña, 2013).

Consistent with this developing trend, modern light painting is expected to become a promising integral creative arts therapy that allows self-motivated expression. *Light painting*, also called light drawing or light art performance photography, is a creative method of photographically recording the movement path of a light, in which the light source is regarded as the paintbrush and the movement path of the light is considered the brush stroke, forming the structure of the painting (Lorenzi & Francaviglia, 2007). Light painting is always conducted in a dark environment and requires at least one painter and one photographer. It involves the technique of taking a long-exposure photograph of a moving light source that illuminates a subject or space or that "draws" by either shining a light at the camera or by moving the camera during the light exposure (Miedza & Woellert, 2011). Light painting can be used to imitate characteristics of traditional painting, and superimposition and transparency can easily be achieved by moving, adding, or removing lights or subjects during or between exposures. To participate in a light painting activity, a painter must "paint" (i.e., move) with a certain level of imagination and creativity.

As a novel art form, light painting can integrate elements of painting and dance/movement to music, resulting in an interesting, relaxed, and comprehensive movement intervention. We believed that light painting may be an effective new form of creative arts therapy. However, no empirical study has yet been conducted to explore the effects of a light painting intervention, setting the stage for our effort to fill this gap in the literature.

Previous researchers have usually adopted questionnaires to measure therapy outcomes (Slayton et al., 2010), but these questionnaires alone may not be sufficiently sensitive to detect the effects of a light painting intervention. To address this weakness we adopted a cognitive behavioral measure (i.e., a spatial orientation task) in addition to using the Positive Affect and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to assess participants' mood states. The spatial orientation task is a well-established paradigm that involves a dynamic process in which a participant must remember an object and spatially rotate it in the mind to align with another object, then judge whether the two objects appear the same (Uttal et al., 2013). Spatial rotation of objects is widely used as a measure of spatial orientation ability, which is an

important component of cognitive or intellectual ability (Linn & Petersen, 1985).

In light painting, participants must first imagine and then construct a certain mental picture through motion (i.e., the picture is built dynamically and requires the participant to move and rotate the light source). For example, to create a picture of a ship, a group of participants must first imagine the ship's outline and then design a manifestation of that mental picture with several participants each holding a light source that they move simultaneously along a particular trajectory they are picturing in their own mind. This rendition will then be captured by a camera with a long exposure. If participants want the ship to move through water, then all the team members must move their light sources simultaneously along particular paths. This process involves repositioning the original spatial site; therefore, engaging in these processes and activities may enhance participants' mental rotation abilities and help them to obtain good spatial skills, which have been shown to predict achievement in science, technology, engineering, and mathematics (Wai, Lubinski, & Benbow, 2009). Thus, improving mental rotation skills through short-term training is important from a practical perspective.

In sum, we explored the effectiveness of a light painting intervention using both a measure of mood and a spatial orientation task, as well as a questionnaire to evaluate certain emotional and social factors. To align with the collaborative characteristics of light painting, we carried out a group-based light painting intervention similar to the method used in other creative arts research (Uttal et al., 2013). We employed a comparative (experimental vs. control group) pre- and postintervention design, and speculated that the light painting intervention would induce significant cognitive and socioemotional benefits. Specifically, we hypothesized that taking part in the light painting activity (vs. the control activity) would increase participants' positive emotions and would enhance their performance (i.e., speeding up their reaction time) on the spatial orientation task.

Method

Participants

Sixty students at Hangzhou Normal University, China, volunteered to participate in this experiment. We posted an online advertisement stating that we were conducting a study on the effect of a light painting activity and volunteers were needed. Students were paid CNY 300 (~USD 43.00) to compensate for their participation. Two equal-sized groups comprising 30 people each were included in the study: One experimental group that engaged in light painting (LP) training and one control (CTL) group. The LP group consisted of 24 women and six men (M_{age} = 21.5 ± 2.3 years), and the CTL group also consisted of 24 women and six men (M_{age} = 21.1 ± 2.8 years). The two groups did not differ significantly with regard to age and were also similar in terms of years of education (LP: M = 15.1 ± 1.8 years, CTL: M = 14.6 ± 2.1 years). All participants were right-handed with normal or corrected-to-normal vision. We obtained written informed consent from all participants and received ethical approval from the Institutional Review Board of the Department of Psychology at Zhejiang Sci-Tech University.

Materials and Measures

We used the PANAS (Watson et al., 1988) to measure participants' mood state. This scale consists of 20 items, 10 of which (e.g., interested, excited) belong to the positive affect (PA) subscale, and 10 of which (e.g., distressed, upset) belong to the negative affect (NA) subscale. A higher subscale total score for PA corresponds to a more positive mood state and a higher subscale score for NA corresponds to a more negative mood state.

Next, we used a spatial orientation task to explore visuospatial ability changes that might be associated with the light painting intervention. This task was derived from the Orientation-3D subtest of the Cognitive Laterality Battery (Gordon, 1986), which has been widely adopted in previous studies to measure

participants' rotation and orientation ability (see, e.g., Risucci, Geiss, Gellman, Pinard, & Rosser, 2001). We used 48 stimuli in the experiment. For each stimulus there were two three-dimensional, S-shaped constructions of 10 stacked cubes (see Figure 1). In each stimulus the two constructions were identical but rotated in space around a vertical axis; however, in some cases one construction was the mirror image of the other.

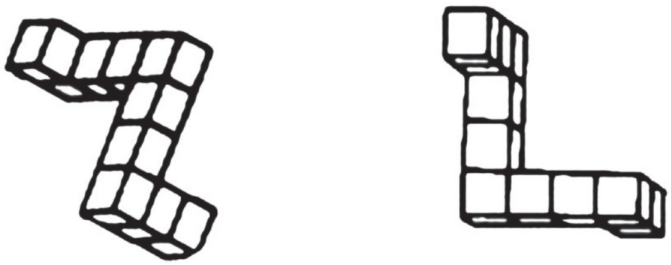

Figure 1. An example of an experimental stimulus in the spatial orientation task.

Procedure

Pretest assessment. On the day before the intervention or control experience began, all participants completed a pretest comprising the PANAS and then the spatial orientation task. The spatial orientation task was conducted using a computer to control the presentation of the stimuli and record the participants' responses via E-Prime 1.1 (Psychology Software Tools). In each trial a "+" symbol was initially presented at the center of the screen for 500 ms, then two three-dimensional S-shaped constructions were shown. The participants were asked to conduct mental rotation of the two shapes and judge as quickly and accurately as possible whether they were the same by pressing either the "A" key for "Yes" or the "L" key for "No." The two keys used for the responses were counterbalanced across participants. When the participant responded, the target disappeared immediately. After either the participant's response or 15 seconds had elapsed, an interstimulus interval of 1,000 ms was initiated before the next trial began. The 48 stimuli were evenly divided into three sessions of 16 stimuli and a brief break was allotted between each session. Before the formal sessions began, the participants were exposed to a short practice session to familiarize them with the procedure.

Intervention.

Light painting activities. Participants in the LP group engaged in a series of activities during five light painting sessions, scheduled every other day over 2 weeks (including weekend days). Because darkness is required as the background for light painting, the activities were conducted from 9 to 10 pm in an indoor stadium at the local university. The degree of difficulty of the light painting activity increased gradually over the five sessions, from a preset creation task to a free creation task and from an individual creation to a team-based, cooperative group creation. Throughout all activities, cheerful music was played to create a pleasant atmosphere. A detailed description of the five sessions is set out in the Appendix and examples of the paintings are depicted in Figure 2.

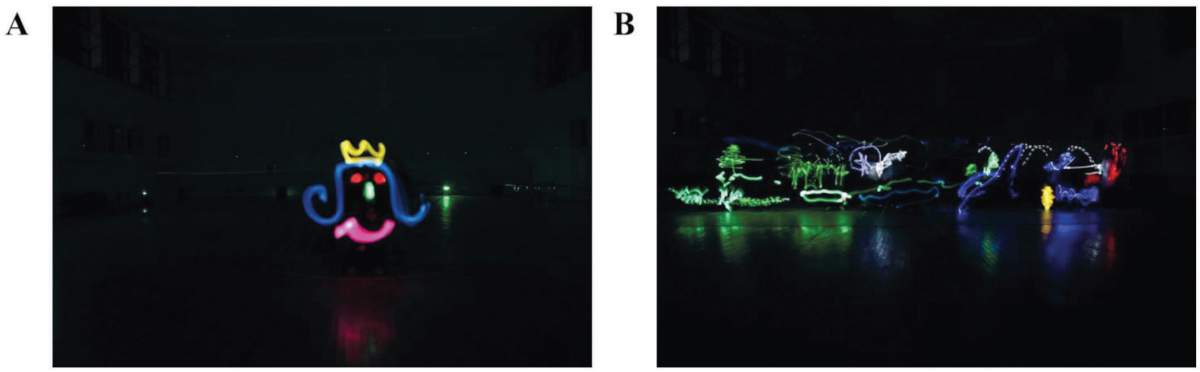

Figure 2. Examples of light painting. (A) Face work by a three-member team, (B) Picture of the Xiaoxiang Spectacle Scroll created by all 30 participants in the light painting group.

Control group activities. CTL group participants carried out individual study activities while located together in a classroom at the local university. They were allowed to read a book, complete their homework, play games on their mobile phone, or undertake any other activities that did not bother other students in the group. The activities were carried out during five sessions that mirrored the schedule for the LP group. We also played soft background music in the classroom during these sessions.

Posttest assessment. All participants in the two groups completed the PANAS and the spatial orientation task again on the day after the intervention finished. The procedures were identical to those followed during the pretest.

One week after the posttest assessment we administered a follow-up survey through the Internet. The 10 items and their corresponding 10-point Likert response scales were as follows: "To what extent did the group activities improve your mood?" (1 = *not at all*, 10 = *very much*), "Did you feel relaxed during the activities?" (1 = *not relaxed at all*, 10 = *very relaxed*), "Did the intervention activities reduce your stress?" (1 = *not at all*, 10 = *very much*), "Did you feel lonely during the activities?" (1 = *not at all*, 10 = *very much*), "Do you think that the intervention activities helped increase your imagination?" (1 = *not at all*, 10 = *very helpful*), "Do you think that the intervention activities helped improve your creativity?" (1 = *not at all*, 10 = *very helpful*), "Do you think that the intervention activities helped improve your teamwork skills?" (1 = *not at all*, 10 = *very helpful*), "Do you think that the intervention activities helped improve your social skills?" (1 = *not at all*, 10 = *very helpful*), "Did you trust your group members during the activities?" (1 = *not at all*, 10 = *very much*), and "How much did you benefit from the activities?" (1 = *not at all*, 10 = *very much*).

Results

The data were analyzed using SPSS 19.0 (IBM Corp., Armonk, NY, USA).

Results for Mood State

The total scores on the PA and NA subscales for the pretest and posttest in the two groups are shown in Table 1.

Table 1. *Pre- and Posttest Scores of Light Painting and Control Groups for Positive and Negative Affect (M ± SD)*

	PA		NA	
	Pretest	Posttest	Pretest	Posttest
Light painting group	30.6 ± 4.9	31.7 ± 6.8	19.7 ± 4.9	21.4 ± 5.5
Control group	31.7 ± 6.8	29.6 ± 5.3	20.5 ± 4.5	21.0 ± 6.4

Note. PA = positive affect, NA = negative affect.

We analyzed the PA and NA results separately by performing a 2 (group: LP, CTL) × 2 (time: pretest, posttest) mixed-design analysis of variance (ANOVA). The results show there were no significant main or interaction effects (*p*s > .05).

Results of the Spatial Orientation Task

For the spatial orientation task, incorrect trials (34.90%) were excluded from the reaction time (RT) analyses, along with outlier trials in which the response latencies were beyond two standard deviations from the mean (1.84% of the trials). The mean RTs for the spatial orientation task during the pretest and posttest are shown in Table 2.

Table 2. *Mean Reaction Times (in ms) for the Spatial Orientation Task (M ± SD)*

	Pretest	Posttest
Light painting group	6961.8 ± 1709.4	5017.7 ± 2284.5
Control group	5913.4 ± 2477.5	5133.0 ± 1997.6

Next, we conducted a 2 (group: LP, CTL) × 2 (time: pretest, posttest) mixed-design ANOVA of the RTs. The results reveal there was a significant main effect of time, $F(1, 58) = 24.76$, $p < .001$, $\eta_p^2 = .30$, but no significant main effect of group, $F(1, 58) = 0.95$, $p = .34$. A significant group × time interaction effect was found, $F(1, 58) = 4.52$, $p < .05$, $\eta_p^2 = .07$. Post hoc analyses show that in the LP group, the posttest RT was significantly shorter than the pretest RT, $F(1, 58) = 25.22$, $p < .001$; further, in the CTL group the posttest RT was significantly shorter than the pretest RT, $F(1, 58) = 4.06$, $p < .05$.

To directly compare the differences in RT between the pretest and posttest for the LP and CTL groups, we conducted an independent samples *t* test. The results show that the RT difference between the two groups was significant, $t(58) = 2.13$, $p < .05$, $d = 0.56$, indicating that the decrease in RT in the LP group was greater than that in the CTL group (see Figure 3). The mean accuracy rates during the spatial orientation task were 64.9% ± 11.8% in the pretest and 66.8% ± 15.2% in the posttest for the LP group, and 62.5% ± 12.8% in the pretest and 66.0% ± 13.9% in the posttest for the CTL group. A 2 (group: LP, CTL) × 2 (time: pretest, posttest) mixed-design ANOVA of accuracy rates yielded no significant main or interaction effects (*p*s > .05). There were no significant correlations between PA/NA scores and RTs/accuracy rates for the spatial orientation task (*p*s > .05).

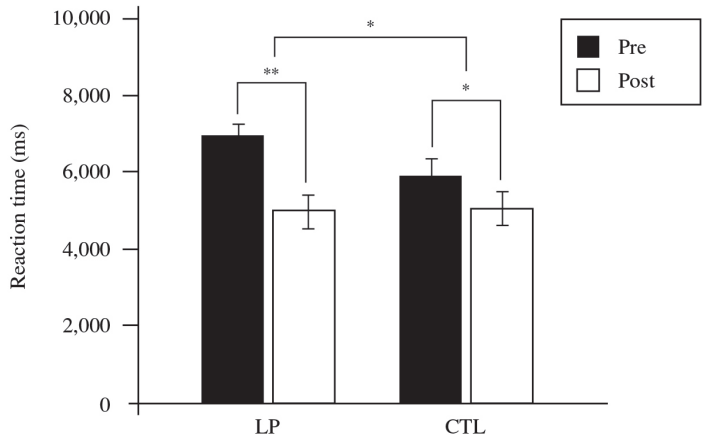

Figure 3. Mean reaction times for the spatial orientation task at pre- and posttest for the light painting (LP) and control (CTL) groups. Error bars denote standard errors.
* $p < .05$, ** $p < .01$.

Results From the Follow-Up Survey

The mean ratings in the follow-up survey of the two groups are shown in Table 3.

Table 3. *Mean Rating Scores for the Follow-Up Survey in the Two Groups (M ± SD)*

Item	LP	CTL	*t*	*p*
Improvement in mood	6.5 ± 1.9	4.7 ± 1.7	3.97	< .001
Relaxation	7.0 ± 1.7	4.2 ± 1.9	6.23	< .001
Reduction in stress	6.4 ± 1.4	4.6 ± 1.9	4.14	< .001
Feeling of loneliness	3.4 ± 1.5	3.9 ± 2.6	-0.84	.40
Improvement in imagination	7.0 ± 1.2	4.2 ± 2.1	6.25	< .001
Improvement in creativity	7.3 ± 1.2	4.4 ± 1.9	7.35	< .001
Improvement in teamwork skills	7.3 ± 1.3	4.7 ± 2.1	5.87	< .001
Improvement in social skills	5.7 ± 1.5	4.5 ± 2.0	2.66	< .01
Group trust	7.1 ± 1.4	4.9 ± 2.1	4.76	< .001
General benefit	7.3 ± 0.9	5.0 ± 2.0	5.74	< .001

Note. LP = light painting group, CTL = control group.

We used independent samples *t* tests to compare the rating scores of the LP and CTL groups. The results in Table 3 show that, in contrast to the CTL group, the LP group perceived improvements in relaxation, mood, imagination, creativity, teamwork skills, and social skills. The LP group also perceived reduced stress and increased trust among group members to a greater extent than the CTL group did. In general, the LP group gained a higher score for general benefit than did the CTL group. However, no significant difference in the feeling of loneliness was found between the two groups.

Discussion

We explored the cognitive and socioemotional effects of a light painting intervention in a group of healthy young adult participants. As expected, participants in the LP group showed greater postintervention improvement on a spatial orientation task compared to participants in the CTL group. Moreover, participants in the LP group also showed greater increases in imagination, creativity, emotional and mental health, and social skills. Taken together, we have provided preliminary empirical evidence that light painting could have positive effects in the cognitive and socioemotional domains.

We also observed a significant decrease in RT during the spatial orientation task when comparing posttest with pretest results in both the LP and CTL groups. The significant RT reduction in both groups demonstrates a practice effect, as the posttest represents the second time the participants had completed the test. These results are consistent with those of previous studies (see, e.g., Meneghetti, Cardillo, Mammarella, Caviola, & Borella, 2017). However, the LP group showed a significantly greater reduction in RT compared to the CTL group, indicating that the former group had greater improvement in performance on the spatial orientation task, which is in accordance with our prediction. The spatial orientation task is designed to measure the ability to remember an object in the mind and spatially rotate it (Shepard & Metzler, 1971). This ability is an important component of spatial cognition and plays a special role in many daily mental activities (Uttal et al., 2013). Our results are consistent with those of previous studies showing that repeated practice leads to an increase in speed in mental rotation (see, e.g., Heil, Rösler, Link, & Bajric, 1998). Other researchers have found that computer videogame training in games such as Tetris can effectively improve performance on mental rotation tasks (Moreau, 2013; Quaiser-Pohl, Geiser, & Lehmann, 2006), which is comparable to the effect we observed for light painting training.

Mental rotation typically consists of imagery processes, such as visual imagery and motor imagery (Corradi-Dell'Acqua, Tomasino, & Fink, 2009). In the light painting activity, the target picture must first be deciphered through visual imagery and then decomposed into different positions and movements to achieve its recreation. Thus, light painting training leads to performance improvement on mental rotation tasks. This is also in line with our follow-up survey results, according to which the participants perceived improvements in their imagination and creativity. Our findings suggest that light painting training may be a suitable method to improve spatial skills.

By involving art creation and movement as well as teamwork, light painting activities may also benefit participants' emotional and mental health and their social skills, as indicated in the follow-up survey. Specifically, LP group participants perceived that light painting had improved their mood, reduced their stress, and made them feel relaxed. This is consistent with previous findings that creating artwork can significantly reduce negative emotions (Bell & Robbins, 2007) and increase positive emotions (Dalebroux, Goldstein, & Winner, 2008). In addition, participants felt that the light painting had improved their teamwork and social skills, which is in line with Khadar et al.'s (2013) finding that the communication of boys with separation anxiety disorder improved and they were more open to sharing feelings after taking part in painting therapy.

Our results revealed no significant effect of the light painting intervention on participants' mood on the basis of their scores on the PANAS, which is inconsistent with our expectation. This result may have eventuated because emotional moods are generally steady in healthy adults and are difficult to change in a relatively short period of 2 weeks. Another possibility is that university students are generally positive in their moods (Wang, 2014); thus, there was no room for considerable improvement among our participants. As previous studies have demonstrated the effectiveness of other creative arts therapies (e.g., painting therapy, dance/movement therapy) in improving emotion/affect in people with neurological or psychiatric disorders (e.g., autism and anxiety; Brown et al., 2018; Khadar et al., 2013; Lee et al., 2017; Mateos-Moreno & Atencia-Doña, 2013), light painting interventions may also benefit their mood; however, this requires further research for confirmation. We also found that there were no significant differences in the feeling of loneliness between the LP and CTL groups. As both the LP intervention and the CTL self-study activity were

group-based, none of the participants felt lonely during the experiment.

Our study has several practical implications. First, light painting, as an easy-to-learn recreational art form with high interactivity, may be a promising new branch of creative arts therapy that could be used to improve the spatial ability of healthy participants. The participants in our study were intensely interested in light painting, especially when they painted as a group. They regarded light painting as a fascinating activity that is quite different from traditional ways of improving spatial ability, such as repeated mental rotation training, which can be looked on as boring (Heil et al., 1998). Although playing video games is also an interesting method of improving spatial ability (e.g., Moreau, 2013; Quaiser-Pohl et al., 2006), it bears the risks of addiction and visual impairment. Second, for some complex neuropsychiatric disorders, such as autism spectrum disorder—which is a severe developmental disorder characterized by social dysfunction, speech deficits, stereotyped behavior, and emotional dysfunction (Cooper, Loades, & Russell, 2018)—a comprehensive creative arts therapy intervention may be more effective than adopting a single modality (e.g., art therapy, dance/movement therapy, music therapy). Therefore, in future studies participants with disorders such as autism should be incorporated to investigate the effects of a light painting intervention in such populations.

As our research constitutes a preliminary and exploratory study, it inevitably has some limitations. First, our participants were healthy university students who had good cognitive skills and normal psychological development, which may cause a null effect of the intervention (e.g., no significant effect on mood state as assessed with the PANAS) because of the ceiling effect. Second, as the light painting activity comprised a variety of art elements, such as painting, dance, and music, it is difficult to clarify whether the benefits may be attributable to a certain art modality or to some other aspect of the activity (e.g., group work). Third, we cannot exclude the possibility that collectivism, which is a feature of Chinese culture, had a positive effect on the outcome of taking part in light painting, because it is a group-based activity and completion of the artwork necessitates cooperation among all the team members. Further studies should be conducted to compare the effects of an LP intervention in different cultural contexts, for example, East Asian collectivism with Western individualism. Fourth, although the LP group provided some positive feedback on the intervention in the follow-up survey, this is indicative of only the acceptability and feasibility of the intervention. The cognitive and socioemotional effects of light painting interventions still need to be validated in future studies with a rigorous pre- and posttest design.

In summary, we found that taking part in light painting had significant positive effects on spatial ability and in socioemotional domains among healthy young adult participants. Our study supports the use of light painting as a promising new type of creative arts therapy. Further research should be conducted to assess whether this intervention can also benefit people with neuropsychiatric disorders.

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Appendix
Description of the Five Sessions of the Light Painting Activity

Session number	Name of the session	Detailed description of the procedure
Session 1	Knowing light painting	First, the principles of light painting, as well as the light sources (e.g., LED lights, luminous ring, light stick) and photographic equipment (digital camera, tripod, and laptop), were introduced. The digital camera was connected to a laptop computer to show the photographs of the light paintings. Then, the 30 participants were divided into five groups to try light painting. After obtaining some preliminary experience, the participants were encouraged to collaborate with their team members to work out some simple light painting pictures. Next, the experimenter and photographer showed the light painting pictures to each of the groups and provided some feedback and suggestions to them. This first activity allowed participants to became familiar with light painting. In the closing phase of the first session, the after-class assignment was given: To create a piece of work as an individual or in collaboration with others for the next session.
Session 2	Exploring light painting	This session included two phases. During the first phase, the after-class assignment works set in Session 1 were presented and feedback was provided. First, all participants showed the light painting work they had completed either as an individual or as part of a group. Then, the participants in the other groups guessed the theme of the work. Subsequently, the experimenter and photographer provided some feedback and suggestions to refine the light painting. Finally, the participants redid the light painting to produce a better piece of work. In the second phase, the 30 participants were regrouped in different combinations to allow them all to become familiar with each other. In each group, the six members were evenly divided into two small teams. Then, one of the three-member teams assigned a light painting task to the other team (e.g., constructing a swimming fish) and provided some feedback to them. (See example in Figure 2A.) After that team had finished the task, the teams switched roles. Through this exercise, the participants accumulated experience at both individual and group levels and gained a sense of team spirit. For the next session, participants were asked to bring along a light source to use.
Session 3	Playing with light painting	This session also included two phases. In the first phase, all participants were again regrouped into five groups. They were then asked to develop light paintings focused on the relationship between light and the human body. In the second phase, the participants were regrouped again and instructed to freely create a work utilizing the existing light sources and equipment that the experimenter provided, as well as those the participants were asked to bring along as alternative light sources (e.g., a glowing ball).
Session 4	Creating a whole picture together	In this session, the experimenter and photographer showed participants the Xiaoxiang Spectacle Scroll by Mi Youren (a famous painter in the Song dynasty) and instructed them to work out a light painting of this picture. First, the participants were divided into five groups. Each group practiced to construct a certain part of the whole picture. Then, the light painting of each group was photographed and feedback was provided by the photographer and other groups. After they had made adjustments, each group performed the task again and the painting was photographed once more. Finally, all 30 participants began to work together on the whole picture. After some practice, all the participants collectively completed the light painting (see Figure 2B).
Session 5	Free presentation using light painting	In the last session, the participants were encouraged to present whatever pictures they wanted to freely express. First, they proposed a subject for a picture and chose the equipment and how to create it. Then, they practiced light painting techniques to create the pictures, either individually or in a group. After discussion with other participants, they made modifications and presented the light painting again. After all participants had accomplished their own piece of art, the experimenter took a group portrait of the 30 participants with the light sources in their hands. Finally, the experimenter summarized the content of the five sessions and thanked all the participants.