Development of a Three-Stage Strength-Based Meaning Intervention to Promote Mental Health Among Individuals with Physical Disabilities in Disadvantaged Communities: A Randomized Controlled Trial

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Abstract
A three-stage strength-based meaning intervention (SMI) was developed in the present study, and its utility in facilitating the mental health of individuals with physical disabilities in low-income communities was tested. A randomized controlled and single-blind trial was adopted. A total of 50 qualified participants (mean age = 42.12, standard deviation = 8.68; 48% males; 26 for the intervention group, 24 for the control group) completed the pre-intervention test, post-intervention test, and three-month follow-up test. No significant difference was observed between the two groups at pre-intervention assessment. After intervention, the results in terms of strength knowledge, strength use, sense of meaning in life and mental health showed a significant improvement in the intervention group, with the changes maintained over three months except mental health. The differences in mental health between the post-intervention test and the three-month follow-up test were not significant in the intervention group. The results imply that the SMI model is a promising approach in promoting the mental health of individuals with physical disabilities in low-income communities as it promotes improved knowledge and use of strength and sense of meaning in life.

Keywords Individuals with physical disabilities · Strength-based intervention · Meaning therapy · Mental health · Disadvantage community · Randomized controlled trials

1 Introduction

Individuals with physical disabilities who reside in low-income areas are at high risk to develop mental health problems, such as depression and anxiety (Banks et al., 2017; Timms, 1998; World Health Organization, 2017). In low-income communities, insufficient resources (e.g., finances) leads to a lack of support for psychological services for such individuals, exacerbating their situation of disadvantage (Banks et al., 2017). Several interventions have shown benefits in promoting mental health for individuals with physical disabilities.
disabilities, including physical and psychosocial therapies (Chaiyawat & Kulkantrakorn, 2012; Zemestani & Mozaffari, 2020). However, most of these interventions focus on curing mental illness, adopting deficit-based perspectives. Individuals with physical disabilities may not be responsive to such interventions, specifically in the Chinese context, in which physical and mental deficits (e.g., depression and somatization), as well as help-seeking behaviors, are stigmatized (Li et al., 2019). Moreover, such interventions require considerable resources. Due to poverty-related conditions, such as the non-availability of recovery professionals (World Health Organization, 2011), individuals with physical disabilities from low-income areas may not have access to such intervention options.

According to the Chinese Disabled Persons’ Federation, individuals with physical disabilities are those who have “a loss of motor function of varying degrees or limitation in movements or activities resulting from deformed limbs or body paralysis or deformity caused by damage to the structure or function of those body parts involved in mobility”, with physical disabilities divided into ten levels according to the Chinese classification (Chinese National Bureau of Statistics, 2006; Murray et al., 2012). The causes of disability include congenital disorders, trauma, and disease (e.g., poliomyelitis, osteoarthrosis, cerebrovascular diseases, and multiple sclerosis). In China the main causes are disease and injury; that is, most physical disabilities are acquired (Liu, 2003). Individuals with disabilities living in low-income communities suffer from the dual plight of poverty and disability (Banks et al., 2017; Braithwaite & Mont, 2009), both sources of stress on their mental health (Lund, 2014; Lund et al., 2010; Patel & Kleinman, 2003; Zhao & Wang, 2021). An epidemiological survey of mental disorders in four provinces in China showed that individuals in low-income areas suffered a higher risk of mental disorders than those in high-income areas (Phillips et al., 2009). In addition to the vicious circle of poverty and disability, other factors such as stigmatization of psychological disorders, lack of infrastructure and trained practitioners in mental health care, and large rural–urban disparities have also forced individuals with disabilities in Chinese low-income communities into disadvantage (Li et al., 2019; Phillips et al., 2009; Zhao & Wang, 2021). Therefore, it is critical to develop and deliver practical and effective psychological interventions for individuals with physical disabilities in low-income areas in China. This study aims to develop an intervention model which can be adapted to reach a greater proportion of individuals who are struggling with poverty and disability in other countries and regions (Trani & Loeb, 2012).

In contrast to deficit-based perspectives, strength-based perspectives support the notion that individuals with physical disabilities have the potential to leverage their strengths to make life more meaningful (Kobau et al., 2011; Niemiec et al., 2017), along with the ability to adapt healthily living with disability both physically and psychosocially (Psarra & Kleftaras, 2013). Acquiring a physical disability as a result of a traumatic event precipitates a meaning-of-life crisis (Psarra & Kleftaras, 2013). Having a sense of meaning in life involves working toward the goal of transcending the present moment and being able to move steadily toward the achievement of value and meaning in life in a planned way (Heintzelman & King, 2014; Steger, 2013). Studies have shown that people who find meaning in life may better cope with challenges related to disability. For example, individuals with physical disabilities who make or find meaning tend to show less negative emotion and higher well-being than those who are unable to find meaning (Dezutter et al., 2013). Recently, some studies have shown that individuals with physical disabilities or chronic diseases who find meaning in life may be better able to cope with negative emotions. For example, a study of individuals with multiple sclerosis reported that making meaning resulted in benefits including higher life satisfaction and lower levels of anxiety and depression (Pakenham, 2007). Similarly, spinal cord injury patients with meaning and
purpose in life were shown to achieve excellent recovery (deRoon-Cassini et al., 2009). For people with long-term physical dysfunction, life purpose, acceptance, and life meaningfulness, essential elements of a sense of meaning in life, may directly or indirectly affect depression, anxiety, and other outcome variables related to mental health (Martz & Livneh, 2016). This study thus aimed to develop a strength-based meaning intervention (SMI) and test whether it is an effective means of promoting the mental health of individuals with physical disabilities from communities in low-income areas in China.

### 1.1 Intervention Development

Meaning-enhancing intervention (e.g., logotherapy and meaning therapy) is a pluralistic approach to psychotherapy that is meaning-oriented and value-centered (Frankl, 1985; Wong, 2016). The key to meaning-enhancing intervention is spiritual activation through a creative approach that fits each participant’s unique characteristics (i.e., specific situation, personal history, personality) (Wong, 2016). The essential process for this spiritual activation includes three steps: (1) **Exploration**: finding traces of self-transcendence in the individual’s past experiences, (2) **Insight**: discovering meaning in life in the spiritual virtues of self-transcendence, and (3) **Implementation**: knowing the good and evil in the world, willingness to realize one’s own meaning, and development of positive personal traits (Frankl, 1985; Hill, 2017; Vos et al., 2017; Wong, 2016). Despite impressive results from meaning-enhancing interventions in alleviating mental health problems (e.g., depression, anxiety, stress) (Eisenbeck et al., 2021; Marco et al., 2021; Morgan, 2013; Park & Baumeister, 2016), such interventions remain underdeveloped compared to other positive interventions (Wong, 2016).

Several meaning-centered therapies have achieved exceptional results in clinical settings (Hill, 2017; Vos, 2016; Vos et al., 2017). For example, offering support, helping clients examine thoughts, feelings, and behaviors to discover hopes and goals, and facilitating exploration were recommended as clinical measures for meaningful therapy (Hill, 2017). Supportive and exploratory interventions were used to offer a safe place for individuals to encourage the desire for self-exploration, with which the measures can be more powerful (Hill et al., 2017). However, the theoretical foundations of classical meaning-centered practices, such as the sources of meaning identified by Frankl, tend to be philosophical and lack empirical support (Frankl, 1985; Vos et al., 2017; Wong, 2020). In addition, clinical therapies place high demands on therapists’ clinical competencies and dyadic therapeutic relationships to develop a unique sense of meaning for clients (Vos et al., 2017). Case-by-case work has become quite costly for numerous therapists and corresponding material resources support.

In contrast, group meaning intervention shows promise, such as meaning-centered group psychotherapy for cancer patients and survivors (Breitbart et al., 2010, 2015; van der Spek et al., 2014) and group logotherapy for depressed university students and stressed infertile couples (Mosalanejad & Koolee, 2013; Robatmili et al., 2015). Group intervention can be useful in resource-limited communities, leveraging the therapeutic value of exploring individual internal meaning by capitalizing on meaning embedded in the group process (Robatmili et al., 2015; Somov, 2007). Nevertheless, group meaning interventions for individuals with psychological subhealth who live in low-income communities remain less explored. Given the demonstrated clinical effectiveness and cost-effectiveness of group meaning interventions in the available research evidence, this study aimed to
design a group meaning intervention for the target population of individuals with physical disabilities.

Meaning-enhancing intervention is open to incorporating different approaches of psychotherapy, such as cognitive behavioral therapy, narrative therapy, couples therapy, and online intervention (George & De Guzman, 2019; Schulenberg et al., 2009; Singer et al., 2013; Van Zyl et al., 2020). In this study, we tried to combine meaning-enhancing intervention with strength–based intervention, which is beneficial to different groups such as individuals with developmental, intellectual, and chronic physical disabilities, children with neuropsychiatric disabilities, and brain injury survivors (Andrewes et al., 2014; Niemiec et al., 2017; O’Donnell, 2013; Ullenhag et al., 2020). Here, “personal strength” is defined as a set of positive personal assets reflecting human virtues through which people may achieve more fulfilling and meaningful lives (Peterson & Seligman, 2004). Strength-based interventions are conducted in accordance with the cognitive behavioral model (Bu & Duan, 2017; Duan & Bu, 2017; Duan et al., 2017, 2018). These can improve individual well-being and reduce negative emotions in a specific and effective way, such as by encouraging strength knowledge and strength use (Gander et al., 2012; Seligman et al., 2005; Sin & Lyubomirsky, 2009). Previous studies have reported a positive correlation between character strengths and sense of meaning (Littman-Ovadia & Steger, 2010) and that balancing various strengths is conducive to enhancing a sense of meaning (Allan, 2014). Furthermore, strength-based intervention, an independent approach emphasizing self-observation, has been proven effective for promoting resilience and flourishing, which in turn can drive individuals to resist adversity (Bu & Duan, 2021; Rashid, 2014). In light of previous strength-based interventions, such as strength-based cognitive and flourishing interventions (Bu & Duan, 2021; Duan & Bu, 2017), we believe that SMI, which combines character strength with meaning-enhancing intervention, can be a creative way to promote mental health among individuals with physical disabilities living in low-income communities.

Specifically, we developed a three-stage SMI. In the first stage, we focused on enhancing awareness of strengths and exploring past or current meaningful experiences, in which we identify the spotlight of strengths. In the second stage, we aimed to help participants engage in meaningful activities by using one’s strengths, thus gaining insight into the link between their life meaning and their strengths. In the third stage, participants were encouraged to use their strengths to make plans for achieving meaning and making it habitual in their future lives. The outline of SMI is shown in Table 1.

1.2 The Current Study

This study consists of a randomized controlled trial (RCT). We developed an SMI that aimed to enhance the mental health of individuals with physical disabilities by enhancing their ability to understand and use their strengths and explore meaning in life. This study proposed the following hypotheses. We first checked the manipulation of the use and knowledge of character strengths and sense of meaning in life in this study (Hypotheses 1a–c): specifically, compared with the control group, the intervention group was expected to indicate benefits after the intervention, including improvements in (a) strength knowledge level, (b) strength use level, and (c) level of sense of meaning in life. To test the intervention effects, we further propose Hypothesis 2: compared to participants in the control group, those in the intervention group should show better improvements in mental health after the intervention.
### Table 1  Summary of intervention manual contents

| Stage                  | Content                                      | Length       |
|------------------------|----------------------------------------------|--------------|
| First stage (Exploration) | Theme: Awareness of meaning and strengths     | 90 minutes   |
|                        | Essential Content: Raise awareness of strengths |              |
|                        | Explore past or current meaningful experiences |              |
|                        | Identify the spotlight of strengths from the experiences |  |
|                        | Example Activities: Introduce character strengths |              |
|                        | Identify and praise each other’s strengths   |              |
|                        | Identify your signature strengths and cultivate your intrinsic self-worth |  |
|                        | Share meaningful moments from past and current experience (e.g., selflessly helping others and showing a sense of social responsibility) |  |
|                        | Explore character strengths used in meaningful experiences |  |
| Second stage (Insight)  | Theme: Insight of meaning and strengths       | One day      |
|                        | Essential Content: Engage in meaningful activities by using strengths |  |
|                        | Gain insight into meaning of themselves connected with strengths |  |
|                        | Example Activities: Divide all participants into four groups |  |
|                        | Each group go on an adventure in a scenic area in pairs |  |
|                        | Look for meaningful moments with strength using and photograph with their smartphones |  |
|                        | Reflect upon what the photo meant and how strengths assisted them to gain the meaning of life |  |
| Third stage (Implement) | Theme: Application of meaning and strengths    | 90 minutes   |
|                        | Essential Content: Make plans by using strengths for future to continue achieving meaning in life |  |
|                        | Make use of the strengths to get meaning into routine in the future |  |
|                        | Example Activities: Reviewing the meaningful photos and strengths using in previous stage |  |
|                        | Imagine the meaningful life in the future     |              |
|                        | Make a plan for how you would use your strengths to achieve meaning in future life |  |
2 Methods

2.1 Trial Design and Setting

A randomized (1:1) parallel-group controlled, single-blind trial was applied to test SMI on individuals with physical disabilities in a community in Kunming City, the capital of Yunnan Province, located in Southwest China. This city has a comparatively disadvantaged economic level in which the annual disposable income for each urban resident averages 48,018 CNY (about 7409 USD), while the annual disposable income for each rural resident is 17,719 CNY (about 2734 USD) (The Kunming City Government, 2020).

A power analysis was conducted using G*Power v3.1 (Bruin., 2011) based on a repeated measure analysis of variance to estimate the sample size needed to assess the interaction effect of the intervention. Specifically, first, among the test family options, we selected “F test”; then, from the statistical test options, we selected “ANOVA: Repeated measures, within-between interaction”; and finally, for type of power analysis we to calculate the sample size we chose “A priori: Compute required sample size—given alpha, power, and effect size.” Input parameters were set as three measurements, a large effect size (partial eta square) of 0.14, an alpha of 0.05, and a power of 80%, since several meta-analyses of meaning-enhancing interventions have reported a large effect size for promoting a sense of meaning in life (Manco & Hamby, 2021; Vos et al., 2015). Thus, the total sample size for the current study was optimized at least 34. Relying on local communities and disability federations to advance the participant recruitment process, 50 participants were recruited for the intervention.

2.2 Participants and Procedures

To achieve and increase a sense of meaning in life among individuals with physical disabilities, we designed an intervention program in cooperation with the Kunming Disabled Persons’ Federation and the Sichuan Yuanmeng Disabled Service Center. The recruitment announcement for the program was posted by these local organizations to prospective participants, who were pre-screened based on inclusion and exclusion criteria. The inclusion criteria were as follows: (a) age range 18–65 years old, (b) able to read and write Chinese at a minimum of year 6 education level, and (c) diagnosed with Grade Four physical disability (i.e., the least severe level; able to complete daily activities independently with mild limb dysfunction) by the National Practical Standards for Evaluation of Disabled People (Standardization Administration of the People’s Republic of China et al., 2011). Meanwhile, the exclusion criteria were as follows: (a) participated in at least one other session of psychosocial or multidisciplinary therapy in a month, (b) identified as Grade Three and above physical disability (i.e., the more severe levels; partial or complete inability to complete daily activities independently) by the National Practical Standards for Evaluation of Disabled People (Standardization Administration of the People’s Republic of China et al., 2011), and (c) diagnosed with any other type of disability (e.g., hearing, visual, speech, intellectual).

Written informed-consent forms were obtained before the participants took part in the study. Upon completion of all phases of the intervention and assessment each participant was given 30 CNY (about 4.53 USD) to compensate them for the time spent. For context, the daily disposable income for an urban resident is about 117.78 CNY (about 17.80 USD) and for rural about 48.81 CNY (about 6.17 USD) (The Kunming City Government, 2020).
Conversions were based on the average USD-CNY exchange rate (6.62 USD/CNY) for 2018 (China Foreign Exchange Trade System, 2018). The 50 qualifying participants recruited (M\textsubscript{age}=42.12, standard deviation=8.68; 48% males, 52% females) were split between the intervention group (n=26) and the control group (n=24), according to a list of random numbers generated by computer. All 50 participants completed the pre- (T1) and post-intervention (T2) as well as the three-month follow-up test (T3). There were no dropouts. The CONSORT flowchart can be seen in Fig. 1. We assumed that all characteristics (i.e., age, sex, employment status, monthly income level, marital status, cause of disability, caregiver(s), residence, long-term control medication, and education level) did not significantly vary between the two groups. All data analyses were conducted using JASP v0.14.1 (JASP Team, 2020). In this paper, we report how the sample size was determined.

![Fig. 1 CONSORT flowchart of participants](image-url)
and all data exclusions, manipulations, and measures used in the study (Simmons et al., 2012).

### 2.3 Intervention Sessions

The intervention consisted of three phases designed by an interdisciplinary team. Social work experts, positive psychologists, frontline social workers in the local community, local agency staff, and disability services specialists were also involved.

The SMI in this study included three stages for three consecutive days. The details are shown in Table 1. The first stage, which lasted 90 min, aimed to explore meaning from past or current experiences based on awareness of strengths. The strategies used in this stage were adopted from previous strength-based and meaning-centered intervention strategies, such as identifying signature strengths (Bu & Duan, 2021; Seligman et al., 2005) and cultivation of intrinsic self-worth (Wong, 2015b).

In the second stage, we adopted nature-based and photo-ethnographic strategies to help participants engage in meaningful activities and discover enduring values and meaning in life (Capaldi et al., 2015; Van Zyl et al., 2020). Specifically, the participants were invited to spend a whole day in a scenic area and look for meaningful moments while using their strengths and taking photographs with their smartphones. After the outing, the participants were instructed to reflect upon what the photos meant and how their strengths assisted them in discovering meaning in life.

In the last stage, which lasted about 90 min, the participants were encouraged to make plans to find meaning in the future by applying their strengths and making it habitual. In this stage, meaning-centered intervention strategies (e.g., fast-forwarding techniques) were applied to assist participants in developing a plan for how they would use their strengths to achieve meaning in their future lives (Wong, 2015b).

The control group in our study received no intervention of any kind. They only engaged in the normal activities offered by the community. Social workers and staff from local agencies communicated with all participants in both groups regularly to track their physical and psychological conditions to ensure that the participants in both groups had not suffered significant events during the study that might affect results.

### 2.4 Measures

#### 2.4.1 Strength Knowledge and Use

The levels of participants’ strength knowledge and use were measured using the Chinese versions of the Strength Knowledge Scale (SKS, 8 items), a seven-point Likert-type scale with choices ranging from 1 = “strongly disagree” to 7 = “strongly agree” for all items except the second (1 = strongly agree and 7 = strongly disagree), and of the Strength Use Scale (SUS, 14 items), a seven-point Likert-type scale ranging from 1 = “strongly disagree” to 7 = “strongly agree” (Duan et al., 2017; Govindji & Linley, 2007). The two scales have been shown to have high reliability (Duan et al., 2017). In the current research, both scales presented a good internal consistency coefficient (T1: Cronbach’s $\alpha=0.97$, T2: Cronbach’s $\alpha=0.97$, T3: Cronbach’s $\alpha=0.95$).
2.4.2 Meaning in Life

The Meaning in Life Questionnaire was used to measure the level of the subjects’ sense of meaning in life. This tool consisted of two subscales corresponding to presence of meaning and the search for meaning. Each subscale contains five items, with a score ranging from 1 (“absolutely untrue”) to 7 (“absolutely true”) (Chan, 2016; Steger et al., 2006). The Chinese version of this scale represented a high internal consistency coefficient (Huo et al., 2019). In this study, the internal consistency of the questionnaire was found to be acceptable after performing tests three times (T1: Cronbach’s α = 0.95; T2: Cronbach’s α = 0.90; T3: Cronbach’s α = 0.84).

2.4.3 Mental Health

The Depression Anxiety Stress Scale, which consisted of three subscales (Depression, Anxiety, and Stress), was used to measure the participants’ mental health levels. Each subscale contains seven items, with scores ranging from 0 (“not suitable for me at all”) to 3 (“very suitable for me”) (Lovibond & Lovibond, 1995). The Chinese version of this scale represented a high internal consistency coefficient (Lu et al., 2018). In this study, the internal consistency of the questionnaire was found to be high after performing tests three times (T1: Cronbach’s α = 0.95; T2: Cronbach’s α = 0.97; T3: Cronbach’s α = 0.94).

3 Results

3.1 Descriptive Statistics and Pre-intervention Examination

Chi-squared tests (for sex, employment status, education level, monthly income level, marital status, cause of disability, long-term control medication, caregiver(s), and residence, in Table 2) and ANOVA (for age and length of disability, in Table 2) were used to estimate the differences in demographic characteristics for participants in the two groups. The result reflects that there is no difference in age, sex, employment status, monthly income level, marital status, cause of disability, caregiver(s), or residence, but there was significant difference in long-term control medication ($\chi^2 = 14.67, p < 0.001$) and marginally significant in education level ($\chi^2 = 9.41, p = 0.05$). The mean and standard deviation for outcome variables at three time points are reported in Table 3. One-way ANOVAs for the variables at T1 in both the control and intervention groups are also shown in Table 3. There was no significant difference between the intervention and control groups at T1 in terms of strength knowledge, strength use, sense of meaning in life, and mental health.

3.2 Manipulation Check

The improvements of strength knowledge, strength use, and sense of meaning in life were tested as manipulation checks through repeated measures ANOVA with group and time as the between-subjects and within-subjects factors, respectively, using partial eta-squared ($\eta_p^2$) to estimate the effect size. The partial eta-squared effect sizes ($\eta_p^2$) were defined as small (0.01), medium (0.06), and large (0.14) (Cohen, 2013). For post hoc analysis, ANOVA was used for comparison of within-groups and between-groups effects, and Cohen’s $d$ was used to estimate the effect size. Cohen’s $d$ was defined as small (0.20),...
Table 2  Chi Square Tests for Demographic characteristics of participants

| Characteristics                   | Total Sample (n = 50) | Intervention Group (n = 26) | Control Group (n = 24) | ANOVA | Chi Square Tests |
|-----------------------------------|-----------------------|-----------------------------|------------------------|-------|------------------|
|                                   | M ± SD | Range | M ± SD | Range | M ± SD | Range | F | p | x² | p |
|                                   | n | %     | n | %     | n | %     |    |    |    |    |
| Age                               | 42.12 ± 8.68 | 25-56 | 41.12 ± 8.54 | 26-53 | 43.21 ± 8.89 | 25-56 | 0.72 | .40 |    |    |
| Sex                               |          |       |       |       |       |       | 0.07 | .79 | 4.93 | .09 |
| Male                              | 24 | 48.00% | 12 | 46.15% | 12 | 50.00% |    |    |    |    |
| Female                            | 26 | 52.00% | 14 | 53.85% | 12 | 50.00% |    |    |    |    |
| Employment Status                 |          |       |       |       |       |       | 9.41 | .05 |    |    |
| Employed                          | 32 | 64.00% | 20 | 76.92% | 12 | 50.00% |    |    |    |    |
| Unemployed and Retired            | 12 | 36.00% | 6  | 23.08% | 12 | 50.00% |    |    |    |    |
| Education Level                   |          |       |       |       |       |       |    |    | 1.34 | .51 |
| Primary School and Below          | 4  | 8.00% | 0   | 0.00% | 4  | 16.67% |    |    |    |    |
| Junior School                     | 18 | 36.00% | 7  | 26.92% | 11 | 45.83% |    |    |    |    |
| High School                       | 13 | 26.00% | 10 | 38.46% | 3  | 12.50% |    |    |    |    |
| Specialty College                 | 11 | 22.00% | 7  | 26.92% | 4  | 16.67% |    |    |    |    |
| Bachelor and Above                | 4  | 8.00% | 2  | 7.69% | 2  | 8.33% |    |    |    |    |
| Monthly Income (CNY)              |          |       |       |       |       |       |    |    |    |    |
| 0-3000                            | 46 | 92.00% | 24 | 92.31% | 22 | 91.67% |    |    |    |    |
| 3001-12000                        | 4  | 8.00% | 2  | 7.69% | 2  | 8.34% |    |    |    |    |
| Marital Status                    |          |       |       |       |       |       |    |    | 6.10 | .11 |
| Unmarried                         | 17 | 34.00% | 12 | 46.15% | 5  | 20.83% |    |    |    |    |
| Married                           | 28 | 56.00% | 11 | 42.31% | 17 | 70.83% |    |    |    |    |
| Others                            | 5  | 10.00% | 3  | 11.54% | 2  | 8.34% |    |    |    |    |
| Causes of Disability              |          |       |       |       |       |       |    |    | 2.67 | .26 |
| Acquired                          | 40 | 80.00% | 23 | 88.46% | 17 | 70.83% |    |    |    |    |
| Hereditary/Congenital             | 10 | 20.00% | 3  | 11.54% | 7  | 29.17% |    |    |    |    |
Table 2 (continued)

| Characteristics                          | Total Sample (n = 50) | Intervention Group (n = 26) | Control Group (n = 24) | ANOVA | Chi Square Tests |
|------------------------------------------|-----------------------|-----------------------------|------------------------|-------|------------------|
|                                          | M ± SD | Range     | M ± SD | Range     | M ± SD | Range     | F   | p   | x²  | p   |
|                                          | n      | %         | n      | %         | n      | %         |     |     |     |     |
| Length of Disability (Year)              | 25.96 ± 15.2 | 1.89-52.56 | 24.89 ± 15.92 | 1.89-52.56 | 27.12 ± 14.55 | 3.63-51.74 | 0.27 | .61 |     |     |
| Long-Term Control Medications            |         |           |         |           |         |           | 14.67 | < .001 |     |     |
| Yes                                      | 15      | 30.00%    | 14      | 53.85%    | 1       | 4.17%     |     |     |     |     |
| No                                       | 35      | 70.00%    | 12      | 46.15%    | 23      | 95.83%    |     |     |     |     |
| Care Giving                              |         |           |         |           |         |           | .98  | .61  |     |     |
| No Care Givers                          | 15      | 30.00%    | 9       | 34.62%    | 6       | 25.00%    |     |     |     |     |
| By Partner, Family and Friends - Unpaid | 32      | 64.00%    | 15      | 57.69%    | 17      | 70.83%    |     |     |     |     |
| By Staffs In Nursing Home                | 0       | 0.00%     | 2       | 7.69%     | 0       | 0.00%     |     |     |     |     |
| Others                                   | 3       | 6.00%     | 0       | 0.00%     | 1       | 4.17%     |     |     |     |     |
| Living                                   |         |           |         |           |         |           | 1.92 | .17  |     |     |
| Living at Home                           | 48      | 96.00%    | 24      | 92.31%    | 24      | 100.00%   |     |     |     |     |
| Others                                   | 2       | 4.00%     | 2       | 7.69%     | 0       | 0.00%     |     |     |     |     |

Bolded indicates significant results
Table 3  Descriptive analysis for variables at three time points and ANOVA for variables at pre-intervention

|                      | Intervention Group (n = 26) | Control Group (n = 24) | ANOVA |
|----------------------|-----------------------------|------------------------|-------|
|                      | Mean  | SD    | Mean  | SD    | F     | p   | $\eta^2_p$ |
| Strength Knowledge   |       |       |       |       |       |      |           |
| Pre-Intervention     | 5.11  | 0.86  | 4.99  | 0.72  | 0.27  | .61 | .01       |
| Post-Intervention    | 5.53  | 0.80  | 4.91  | 0.67  |       |     |           |
| 3-Month Follow-Up    | 5.62  | 0.89  | 4.63  | 0.96  |       |     |           |
| Strength Use         |       |       |       |       |       |      |           |
| Pre-Intervention     | 4.93  | 1.02  | 4.77  | 1.16  | 0.30  | .59 | .01       |
| Post-Intervention    | 5.54  | 0.92  | 4.83  | 1.08  |       |     |           |
| 3-Month Follow-Up    | 5.50  | 0.91  | 4.94  | 1.04  |       |     |           |
| Meaning in Life      |       |       |       |       |       |      |           |
| Pre-Intervention     | 4.84  | 1.32  | 4.69  | 1.29  | 0.18  | .68 | .01       |
| Post-Intervention    | 5.58  | 0.94  | 4.67  | 1.58  |       |     |           |
| 3-Month Follow-Up    | 5.32  | 1.03  | 4.57  | 0.81  |       |     |           |
| Mental Health        |       |       |       |       |       |      |           |
| Pre-Intervention     | 0.93  | 0.71  | 0.90  | 0.75  | 0.02  | .89 | .01       |
| Post-Intervention    | 0.44  | 0.54  | 1.07  | 0.68  |       |     |           |
| 3-Month Follow-Up    | 0.70  | 0.84  | 1.10  | 0.42  |       |     |           |

SD Standard Deviation

Fig. 2  The level of strength knowledge in two groups at three time points. T1 = Pre-Intervention; T2 = Post-Intervention; T3 = Three-Month Follow-Up; IG = Intervention Group; CG = Control Group; The dashed lines indicate insignificant differences and the solid lines indicate significant differences; ns p > .05, * p < .05, ** p < .01, *** p < .001

medium (0.50), and large (0.80) (Cohen, 2013). We have used the Bonferroni method to adjust the p-value three times to control for alpha-error cumulation Detailed results can be found in Figs. 2, 3 and 4 and Tables 4 and 5.
The 2×3 mixed repeated measure analyses reported that the main group effect of strength knowledge, strength use, and sense of meaning in life were all significant. Detailed results can be found in Table 4. Pairwise comparisons (seen in Table 5) showed that the
differences in strength knowledge, strength use, and sense of meaning in life were significant between the two groups at T2 and T3. Differences in strength knowledge and sense of meaning in life between the two groups were still significant at T3, while the significance of strength use between the two groups decreased at T3.

Furthermore, strength knowledge and strength use in the intervention group gained significant growth at T2 and T3, while the change in strength knowledge and strength use was not significant from T2 to T3. A conspicuous difference was found in sense of meaning in life at T2, while the significance was not observed at T3. There was no significant change of sense of meaning in life from T2 to T3. In the control group, the changes were not significant. Therefore, the results supported the manipulation check (Hypotheses 1a–c), indicating that the intervention group showed improvements in strength knowledge and use and sense of meaning in life after the intervention, compared with the control group.

### 3.3 Intervention Effects

Mental health was determined as the dependent variable and was tested through repeated measures ANOVA with the group as the between-subjects factor and time as the within-subjects factor using partial eta-squared ($\eta_{p}^2$) to estimate effect size. We measured the levels of participants’ negative emotions (depression, anxiety, and stress) to reflect the state of their mental health. The participants in the intervention group showed a fair decrease in the discovery of negative emotions. ANOVA was used for comparison of within-groups and between-groups effects and Cohen’s $d$ was used to estimate the effect size in post hoc analysis. Cohen’s $d$ was defined as small (0.20), medium (0.50), and large (0.80) (Cohen, 2013). Detailed results can be found in Fig. 5 and Tables 4 and 5.

Results of the repeated measures analysis (shown in Table 4) showed that the main effect between groups was significant. Furthermore, pairwise comparisons (shown in Table 5) showed that the difference in the level of negative emotion was significant between the two groups at T2, with the significance decreasing at T3. The time×group interaction effect was significant, while the main time effect was not significant. Post hoc analyses (shown in Table 5) showed that levels of mental health in the intervention group significantly changed from the pre-intervention to the post-intervention, while three months later, the change was not significant. Notably, no significant changes appeared from T2 to T3 either. Furthermore, there were no significant differences in the control group for all three tests. Hypothesis 2 regarding intervention effects was partially supported in that participants in

### Table 4 Repeated-measures analyses of variables for intervention effectiveness analysis

|                         | Time×Group Interaction | Main time effect | Main group effect |
|-------------------------|------------------------|------------------|------------------|
|                         | $F$  | $p$  | $\eta_{p}^2$ | $F$  | $p$  | $\eta_{p}^2$ | $F$  | $p$  | $\eta_{p}^2$ |
| Strength Knowledge      | 5.29 | .01  | .10          | .84  | .43  | .02          | 10.97| <.01 | .19          |
| Strength Use            | 2.00 | .14  | .04          | 4.21 | .02  | .08          | 3.98 | .05  | .08          |
| Meaning in Life         | 1.89 | .16  | .04          | 1.53 | .22  | .03          | 6.44 | .01  | .12          |
| Mental Health           | 4.78 | .01  | .09          | 1.37 | .26  | .03          | 5.13 | .03  | .10          |

Time = tests of within-subjects’ effects; Group = tests of between-subjects’ effects; Time×Group = the interaction effects between time and group
Table 5  Post hoc analyses of variables

|                      | Within-groups effects | Control Group (n = 24) | Between-groups effects |
|----------------------|-----------------------|------------------------|------------------------|
|                      | T1 vs. T2             | T1 vs. T3              | T2: IG vs. CG          |
|                      | p | p_{bonf} | d | p | p_{bonf} | d | p | p_{bonf} | d |
| Strength Knowledge   | 0.03 | 0.08 | −0.51 | 0.69 | 1 | 0.12 |
|                      | 0.02 | 0.06 | −0.58 | 0.09 | 0.35 | 0.42 |
|                      | 0.58 | 1 | −0.11 | 0.09 | 0.26 | 0.34 |
| Strength Use         | 0.01 | 0.02 | −0.63 | 0.78 | 1 | −0.05 |
|                      | 0.02 | 0.05 | −0.59 | 0.46 | 1 | −0.15 |
|                      | 0.73 | 1 | 0.04 | 0.41 | 1 | −0.10 |
| Meaning in Life      | 0.01 | 0.04 | −0.65 | 0.94 | 1 | 0.01 |
|                      | 0.14 | 0.43 | −0.41 | 0.73 | 1 | 0.11 |
|                      | 0.29 | 0.88 | 0.26 | 0.71 | 1 | 0.08 |
| Mental health        | < .001 | < .001 | 0.78 | 0.27 | 0.82 | −0.24 |
|                      | 0.18 | 0.53 | 0.3 | 0.33 | 0.98 | −0.33 |
|                      | 0.06 | 0.17 | −0.37 | 0.93 | 1 | −0.05 |

\(T1 = \) Pre-Intervention, \(T2 = \) Post-Intervention, \(T3 = \) Three-Month Follow-Up, \(IG = \) Intervention Group, \(CG = \) Control Group, \(d = \) Cohen’s, Mean difference = raw mean difference
the intervention group exhibited greater improvements in mental health at T2 than those in the control group.

The data, code plan, and analysis scripts of the study are available from the first author by email.

4 Discussion

The research tested whether a three-stage SMI could enhance strengths and sense of meaning in life as a resource to improve mental health among individuals with physical disabilities living in disadvantaged communities. A significant immediate effect was observed in improving strength knowledge, strength use, and sense of meaning in life, as well as the mental health of participants in the intervention group. Although the three-month short-term effect declined, the differences between T2 and T3 were not significant.

The limited effect after the three-month follow-up test may be due to the following factors. First, effectiveness may be affected by the small sample size, and the results may thus have been affected by low statistical power. Notably, the absence of evidence of effectiveness does not mean that there was an absence of effectiveness (Wasserstein et al., 2019). Larger samples are conducive to a more accurate evaluation of interventions. Second, considering the limited funds and human resources in the local community, only one session was carried out at each stage. It is possible that the brief sessions shortened the period of intervention without allowing time for participants to gain adequate comprehension and habituation of intervention components, as may happen over several sessions (Rose et al., 2003). Therefore, multi-session intervention should be considered. Third, structural barriers (i.e., others’ negative attitudes and insensitive comments) still exist, threatening the mental health of individuals with disabilities (Martin et al., 2016). Negative social stigmas attached to individuals with physical disabilities serve as important factors in a low quality of life (Kim et al., 2021). Fourth, there may be insufficient motivation for participants...
to apply the strategies to pursue a sense of meaning of life after the intervention. Self-practice is crucial for ensuring the long-lasting effects of an intervention (Seligman et al., 2005). For individuals with physical disabilities in low-income areas, the need for material resources may be more urgent and important (Wang, 2018). Nevertheless, the overall well-being of individuals is achieved through both hedonic (i.e., experiences of pleasure and enjoyment) and eudaimonic happiness (i.e., experiences of meaning and purpose). Providing material resources, such as increased income, matters for the improvement of hedonic wellbeing, but may also lead to the “paradox of progress” if there is an absence of mental health services (Graham et al., 2017). Moreover, in Chinese rural areas, especially under the attack of COVID-19 in recent years, there are important reasons for the lack of treatment for people with mental disorders, including the lack of specialized mental health services and the limited training of general practitioners in mental health care (He et al., 2022; Phillips et al., 2009). Therefore, along with improving material supplements, mental health services for this group need to be emphasized. However, for groups characterized by a long-term negative psychological state, long-term interventions are needed to enhance the intervention effect. Meanwhile, for supporting individuals living in low-income communities, empowerment has been considered vital (Gu, 2017). Personality traits and beliefs were found to be key factors of individual-oriented empowerment (Gutiérrez, 1994). Thus, this study promoted individual empowerment through the SMI intervention strategy by focusing on personal strengths and sense of meaning in life.

Meaning-enhancing intervention is a pluralistic strategy, yet few studies have also incorporated strength-based intervention into the strategy (Cooper & McLeod, 2010; Wong, 2016), even if they both have the potential to promote mental health. Given that participants’ personal strengths (i.e., specific situation, personal history, personality) were developed by SMI, this study can thus be considered effective. Specifically, strength-based intervention (e.g., identification of one’s own strengths) offered a chance for participants to recognize and use their unique strengths. Character strengths have been shown to have a positive effect on the meaning-enhancing intervention (Rashid, 2014). According to research on the relationship between character strengths and the three happiness orientations (an existence that is pleasurable, engaging, and meaningful) (Seligman, 2002), character strengths are most closely related to a meaningful orientation (Peterson et al., 2007). Moreover, strength-based and meaning-enhancing interventions share a similar underlying mechanism, namely, the cognitive behavioral model (Bu & Duan, 2017; Duan & Bu, 2017; Duan et al., 2018; Wong, 2016). Furthermore, we chose nature-based and photography activities to address the special circumstances of individuals with physical disabilities. Due to physical dysfunctions and poor accessibility in low-income areas, people with physical disabilities have restricted access to outdoor activities, which limits their socialization. The disrupted social relationships of these individuals is an important factor in their low quality of life (Kim et al., 2021). This study thus provided an opportunity for participants to go out, and they were encouraged to build social relationships, take care of themselves, serve others, connect with nature, and overcome external situations and physical limitations, all in the spirit of self-transcendence (Wong, 2015a, 2016).

This study has some limitations. First, its generality is limited. The nature-based form of the activities limits the degree of physical disability for participants to only mild cases. Such activities are not accessible to individuals with severe physical disabilities. In addition, this form of group intervention may be particularly suitable for Chinese culture, where the connection between the individual and the collective and society is very important. Also, the definition of meaning is influenced by culture (Steger et al., 2008). In further research, a more universal intervention strategy may be sought. Second, the scales selected
in this study were all self-reporting scales in the form of a long questionnaire. Participants may become tired as they work through the questionnaire, thereby affecting the accuracy of the results. One study reported that some clients in meaning therapy were not fully aware of meaning-in-life issues and needed a longer period to prepare compared to clients who explicitly raised meaning-in-life issues (Hill et al., 2017). The semantic synonym technique was used in the pre-intervention test to identify whether participants were answering with care (DeSimone et al., 2015). The item “Do you think your life is meaningful?” was used three times in the pre-intervention questionnaire, and samples with inconsistent pre- and post-intervention test responses were excluded. Individuals who completed the intervention were more willing to participate, and this item was eliminated from the follow-up measures in order to reduce the size of the questionnaire. Thus, further studies may consider using mixed measurements with questionnaires and interviews as a better approach. Third, this study lacked a nature-based control group. Previous evidence has shown the benefits of brief exposure to nature in increasing individuals’ positive emotional states (Capaldi et al., 2015). Therefore, a nature-based control group who only participated in nature-based activities could be added in further studies to test whether the effect of SMI is generated by such activities. Fourth, the significant differences in educational level and long-term control medications in the two groups at the pre-intervention assessment were supposed to be considered. Poor education and comorbidity were proved consistent risk factors for low levels of mental health (Patel & Kleinman, 2003). However, participants’ physical disabilities were partially due to chronic diseases. Therefore, the factor of long-term control medication was difficult to control pre-intervention. More rigorous participant selection criteria should be applied in further studies.

Despite this study having some limitations, a brief SMI is still of significance. For communities with limited resources, the SMI provides an accessible option to help individuals with physical disabilities address their mental health needs. First, to a certain degree, strength-based intervention could encourage individuals with physical disabilities to take part in activities without concerns about stigmatization. Second, this intervention is low-cost and therefore can easily be implemented: on the one hand, excessive additional human resources are not necessary, because local community staff can be trained to deliver and facilitate intervention, while on the other, no community spending was required to build facilities, as SMI can be integrated into existing community-based initiatives in regular settings without additional costs. In China, many attractions are free for individuals with physical disabilities, so there is little financial burden for the participants.

In summary, this study integrated strength-based intervention and meaning therapy to form SMI, with the aim of improving the mental health of individuals with physical disabilities living in disadvantaged communities. The findings provide a new path through which individuals with physical disabilities can achieve well-being. In addition, SMI gained continuous development based on SCI and SFI, thereby offering scientific evidence for further studies.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Consent to Participate Informed consent was obtained from each participant included in the study.
Consent for Publication We, the authors, consent to our manuscript being published and agree to transfer copyright over to the journal upon the article’s acceptance.

Ethics Approval Ethics approval was obtained from the Human Subjects Ethics Sub-Committee of East China University of Science and Technology.

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