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Abstract

Purpose Studies that focus on the development of the typology of individual strength profiles are limited. Thus, this study aimed to determine strength profiles with different health outcomes based on the Three-Dimensional Inventory of Character Strengths (TICS).

Methods The TICS was used to measure three-dimensional strengths: caring, inquisitiveness, and self-control. A total of 3536 community participants (1322 males and 2214 females with ages ranging from 17 to 50, $M = 23.96$, SD = 5.13) completed the TICS. A subsample ($n = 853$; female = 68.2%, male = 31.8%) was further required to complete the Depression Anxiety Stress Scale and Flourishing Scale. A latent profile analysis (LPA) was conducted in the total sample to identify the latent strength profiles. Then, a three-step method was implemented to compare the mental health outcomes between strength profiles in the subsample.

Results The LPA helped determine two subgroups based on the entire sample: the at-strengths group (high scores on all dimensions) and the at-risk group (low scores on all dimensions). As expected, the at-strengths group had less significant negative emotional symptoms (at-strengths group = 0.57, at-risk group = 0.83, $\chi^2 = 33.54$, $p < .001$) and had better psychological well-being (at-strengths group = 5.81, at-risk group = 4.64, $\chi^2 = 276.64$, $p < .001$).

Conclusions This study identified two character strength profiles with different health outcomes. Specifically, populations with low-character strengths (caring, inquisitiveness, and self-control) were more likely to demonstrate poor mental health outcomes. Our findings also showed that a particular trait subtype can be considered in identifying high-risk populations and further implementing targeted strength-based interventions.

Keywords Latent profile analysis · Character strengths · Strength profile · Mental health · Strength-based intervention

Introduction

Character strengths are defined as a cluster of positive trait-like qualities that promote positive cognition, emotions, and behavior [1]. These strengths pertain to organized categories of positive qualities referring to the self, others, and the world [2]. Current studies have indicated that character strengths are related with life satisfaction, subjective well-being, and happiness [3, 4]. In addition, strength-based intervention has been shown to considerably improve individual satisfaction with life [5], happiness, and subjective well-being [3]. However, arguments regarding the effectiveness of the intervention remain. For example, some strength-based interventions demonstrate long-term effects for 6 months [3, 6], whereas other interventions are only effective within a period of 1 month or even less [6, 7]. One possible reason behind such a difference could be the characteristics of the participants, that is, people with high or low strength, have different reactions to strength-based interventions. As indicated by previous research, interventions are more effective on particular personality-type populations [8, 9]. Traits (e.g., big five model of personality) can be adopted as an organizing framework for identifying subtypes of health outcomes [10]. For example, Jokela et al. [11] noted that individuals with high neuroticism are strongly related with the risk of coronary heart disease. Interventions may also result in different effects on various personality profiles. For example, intervention to help prevent binge drinking is particularly more effective on those with a sensation-seeking

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personality than other personality profiles [8]. Therefore, identification of strength profiles can considerably improve the effectiveness of psychological interventions [12]. To the best of our knowledge, studies on the assessment of character strengths to develop a typology of individuals in different health outcomes are limited. The only study of Haridas et al. [13] employed a 24-item brief strengths test [14] to determine a four-profile solution (e.g., low, mind, heart, and high strengths), which is markedly associated with self-esteem, depression, anxiety, and coping efficacy. Nevertheless, the psychometric properties of the measure of character strengths they employed (i.e., brief strengths test) have yet to be investigated in empirical studies. This issue may challenge the results of Haridas et al. [13].

The assessment and factor structure issues of character strengths have been the subject of ongoing debates in the literature [15–17]. The primary dispute is that the factor structure might be disrupted by differences in cultural and moral norms [18]. With the framework of the combined emic–etic approach [19], Duan and Bu [20] developed a Three-Dimensional Inventory of Character Strengths (TICS) based on two independent samples: a cross-cultural (Asians vs. Westerners) sample and a cross-population (community participants vs. inpatients) sample. This study replicated and extended previous similar research [17, 21–23]. Items of the TICS were confirmed to be equivalent and relevant in both Western and Eastern societies. The TICS measured the following three-dimensional strengths: caring, inquisitiveness, and self-control. Caring involves strength in maintaining friendly relations with others, inquisitiveness refers to one's curiosity and creativity to explore the unknown outer world, and self-control indicates self-regulation and self-discipline to achieve one's life goals and values [20]. Accordingly, the current study adopted the newly developed Three-Dimensional Model of Character Strengths and its corresponding inventory to re-identify the subtypes that may have different health outcomes.

The person-oriented method (i.e., latent profile analysis [LPA]) was employed to provide profiles of individuals that can be used to identify different character strength subgroups. LPA is a mixture model for identifying qualitatively distinct subgroups in a population based on a set of continuously observed indicators [24]. Observable descriptions for different types of groups can be obtained using LPA. Moreover, designing targeted psychological interventions is now possible because of LPA [8, 9]. Compared with factor structure, the latent profile structure obtained from LPA can distinguish heterogeneous subgroups among the population. For example, compared with individuals with high heart and mind strengths (high strengths), individuals with only high heart strengths (heart strengths) have a similar mental health that is higher than those with low (low strengths) or only high mind strengths (mind strengths) [13]. Similarly, different from the configuration of the heart and mind strengths [13], Seligman [25] proposed a set of theoretical criteria for mental disorder, which relates low strength to illness and high strength to health. Many empirical studies have reported similar findings that are consistent with this theory. High- and low-character strength groups have been identified by Li et al. [26], who also reported that high character strengths are effective in ameliorating psychological symptoms, including depression, anxiety, and stress. Other studies have also found that participants who scored high in character strengths reported a strong increase in happiness and a decrease in depressive symptoms after undergoing strength-based intervention [3]. Therefore, we hypothesize that the profile of character strengths can be generalized into a two-profile model: the at-strengths group assuming high strengths and the at-risk group assuming low strength. Specifically, the at-strengths group is supposed to have less negative emotional symptoms and higher psychological well-being than the at-risk group.

By using the LPA approach in analyzing data from 3536 community participants, the current study aimed to identify distinct patterns and develop a typology of individuals through their character strength profiles. In addition, this study aimed to examine the relationship between profile membership and mental health outcomes. Negative emotional symptoms and psychological well-being are adopted as health outcomes of the proposed groups. Furthermore, our research provides empirical evidence to support the theoretical statement proposed by Seligman [25]. Strength profiles can help clinicians identify high-risk populations for psychosocial illness [12, 27], for whom effective targeted intervention and prevention measures can be implemented [12]. This study also provided a framework to distinguish at-risk groups with poor mental health based on character strengths. After experiencing disasters or stressful circumstances, those with typical strength profiles are more vulnerable to poor mental health [12, 26]; therefore, targeted intervention and prevention are necessary to improve this high-risk population's health outcomes.

Methods

Participants and procedure

Data were collected from 2016 to 2017 in Mainland China. An online questionnaire was distributed to participants through widely used social network platforms (e.g., Sina Weibo, WeChat, and Qzone). A total of 3536 individuals participated in this study, and their ages ranged from 17 to 50 ($M = 23.96$, $SD = 5.13$). All the participants completed the TICS. The participants comprised a total of 2214 females and 1322 males. Moreover, 23.7% of participants

were single, 23.6% were in a relationship, 46% were married, 5.3% were divorced, and 1.5% were widowed. A subsample of 853 participants (female = 68.2%, male = 31.8%) aged 17–27 years ($M = 21.67$, SD = 1.39) who were willing to complete the Depression Anxiety Stress Scale (DASS-21) and Flourishing Scale (FS) were also invited. In the subsample, 283 (33.2%) were single, 227 (26.6%) were in a relationship, and 343 (40.2%) were married. Written informed consent was obtained by instructing the participants to click a button before completing the survey. The Human Subjects Ethics Sub-Committee of the Department of Sociology, Wuhan University approved this study.

Measures

Character strengths

Character strengths were measured by TICS [20]. The TICS was assessed using the 15-item version, which comprised three dimensions, namely, caring, inquisitiveness, and self-control, and each dimension contained five items. The participants were required to rate the items on a 5-point Likert scale (1 = "very much unlike me" and 5 = "very much like me"). The three dimensions of strengths have been proven as components of a general factor of good character [20]. We used the average score of all TICS items to indicate the general level of one's good character. The good internal reliabilities (Cronbach's α higher than 0.74) and predictive validities of all subscales were confirmed in a cross-population (community participants vs. inpatients) sample and a cross-cultural (Asians vs. Westerners) sample [20].

Negative emotional symptoms

Negative emotional symptoms were measured using DASS-21 [28]. The 21-item version was used to assess DASS-21, which comprised three dimensions, namely, depression, anxiety, and stress. The internal reliabilities (Cronbach's α) of all subscales were higher than 0.80, and total internal consistency was 0.92 in the Chinese college sample [29]. Participants were required to rate the items on a 4-point Likert scale (0 = "It did not apply to me at all" and 3 = "It applied to me very much or most of the time"). An average score of all DASS-21 items indicated the entire level of one's negative emotional symptoms.

Psychological well-being

Psychological well-being was measured using the 8-item FS [30]. Participants were required to evaluate each item from 1 to 7 (1 = "strongly disagree" and 7 = "strongly agree"). Previous research has shown the good internal consistency reliability of the FS in the Chinese context, which is higher than 0.90 [31]. An average score of all FS items indicated the level of one's psychological well-being.

Data analysis plan

First, we complemented the descriptive analysis in the entire sample and subsample. The Pearson's correlations, mean, standard deviation, and Cronbach's α among the key study variables were listed. Three strength dimensions were expected to have significant positive correlations with psychological well-being and negative correlations with negative emotional symptoms.

Then, the LPA method was applied to the entire sample to distinguish the latent subgroups sharing similar character strength profiles. LPA was conducted using Mplus *Version 7.11* and implemented based on the mean scores of the following character strengths: caring, inquisitiveness, and self-control. The resulting profiles were selected and compared based on the following fitting indexes: Akaike information criterion (AIC), Bayesian information criterion (BIC), sample-size adjusted BIC (SSABIC), Lo–Mendell–Rubin likelihood ratio test (LMR–LRT), and an entropy measure. AIC, BIC, and SSABIC are commonly applied in the literature to measure the complexity and fitness of the estimated model; a low score for each index results in improved fitness of the model. Entropy was employed in this study to determine the classification fitting degree ranging from 0 to 1, in which high scores indicated that classification was accurate and sound. Another measurement tool for the fitting test was the LMR–LRT, which was used to further investigate the model's goodness of fit. In this study, a significant value ($p < .05$) implied the acceptance of this model hypothesis. Based on the entire sample results, two distinguished groups emerged: a group with high three-dimensional strengths (at-strengths group) and a group with low three-dimensional strengths (at-risk group).

Finally, the relationships of strength profiles and mental outcomes in the subsample were explored. The three-step method [32] was implemented to test the equality of the mental outcome means across the generated latent profiles. First, the LPA was conducted using only latent profile indicators. Then, the suitable membership was provided by the posterior distribution obtained during the first step [33]. Finally, we employed the BCH command in Mplus [32, 34], which is suitable for continuous distal outcomes, to compare the modeled outcome variables (i.e., FS and DASS-21) between profiles. Our hypothesis was supported if the at-strengths group had higher psychological well-being and lower negative emotional symptoms compared with those of the at-risk group.

Table 1 Correlations, mean, standard deviation, and Cronbach's α of character strengths and mental health outcomes

Variables	Total sample (3536)				Subsample (853)					
	1	2	3	4	1	2	3	4	5	6
M	3.32	3.38	3.79	3.50	3.22	3.35	4.03	3.54	0.72	5.16
SD	0.61	0.61	0.64	0.48	0.61	0.62	0.53	0.47	0.50	0.91
Cronbach's α	0.75	0.77	0.75	0.84	0.76	0.79	0.78	0.85	0.92	0.91
1 Self-control	–				–					
2 Inquisitiveness	0.62**	–			0.54**	–				
3 Caring	0.28**	0.34**	–		0.39**	0.38**	–			
4 TICS	0.81**	0.83**	0.70**	–	0.83**	0.82**	0.72**	–		
5 DASS-21	–	–	–	–	−0.16**	−0.28**	−0.18**	−0.26**	–	
6 FS	–	–	–	–	0.50**	0.56**	0.52**	0.67**	−0.37**	–

M Mean, *SD* standard deviation, correlations between variables were measured using Pearson's *r*. Self-control, *TICS* three-dimensional inventory of character strengths, *DASS*-21 Depression Anxiety Stress Scale, *FS* Flourishing Scale. Inquisitiveness and caring were used to identify latent profiles in first and second step (total sample), and DASS-21 and FS were compared between profiles in third step (subsample)

**$p < .01$

Table 2 Model fit indexes of LPA ($N = 3536$)

	AIC	BIC	SSABIC	Entropy	LMR–LRT
1-Class	19907.15	19944.17	19925.11		
2-Class	18512.39	18574.10	18542.32	0.63	0
3-Class	18038.79	18125.18	18080.69	0.75	0.12

AIC Akaike's information criterion, *BIC* Bayesian information criterion, *SSABIC* sample-size adjusted Bayesian information criterion, *LMR–LRT* Lo–Mendell–Rubin likelihood ratio test

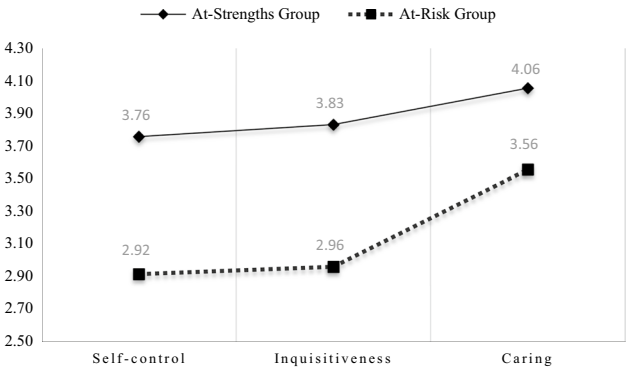

Fig. 1 Means of the character strengths across two profiles ($N = 3536$)

Results

Descriptive and correlation statistics

Table 1 provides the Pearson's correlations and descriptive statistics among the key study variables of the sample and subsample. As shown in Table 1, the TICS, FS, and DASS-21 had good internal consistency reliability. As expected, character strengths had a significant positive correlation with psychological well-being and a negative correlation with negative emotional symptoms.

Latent profile analysis (LPA)

The model fit indexes of the LPA results are displayed in Table 2. Based on the LMR–LRT, only the two-class solution was suitable, and other solutions were rejected. Given that the LMR–LRT can be considered the most sensitive index for LPA [35], the two-class solution was adopted. Figure 1 provides the mean of the three strength dimensions of the entire sample. Class 1 was named the at-strengths group, which comprised 47.4% of the sample ($n = 1676$) and included representative individuals with relatively high levels of self-control, inquisitiveness, and caring. Class 2 was referred to as the at-risk group, which comprised 52.6% of the sample ($n = 1860$) and included representative individuals with notable low levels of the same three-dimensional strengths. About 45.4% of the subsample ($n = 387$) accounted for the at-strengths group, whereas 54.6% ($n = 466$) were classified into the at-risk group.

Profile differences in mental health outcomes

The three-step comparison indicated significant differences between negative emotional symptoms and psychological well-being between strength profiles. As shown in Table 3, participants assigned to the at-strengths group had a high level of psychological well-being ($\chi^2 = 276.64$, $p < .001$)

Table 3 Estimated means (standard deviation) per profile and χ^2 values for mean comparisons ($N = 853$)

	At-strengths group	At-risk group	χ^2
Psychological well-being	5.81 (0.05)	4.64 (0.04)	276.64***
Negative emotional symptoms	0.57 (0.03)	0.83 (0.03)	33.54***

The standard errors of average psychological well-being and negative emotional symptoms are shown in parenthesis

***$p < .001$

and a low level of negative emotional symptoms ($\chi^2 = 33.54$, $p < .001$).

Discussion

The current study aimed to develop a typology of character strength subgroups with different health outcomes. As expected, two typical subgroups emerged using LPA: the at-risk group and the at-strengths group. Compared with the at-risk group, the at-strengths group had high scores on self-control, inquisitiveness, and caring. Meanwhile, both groups had higher scores on caring than the two other character strengths, but individuals in the at-strengths group had low negative emotional symptoms and high psychological well-being.

Individuals in the at-strengths group generally occupied higher levels of all three character strengths than those in the at-risk group. Similar groups can also be found in the study results of Liu et al. [36] and Haridas et al. [13] (e.g., above average group vs. lower than average group and high strength vs. low strength). Previous research has indicated that character strengths are interactive and interdependent [37], which means that the population can express combined strength scores rather than a high or low strength alone. Meanwhile, Seligman [25] concluded that character strengths present a continuum that ranges from mental illness (low level) to mental health (high level). Further investigations have proven that high overall good character (e.g., total score of strengths) is significantly related to psychological well-being [38, 39], life satisfaction [40], and psychological symptom reduction [39]. However, our results did not reflect the awareness categorization of excess. Seligman [25] believed that excess and absence are mental illnesses and the underuse and overuse of character strengths could lead to negative outcomes [41]. This limitation might be due to two reasons. First, the ceiling effect might have limited us from distinguishing the population who scored higher than the highest possible score. Second, no specific criteria for determining reasonable and excessive strength have been proposed so far. Hence, such missing criteria should be investigated in further research.

Furthermore, the mental health outcomes, including the low level of negative emotional symptoms and the high level of psychological well-being of the individuals in the at-strengths group, were better than those at the at-risk group. These results partly support and provide empirical evidence for the theoretical statement earlier proposed by Seligman [25]. Accordingly, high interpersonal strengths have been associated with well-being and happiness [42]. Moreover, adolescents who scored low on interpersonal strengths (e.g., forgiveness, kindness, teamwork, fairness, and humility) are more likely to have a higher levels of depressive symptoms after a year of school life than their peers [43]. Self-control plays an important role in facilitating life satisfaction, subjective well-being, and happiness [4]. In addition, the underuse of self-regulation is associated with social anxiety [41]. High inquisitiveness has been shown to predict high scores of life satisfaction and physical fitness [43, 44], whereas low inquisitiveness has been associated with depression and anxiety [45].

The broaden-and-build theory of positive emotion [46] provides a theoretical explanation mechanism. This theory proposes that positive emotions broaden one's thought–action repertoires, and subsequent behaviors would build one's personal resources. Proyer et al. [44] found that character strengths and health-oriented behaviors have a positive relationship. Specifically, the high self-control of the at-strengths group broadens one's mindset to adopt a long-term life schedule and develop more health-oriented behaviors. High Inquisitiveness can motivate someone to explore the unknown, and intense concentration in the task would relieve them of depressive thoughts and worries [47]. High caring also demonstrated positive relations with health-oriented behaviors (e.g., practicing safe sex, acquiring vaccinations) [44]. Similar physical, intellectual, and social behaviors have been proven effective in improving subjective well-being and mental health [48, 49]. Therefore, high character strengths can enhance one's cognitive status and mental health [44, 50]. Meanwhile, self-determination theory [51] suggests alternative perspectives. Members of the at-strengths group showed considerable autonomy and initiative when it came to adopting health-related behaviors, forming good interpersonal relationships, and enjoying the acts of exploration and creation. For example, inquisitive people manifest generally altruistic behaviors [52]. Their intrinsic motivation drives them to realize their psychological needs, from which they gain pleasure and happiness. For example, Moran et al. [53] reported that a population with high autonomous motivations (e.g., intrinsic, integrated, identified) assumed favorable job characteristics and psychological satisfaction. Therefore, we can attribute the healthy mental outcomes of the at-strengths group to their powerful

autonomous motivations and a series of behaviors that can produce psychological needs.

Individual strengths have been proven as a defense function to maintain mental health [39]. Our results also revealed that people with high strength scores (at-strengths group) assumed a high level of individual well-being and low level of psychological symptoms. Further, psychological prevention and intervention efforts can adapt our framework to distinguish different subgroups and provide targeted services. This study provided a possible set of criteria that can be used to classify clients into subgroups.

Nevertheless, the difference of caring strengths between the at-strengths group and the at-risk group was smaller than those of the two other character strengths (i.e., inquisitiveness and self-control). Though several universal virtues across cultures exist, Chinese people are concerned about interpersonal support and assign greater importance to the values of collectivism and preserving inter-relational harmony [54]. Therefore, the at-strengths group and the at-risk group are both influenced by their Chinese cultural background and assumed comparatively high scores on interpersonal strength. Our result is consistent with previous findings indicating that the Chinese have high scores on interpersonal strength [55].

Positive psychological interventions based on particular strengths, namely, signature strengths, have been widely implemented to improve happiness and alleviate depression [3]. However, such interventions gained several incongruous results. For example, strength-based intervention obtained a low ameliorate only in the post-test and in the one-month measure [6], and no significant effects on depressive symptoms have been found [7]. Such differences can be attributed to the fact that targeted individuals belong to different strength groups. This has led to various baselines of mental health, which affected the significance of the result. The present study's results indicated that the implemented interventions can be based on the following criteria: individuals who were impatient, indifferent in interpersonal relationships, and lacked enthusiasm in life.

The limitations of the current research include the generally high cultural level of participants, the lack of a cross-cultural comparative sample, and the use of self-reported measures. Meanwhile, finding specific differences existing in certain strength dimensions is possible. Only the qualitative difference of our results can be partly attributed to the high correlation of strengths [1, 20]. Two-class model seems to have the potential for further subdivision. Further research can distinguish the potential difference based on a more heterogeneous sample and develop more special typologies. On the other hand, demographic variables, such as gender, marital status, and so on, should also be included in the analysis model. Therefore, future research will discuss the relationship between more subdivided strength typologies and variables such as health and demographic variables. Meanwhile, the personality of an individual is a developing totality [2], and as such, character profile is a dynamic and continuous process. Thus, future research must implement a longitudinal study to explore the formation, development, and transformation of strength profiles.

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Compliance with ethical standards

Conflict of interest The authors, Wenjie Duan and Yuhang Wang, declare no conflict of interest.

Ethical approval The Human Subjects Ethics Sub-Committee of the Department of Sociology and Wuhan University approved this study. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Written informed consent was obtained by click a button from the participants before they completed the survey.

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