Validation and Reliability of the Chinese Version of the Miller Behavioral Style Scale

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Research

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Abstract

Objectives: To test the psychometric properties of the Chinese version of Miller Behavioral Style Scale(C-MBSS).

Methods: The forward-back-translation procedure was adopted in the translation of the Miller Behavioral Style Scale. Content validity was assessed in a panel of experts. In a sample of 1343 individuals, reliability and construct validity were assessed using Cronbach's alpha coefficient and factor analysis. For exploratory factor analysis, parallel analysis was used to decide number of factors, principal axis factoring and direct oblimin rotation method were used to select factor. For confirmatory factor analysis, structural equation modelling was established to verify the extracted factor structure.

Results: The C-MBSS achieved conceptual and semantic equivalence with the original scale. The item content validity index(I-CVI) of each item ranged from 0.78 to 1, and the averaging scale content validity index(S-CVI/ Ave) was 0.95. The cronbach's alpha coefficient for the scale and sub-scales were over 0.6. The exploratory factor analysis resulted in 2-factor assumption for each hypothetical threat-evoking scenario. Confirmatory factor analysis provided confirmatory evidence for the second-order factor structure of 2-factor solution (Monitoring and Blunting) and demonstrated a good fit between theoretical model and data.

Conclusions: This study verified the psychometric properties of the C-MBSS and indicated that the C-MBSS can be used to identify individual's information-seeking style in Chinese population. With the use of the C-MBSS, health care professionals in China can deliver health education based on patients' information-seeking behavior, which can improve the effect of health education and patients' health outcomes.

Introduction

As a health promotion method, health education help improve people's knowledge of illness, develop their health behavior, increase individual's sense of responsibility for maintaining health and achieve fully informed consent by the providence of health care information [1–6]. It was reported that if patients were informed about any side effects, possible complications, and the way treatment might affect their daily life, they might establish healthy behaviors and improve self-efficacy [7, 8]. Furthermore, patients can make the right decisions about treatment, correct their wrong beliefs, alleviate psychological comorbidities and thus enhancing their quality of live by being informed about appropriate, valid, and expert health care information [9]. Hence, health care information can also be therapeutic and many patients desire to be given more health-related risk and disease information [10].

Although several studies have documented the various positive impacts of health care information, it has also been evidenced that sometimes the wealth of information available to patients can be as dangerous as it is helpful [11–14]. Deyirmenjian et al. reported that for open-heart patients, the ones with more information providence showed higher levels of preoperative and postoperative anxiety compared with patients almost with no information giving [15]. Montazeri et al. found out that after giving cancer-related information to women in a waiting room at the breast cancer center, they became upset and anxiety [16]. Miller et al. mentioned that when women were exposed to cervical cancer risk information, they might catastrophize health dangers and felt intensely anxious and vulnerable [17]. Doherty-Torstrick et al. reported that for individuals with high illness anxiety, the search for medical information on the Internet made them experience more anxiety [18].

Miller proposed the "Blunting Hypothesis" based on Seligman's safety signal theory, which accounts for individual differences about preference for predictability("monitors") and preference for unpredictability("blunters") under threat [19]. In this theory individuals were categorized into two different coping styles based on their threat-related response: monitors(information seekers) or blunters (information avoiders). When encountering threat-related event, information seekers monitor information and amplifv cognitively and emotionally threats, whereas information avoiders avoid and

psychologically blunt such cues [20]. In health-related situations, high monitors prefer detailed health-related information and fare better when it is given, and they tend to perceived more risks and show great anxiety or distress when information is not readily available [9, 19]. On the contrary, blunters do better with less information. They cope with aversive health events by distraction, and they tend to make themselves remove from further psychological awareness of disease and their anxiety may be increased when information is supplied too much [19]. Miller mentioned that when patients receive information which match their coping styles, they have better outcomes psychologically, behaviorally and physiologically [21, 22]. It has been evidenced that once the information provided is consistent with individual's coping style, they will feel less anxious, suffer less complications after surgery, experience shorter hospital length of stay, improve adherence, and show more satisfaction with communication [23–25]. Therefore, patients' information-seeking styles need to be taken into consideration before providing health care information. The first step is to identify individual variations in information-seeking styles, which requires validated measures of individual information-seeking style preferences.

There exist several scales that can predict information-seeking styles, such as Sentence Completion Test, Repression-Sensitization Scale, Schedule of Recent Experiences [20, 26, 27], among which the Miller Behavioral Style Scale (MBSS) shows good reliability as well as good discriminant and convergent validity compared with other scales.¹⁹ The MBSS is a reliable and validated scale, and by far the most extensively used scale for predicting information-seeking style [28–30]. Whether the original scale can be used in population from different social, ethical and cultural backgrounds needs further study. In addition, according to Rees's [29] literature review of the researches about the MBSS scale, Cronbach's alpha coefficient was rarely reported, and many of the research samples were recruited from students and the sample sizes were small, which limited the generalization of the scale. This study aims to examine the psychometric properties of the MBSS among individuals in Mainland China using a large sample size in medical and non-medical settings.

Methods

Design

A cross-sectional survey with a convenience sampling method was conducted from August to September 2019 in Yunnan Province, Southwest China. The MBSS can be used in different contexts (i.e., medical setting, worksite, academic context, community center, home setting), as well as across populations (i.e., individuals at-risk for disease, patients, and the healthy population). Our participants included university students, medical staff, patients receiving percutaneous coronary intervention and their caregivers, which could maximize the sample size and diversity. University students and medical staff got the Chinese version of MBSS (C-MBSS) via on line survey(wenjuanxing). Patients receiving percutaneous coronary intervention and their caregivers were given 15 minutes to fill in the written C-MBSS in the hospital placement before their surgery. The research was approved by the ethics committee of the hospital.

Measures

Miller Behavioral Style Scale (MBSS) assesses individuals in terms of their distinctive attentional processing styles or "behavioral signatures," by characterizing them into high versus low monitors in terms of how individuals process and effectively react to threat information. The scale consists of four hypothetical threat-evoking scenarios (1.fear of having dental work done; 2.kidnapped by a group of terrorist militants; 3. in danger of losing the job; 4. technical problems with the flight); each of which has eight corresponding potential coping responses, including 4 monitoring responses(e.g., "I would watch all the dentist's movements and listen for the sound of the drill") and 4 blunting responses(e.g., "I would try to think about pleasant memories"). There are totally 16 monitoring responses and 16 blunting responses. With the permission of the original author of the scale, a 5-point Likert scale ranging from 1 "strongly unlikely" to 5 "strongly likely" was used for items scoring instead of the original dichotomous one, which allowed participants to give more varied and

Loading [MathJax]/jax/output/CommonHTML/jax.js wers [29, 31]. The participants were asked to indicate the score that would

apply to them for each response [20]. Therefore, the total Monitoring ("M") score ranges from 16–80 and the total Blunting ("B") score ranges from 16–80. Beyond that, demographic information including gender, age, nationality, occupation, educational background, diagnosis, type of operation etc. were also collected using a self-made demographic questionnaire.

Translation procedure

With the written permission of the original author to use the MBSS, we translated the scale followed the forward-back-translation procedure [32]. Firstly, two native Chinese speakers with proficiency in English translated the scale into Mandarin Chinese. One translator is a nurse with master degree who studied in Ireland for one year; the other is an English linguistics scientist who had experiences of staying in London for two years. The two translated versions were selected and merged into a single version by the two translators. Secondly, two bilingual translators translated the Chinese version back to English. Translators were Chinese scholars who had worked in the USA for 10 years and were unaware of the research. The two English versions were selected and merged into a single version by the two translators. Semantic equivalence was conducted between the translation and the original version by an English native speaker. Thirdly, an expert committee composed of a psychiatrist, an English linguistics scientist and two nurses conducted cultural adaptation of the Chinese version to form a pre-final scale.

The readability and comprehensiveness of the scale were assessed in a convenience sample of 20 patients with coronary heart disease and 20 healthy university students. For the pilot test, after reading the four hypothetical stress-evoking scenarios of the C-MBSS, the participants were asked to tick the responses which they would most likely to do using a Likert 5-point scale (from strongly unlikely to strongly likely). Then a face-to-face interview was conducted to all participants to get their opinion about scale. According to the interview, all participants stated that they could understand the scenarios and responses easily, and it took approximately 10–15 minutes to finish the scale.

Content validity

The item content validity index (I-CVI) and averaging calculation method (S-CVI/Ave) were used to evaluate the content validity [33]. Nine experts, including two psychological professors, one doctor, two advanced nurse practitioners and four associate professors in nursing, were invited to score and to evaluate item validity of the MBSS using clarity of phrasing and applicability of content as criteria [34]. Simultaneously, the experts gave suggestions on item modification and evaluated correlation level of each item for its corresponding construct using 4-point scale (from not relevant to highly relevant). According to nine experts' responses and comments, the I-CVI of item 1 and 18 was 0.67, and item 24, 25, 26 were 0.44, with experts' comments of inappropriateness due to cultural diversity, which should be candidates for deletion [33]. Therefore, we deleted the five items with the value of I-CVI below 0.78. The I-CVI of remaining items ranged from 0.78 to 1 and the S-CVI/Ave was 0.95, indicating an adequate content validity of the 27-item version C-MBSS.

Sample

More accurate solutions are achieved with larger sample sizes rather than the ratio of participants to variables of 1:5 to 1:10 [35]. Therefore, the item to participant ratio of 1:20 was used to calculate sample size. Considering possible data loss, we included more participants. Inclusion criteria were: (1) over 18 years old; (2) Having normal communication and literacy skills; (3) Voluntary participation. Participants with mental disorder or poor physical condition were excluded. Before the survey, participants received a brief introduction about the study and how to finish the questionnaire. All participants' information were assured to keep confidentially and verbal informed consent was obtained before data collection. The sample included 100 patients, 100 patients' caregivers, 750 university students, 550 medical staff. The researchers collected 1402 returned questionnaires. The return rate of questionnaires was 93.47%. After screening, 59 questionnaires that were not fully completed were excluded. Therefore, a total of 1343 questionnaires were returned for analyzed; The valid return rate was 95.79%.

Statistical analysis

Data base were established by Epidata 3.1 and then imported into Statistical Package for the Social Sciences version 20.0 (SPSS 20.0). Demographic data were analyzed using descriptive statistics. The validity and reliability of the C-MBSS were analyzed using SPSS 20.0 and Analysis of Moment Structure version 24 (AMOS 24). Firstly, factor analysis including exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to test the construct validity of the C-MBSS. The 1343 sample was divided into groups A and B randomly using SPSS 20.0. Sub-sample A(n = 672) was used for EFA. Kaiser–Meyer–Olkin(KMO) and Bartlett’s test of sphericity were used to test sampling adequacy and the suitability of data for factorisation respectively. Monte Carlo parallel analysis was used to extract factor number. Principal axis factoring with direct oblimin rotation was used to identify meaningful components [35, 36]. According to Stevens’ advice [37], a sample size of 600 with a loading of 0.21 can be considered significant. Therefore, we deleted items with factor loads below 0.21 or cross-factor loads over 0.21. Sub-sample B(n = 671) were used for CFA to verify the factor structure of the C-MBSS derived from EFA. In the study, model fit was reflected by six fit indices including CMIN/DF, GFI, AGFI, CFI, RMSEA, SRMR [38]. Secondly, The Cronbach’s α coefficient was used to assess internal consistency reliability, and acceptable level should be greater than 0.6 [39].

Results

Demographic characteristics

Of the 1343 participants who submitted eligible questionnaires, 655(48.77%) were university students, 491(36.56%) were medical staff, and 197(14.67%) were patients receiving percutaneous coronary intervention and their caregivers. A total of 222(16.53%) were male and 1121(83.47%) were female. The age ranged from 18 to 82 years old with an average age of 27.97 years. 1074(80%) were of Han nationality and 269(20%) belonged to minority nationality. Among the participants, 65(4.84%) had master degree or above, 1089(81.09%) had baccalaureate degree, 189(14.07%) had associate degree or below.

Exploratory factor analysis

The C-MBSS is consisted of four hypothetical stress-evoking scenarios and theoretically the responses for each scenario are categorized into two factors, thus, we performed exploratory factor analysis to explore factor structures in each scenario. The Kaiser-Meyer-Olkin(KMO) for each scenario exceeded 0.5 and all Bartlett’s tests of sphericity were statistically significant($p = .000$), which supported the use of factor analysis [40]. The parallel analysis resulted in 2-factor assumption for scenario 2, scenario 3 and scenario 4, and resulted in 3-factor assumption for scenario 1. According to the result of principal axis factoring and direct oblimin rotation, item2 in scenario 1 was deleted because of factor loading lower than 0.21. The left 6 items in scenario 1 were re-performed EFA. The value of KMO and Bartlett’s tests of sphericity met target level. The parallel analysis resulted in 2-factor assumption for scenario 1 and the factor loadings of all items met requirements. The variance explained in each scenario ranged from 43.98–52.99%. Table 1 shows the rotated factor loadings of the item.

Table 1
Rotated factor loadings of the C-MBSS questionnaire items

Item	Factor Loadings	Variance explained
Scenario 1		
Factor 1: monitoring		27.97%
4. I would want the dentist to tell me when I would feel pain.	0.33	
6. I would watch all the dentist's movements and listen for the sound of the drill.	0.66	
7. I would watch the flow of water from my mouth to see if it contained blood.	0.76	
Factor 2: blunting		25.02%
3. I would try to think about pleasant memories.	0.45	
5. I would try to sleep.	0.54	
8. I would do mental puzzles in my mind.	0.50	
Scenario 2		
Factor 1: monitoring		25.11%
10. I would stay alert and try to keep myself from falling asleep.	0.51	
12. If there was a radio present, I would stay near it and listen to the bulletins about what the police were doing.	0.52	
13. I would watch every movement of my captors and keep an eye on their weapons.	0.59	
16. I would make sure I knew where every possible exit was.	0.52	
Factor 2: blunting		18.87%
9. I would sit by myself and have as many daydreams and fantasies as I could.	0.34	
11. I would exchange life stories with the other hostages.	0.46	
14. I would try to sleep as much as possible.	0.31	
15. I would think about how nice it's going to be when I get home.	0.50	
Scenario 3		
Factor 1: monitoring		29.08%
17. I would talk to my fellow workers to see if they knew anything about what the supervisor evaluation of me said.	0.65	
20. I would try to remember any arguments or disagreements I might have had that would have resulted in the supervisor having a lower opinion of me.	0.54	
23. I would try to think which employees in my department the supervisor might have thought had done the worst job.	0.52	
Factor 2: blunting		21.37%
19. I would go to the movies to take my mind off things.	0.51	
21. I would try to think about other things to take my mind off out of my mind.	0.48	

Item	Factor Loadings	Variance explained
22. I would tell my spouse that I'd rather not discuss my chances of being laid off.	0.25	
Scenario 4		
Factor 1: monitoring		30.94%
28. I would call for the flight attendant and ask what exactly the problem was.	0.60	
30. I would listen carefully to the engines for unusual noises and would watch the crew to see if their behavior was out of the ordinary.	0.46	
31. I would talk to the passenger beside me about what might be wrong.	0.68	
Factor 2: blunting		20.96%
27. I would watch the end of the movie, even if I had seen it before.	0.47	
29. I would order a drink from the flight attendant or take a tranquilizer.	0.38	
32. I would settle down and read a book or magazine or write a letter.	0.44	

Confirmatory factor analysis

AMOS was used to construct a structural equation modelling with maximum likelihood to verify the 2-factor hypothesis in each scenario extracted from EFA. Table 2 presents the CFA fit indices for the four scenarios. These indices showed moderately good fit for the models and provided confirmatory evidence for the factor structure in the four scenarios [41, 42].

Table 2
Fit indices for confirmatory factor analysis of the four scenarios

Scenario	CMIN/DF	GFI	AGFI	CFI	RMSEA	SRMR
Scenario 1	2.775	0.989	0.972	0.968	0.051	0.0395
Scenario 2	5.466	0.962	0.927	0.810	0.082	0.0630
Scenario 3	6.329	0.976	0.937	0.829	0.089	0.0598
Scenario 4	3.588	0.986	0.964	0.920	0.062	0.0409
CMIN/DF = chi-square/degrees of freedom; GFI = goodness-of-fit index; AGFI = adjusted goodness of fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.						

When we performed factor analysis, we found that factor 1 in scenario 1, factor 1 in scenario 2, factor 1 in scenario 3 and factor 1 in scenario 4 were strongly correlated, similarly, factor 2 in scenario 1, factor 2 in scenario 2, factor 2 in scenario 3 and factor 2 in scenario 4 were strongly correlated (seen in Fig. 1), which suggested that there existed second-order latent variables which might replace highly correlated factors to make the models more precise. Hence, we used the second-order CFA models to replace the first-order models. According to the research of Miller [19, 20], we assumed there were Monitoring and Blunting factors in the C-MBSS. The second-order models are shown in Fig. 2 and Fig. 3. In this study, the T value of Monitoring second-order CFA was 0.94, and Blunting second-order CFA was 0.97, which provided reasonable evidence of a second-order user satisfaction construct [43]. The model fit indices for Monitoring were:

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CMIN/DF = 2.253, GFI = 0.969, AGFI = 0.954, CFI = 0.931, RMSEA = 0.043, SRMR = 0.0429, and the model fit indices for Blunting were: CMIN/DF = 2.861, GFI = 0.962, AGFI = 0.943, CFI = 0.813, RMSEA = 0.053, SRMR = 0.0489, which indicated a good fit between theoretical model and data [41, 42, 44]. Compared with the model fits of the four scenarios, these values provided confirmatory evidence for the second-order factor structure.

Internal consistency reliability

The results of internal consistency reliability tests showed that the Cronbach's alpha coefficient for the total scale was 0.66, and for the monitoring sub-scale and blunting sub-scale were 0.75 and 0.62 respectively, which demonstrated acceptable internal reliability in both the instrument and the sub-dimensions [45, 46].

Discussion

Our study proved that the C-MBSS has good psychometric properties and is a proper, reliable and valid instrument to assess information-seeking style of Chinese population. Due to cultural differences, six items were deleted giving final total of 26 items in the Chinese version of MBSS. According to the experts, item 1, 18, 24, 25 and 26 were deleted resulting from unable to differentiate information-seeking style in the context of Chinese culture. Ideas about confucianism and collectivism are cherished and valued in Chinese culture. For the deletion of item 1, one plausible explanation is that Chinese patients are used to subordinate in the doctor-patient relationship and patient empowerment is not common [47]; therefore, most patients prefer to listen to the doctors rather than asking questions. Item 1 'I would ask the dentist exactly what work was going to be done.' might not suit Chinese health care background. The Confucian principle of hierarchy and obedience emphasize power and social ranking in the organizations of Chinese society [48, 49], which means the inferiors are used to be appraised by their superiors instead of by themselves, hence item 18 'I would review the list of duties for my present job and try to figure out if I had fulfilled them all.' seems inappropriate for Chinese population. In the face of being laid off, the loyal Chinese subordinates show their loyalty and dedication to the supervisors [49] and they will continue doing their work whatever happened; therefore for item 24 'I would continue doing my work as if nothing special was happening.', most of the people might choose to do so no matter what type of information-seeking style they belong. From childhood, Chinese people are trained not to disobey [48], so both monitoring and blunting type person might choose to read the safety notice card as required by the crew man, and the item 25 'I would carefully read the information provided about safety features in the plane and make sure I knew where the emergency exits were' might not identify the different information-seeking style. The collectivist culture emphasis on people instead of task. For example, people would pause and chat with their friends when meeting them on the way to work in the collectivist culture [50]. For item 26 'I would make small talk with the passenger beside me', both the monitoring and blunting type person might choose to do so because of cultural characteristic. Item 2 was deleted in the EFA process due to low factor loading. For item 2 'I would take a tranquilizer or have a drink before going.', the reason for its deletion might due to the fact that Chinese patients don't have the habit of taking a tranquilizer or having a drink before seeing a doctor.

The C-MBSS is consisted of four hypothetical stress-evoking scenarios, hence, we performed EFA for each scenario separately. In the study, EFA of the C-MBSS for each scenario obtained a two-factor solution that explained 52.99%, 43.98%, 50.45% and 51.9% respectively of the variance in the research. CFA was performed to verify the factor structures that were selected from EFA. The results demonstrated moderately model fit and provided confirmatory evidence for the factor structure. When we performed first-order analysis, we found strong correlations among the eight factors in the C-MBSS, which suggested high-order latent variants. Based on researches of Miller, we performed a second-order CFA to simplify the model and resulted in 2-factor assumption (Monitoring and Blunting). The values of T, CMIN/DF, GFI, AGFI, CFI, RMSEA and SRMR demonstrated the acceptable model fitness and proved the feasible 2-factor solution.

In our study, the Cronbach's alpha coefficient of the C-MBSS and its 2 sub-scales were within acceptable limits (0.66 for the C-MBSS, 0.75 for monitoring sub-scale and 0.62 for blunting sub-scale) which prove that monitoring sub-scale has more acceptable internal consistency compare with blunting sub-scale, which is consistent with Miller [20] and Rees's [29] study.

Giving the finding above, the C-MBSS can be used to identify individuals

Information-seeking behavior under threat events. It has been proved that a health education matting information seeking behavior will lead to many positive health outcomes, oppositely, health education inconsistent with information seeking behavior is not conducive to the physical and mental health of patients. Hence, the information seeking behavior of patients should be taken into consideration when assessing issues of information need and patient education [22]. After verifying the psychometric properties of the C-MBSS, interventions can be designed to tailor patients' information seeking behavior and improve the results of health education.

Limitation

There are several limitations that should be taken into consideration. Although we have included a large and diverse sample size, the generalization of our findings might be limited due to the use of convenience sampling. The participants were mainly recruited from the southwest of China and unable to represent all people in China. In addition, due to practical constraints, we did not test the convergent/divergent validity and test-retest reliability of the C-MBSS. The convergent/divergent validity and test-retest reliability may be conducted in the future research.

Conclusions

Our research examined the content validity, construct validity and internal consistency reliability of the C-MBSS among university students, medical staff, patients receiving percutaneous coronary intervention and their caregivers. We deleted six items due to weak in differentiate information-seeking style in the context of Chinese cultural, resulting in a 26-items C-MBSS, which showed good psychometric properties and is a valuable instrument to identify the patient's information-seeking style. By using the C-MBSS, medial staff can assess patients' information seeking behavior, and give them the information that is tailored to their information-seeking style, which can help individuals fare better (psychologically, behaviorally, and physically), and enhance the effect of health education in the end.

Abbreviations

Abbreviations	Full Name
MBSS	Miller Behavioral Style Scale
C-MBSS	Chinese Version of Miller Behavioral Scale
I-CVI	Item Content Validity Index
S-CVI/Ave	Averaging Scale Content Validity Index
EFA	Exploratory Factor Analysis
CFA	Confirmatory Factor Analysis
AMOS	Analysis of Moment Structure
CMIN/DF	Chi-square/Degrees of Freedom
GFI	Goodness-of-Fit Index
AGFI	Adjusted Goodness of Fit Index
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation
SRMR	Standardized Root Mean Square Residual

Declarations

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the First Affiliated Hospital of Kunming Medical University. (2019) Ethical review L no. 26

Consent for publication

Not applicable

Availability of data and materials

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

QQZ analysis and interpretation of data, Drafting the manuscript, HML analysis and interpretation of data, YJB analysis and interpretation of data, QLH have made substantial contributions to conception and design, ALH revising the manuscript, MFY acquisition of data, YJW acquisition of data, WW have made substantial contributions to conception and design, LD analysis and interpretation of data, FM analysis and interpretation of data, Revising the manuscript, Given final approval of the version to be publish. All authors read and approved the final manuscript.

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Figures

Figure 1

The correlations of the factors in four scenarios of the C-MBSS S1F1: scenario 1 factor 1, S2F1: scenario 2 factor 1, S3F1: scenario 3 factor 1, S4F1: scenario 4 factor 1, S1F2: scenario 1 factor 2, S2F2: scenario 2 factor 2, S3F2: scenario 3 factor 2, S4F2: scenario 4 factor 2.

Figure 2

The second-order structural equation modelling of the factor structure of the Monitoring factor S1F1: scenario 1 factor 1, S2F1: scenario 2 factor 1, S3F1: scenario 3 factor 1, S4F1: scenario 4 factor 1.

Figure 3

The second-order structural equation modelling of the factor structure of the Blunting factor S1F2: scenario 1 factor 2, S2F2: scenario 2 factor 2, S3F2: scenario 3 factor 2, S4F2: scenario 4 factor 2.

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