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Item-Level Psychometrics of the 12 Items of the Coping Orientation to Problems Experienced Scale

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Abstract

Objective : This study examined the psychometric properties of the 12-item Coping Orientation to Problems Experienced Scale (COPE) using Rasch analysis. COPE is one of the instruments used to measure stress-coping skills.

Methods : The study participants were 480 community-dwelling older adults. We tested the instrument's unidimensionality assumption using principal component analysis (PCA). Item fit was examined using infit-and-outfit mean-square (MnSq) and standardized fit statistics (ZSTD). The precision and item difficulty hierarchies of the instrument were examined. The item-difficulty hierarchy was investigated to identify the easy and difficult items. We tested differential item functioning (DIF) for sex and age groups.

Results : PCA revealed that the instrument met the unidimensionality assumption (eigenvalue = 1.78). Among the 12 items, item 2 was removed because of misfit (Infit MnSq = 1.33, Infit ZSTD = 5.05, Outfit MnSq = 1.56, Outfit ZSTD = 7.15). The remaining 11 items demonstrated a conceptual item-difficulty hierarchy. The person strata value was 3.10, which is equivalent to a reliability index value of 0.81. There was no DIF for the sex and age groups (DIF contrast ⟨0.27).

Conclusion : The findings indicated that the revised COPE-11 has adequate item-level psychometric properties and can accurately measure stress coping skills.

Keywords : Older adult, Rasch model, Reliability, Stress coping skills, Survey

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Ⅰ. Introduction

Stress is a continuous and cumulative experience that negatively affects an individual's social, emotional, and physical well-being (Min & Yoo, 1998; Schultchen et al., 2019). Individual social stress affects the health of people in various positions such as parents, nurses, office workers, and students (Bai & Ravindran, 2019; Chang et al., 2005; Pascoe et al., 2020). The emotional problems due to stress include depression (Kim, 2019; Lee & Lee, 2002). Also, stress is a leading cause of chronic conditions, such as heart disease, cancer, and lung disease (Khawaja, 2008; Kivimäki & Steptoe, 2018). Therefore, early evaluation and management of our stress are important. A systematic stress evaluation can inform clinicians' treatment goals and quantify treatment progress (Cotton, 1990). Typically, stress assessments consist of three components: stress factor, stress response, and personal characteristics (Cotton, 1990). Therefore, it is essential to implement a sound measurement tool to evaluate (Andrich, 1978).

Coping involves cognitive and behavioral strategies that individuals use to manage stress (Folkman & Moskowitz, 2004). Carver et al. (1989) developed a Coping Orientation to Problems Experienced (COPE) inventory to assess different stress coping styles. While the COPE inventory's 60 items evaluate a wide range of stress components, including 14 subscales, those items have significant overlap in their contents (Carver, 1997). The 14 subscales are: active coping, use of informational support, positive reframing, planning, emotional support, venting, humor, acceptance, religion, self-blame, self-distraction, denial, substance use, behavioral disengagement. This decreases clinical usability, as one study showed that the respondents were slightly impatient for completing the time-consuming COPE inventory (Carver et al., 1993). In order to reduce respondents' burden, Carver (1997) released a short version of COPE (the Brief COPE) that includes a 28-item self-reported scale for assessing both adaptive and maladaptive coping skills (Carver, 1997).

Despite its frequent use, the COPE inventory was criticized for its unstable factor structure (Yusoff et al., 2009). The COPE inventory comprised three to five factors or a hierarchical factor structure with several primary factors loadings on to a few second-order factors, suggesting that the factor structure was unstable and required further examination (Carver, 1997; Carver et al., 1989; Litman, 2006; Lyne & Roger, 2000; Zuckerman & Gagne, 2003). Also, The authors pointed out that fifteen items consisted of four factors, had weak correlations with their scales, or were on scales where they did not theoretically belong (Litman, 2006). The unstable component of COPE makes it difficult to accurately measure stress coping. COPE is a tool for measuring coping with stress, and it must be measured with a single element to ensure an accurate measurement. For this reason, the multidimensionality of the COPE inventory items suggests that it is not suitable for evaluating one characteristic. More recent literature further revealed the complexity of coping, including the role of culture and its relationship with various demographic and personal variables (Folkman & Moskowitz, 2004; Iwasaki et al., 2005).

In addition, the same characteristics or factors are important for legitimate comparisons of assessments (Velozo et al., 1999). For example, in the process of

developing an evaluation tool, several statistical procedures are performed to ensure that the evaluation items are suitable for all respondents (Camilli & Penfield, 1997; Holland & Wainer, 2012). The statistical procedure referred to here aims to classify items with different statistical characteristics in a specific group of respondents. This is called differential item functioning (DIF). Items with DIF are said to function differently between groups as a potential indicator of bias (Sireci & Rios, 2013). Our study presented this gap in differential item functioning (DIF).

As mentioned earlier, the COPE inventory had 60 items, and 28 short versions were released due to the time burden of respondents. Nevertheless, there were still many items, and it was not a single factor. Accordingly, this study intends to analyze using the 12-item combination scales classified in the Well Elderly 2 study (Clark, 2013). The algorithm provided in the Well Elderly 2 study has a total of 10 coping scales and one combination scale. The combination scale consists of Active coping (items 5, 12, 15, 17), Planning (items 3, 19, 23, 33), and Suppression of competing activities (items 9, 20, 24, 32) in the COPE's score Algorithm.

Therefore, the purpose of this study is to investigate the item-level psychometric properties (i.e., item-fit statistics and item hierarchy) of the 12-item COPE, using the Rasch analysis. Rasch analysis can analyze the model fit of the scale, the fit of individual items, and the rating scale by applying the Rasch measurement model based on the item response theory (Wright & Masters, 1982; Wright & Stone, 1979). We also examined DIF to test if the items demonstrate equivalent measures across different gender and age groups.

II. Methods

1. Design and participants

This study was a retrospective cross-sectional study design. We obtained study data from the Well Elderly 2 study conducted from November 2004 to October 2008. The Well Elderly 2 study is public data provided by the Inter-university Consortium for Political and Social Research (ICPSR). The subjects were community-dwelling adults aged 60-95 years or above in Los Angeles, California. Our study used the 12-item combination scale items of the COPE (COPE-12) from the data of 480 subjects who completed 36 items of COPE at the baseline of the Well Elderly 2 study. The algorithm provided in the Well Elderly 2 study has a total of 10 coping scales and one combination scale. In this study, we used a combination scale. The COPE-12 was a selection of 12 items from a combination scale of COPE data collected in the Well Elderly 2 study. The combination scale of COPE-12 consists of active coping (items 5, 12, 15, 17), planning (items 3, 19, 23, 33), and suppression of competing activities (items 9, 20, 24, 32). Also, this study was approved by the local institutional review board and met the research exemption criteria of all participating institutions.

2. Outcome measures COPE

Coping Orientation to Problems Experienced (COPE) inventory. The COPE inventory is a multidimensional inventory developed to evaluate the various coping strategies employed in response to stress (Carver et al., 1989). The COPE represents

the direction of coping mechanisms and comprises a list of statements that the responder reviewed and scored. The COPE inventory itself does not have a baseline score and can be used for self-determination or investigation based on the score results. The combinational scale of the COPE (COPE-12) consisted of 12 test items with a 4-point rating scale (1 = I usually do not do this at all, 2 = I usually do this a little bit, 3 = I usually do this a medium amount, 4 = I usually do this a lot). A higher score of the COPE indicated having a better behavior strategy for dealing with stressful events. The 12-item combination scales are items obtained by extracting and combining four items each corresponding to active coping, plan coping, and coping with Suppression of competing activities from the Well Elderly 2 Study (Clark, 2013), (Appendix 1).

3. Data analysis

In the analysis of this study, we first tested the assumption of a general factor (a unidimensional construct) using principal component analysis (PCA). Rasch analysis was performed to examine the item-level psychometric characteristics of the COPE-12, including fit statistics, precision, and item difficulty hierarchy (Wright & Stone, 1979). We also assessed how often the response categories of the 4-point COPE-12 were selected through rating scale analysis, and whether the response categories were ordered and increased by the functional reserve rate of the participant. The test item invariance was examined using DIF for sex (male vs. female) and age group (less than 76 years old vs. 76 years old or over). In this study, Winsteps Rasch software(version 5.2.5, Winsteps, Chicago, 2022) was employed for Rasch analysis (Linacre, 2017). SAS software(version 9.4, Institute, Cary, NC) was employed to create an analytical file and conduct descriptive statistics.

1) Factor analysis (PCA)

The unidimensionality of the COPE-12 items was invesgated with a PCA using Winsteps Rasch software(version 5.2.5, Winsteps, Chicago, 2022) The eigenvalue of the first contrast less than 2.0 was considered as a cut-off for unidimensionality (Linacre, 2022). After examining the assumptions about unidimensionality, Rasch analysis was performed.

2) Rasch analysis

Rasch analyzes assessed item fits (infit and outfit) using mean-square (MnSq) and z-standardized (ZSTD) fit statistics (Linacre, 2022; Wright, 1984). The acceptable MnSq values were considered as ranging from 0.60 to 1.40 and ZSTD values ranging from -2.00 to 2.00 (Linacre, 2002; Wright, 1994). The person strata was used to examine the precision of the COPE-12, which is a reliability analysis similar to the traditional Cronbach's alpha statistic. At least three person strata were considered acceptable, which is equivalent to the traditional reliability of 0.8 (Fisher, 1992; Fisher Jr, 2007).

3) Rating scale analysis

Rating scale analysis was assumed using the following criteria: (1) at least 10 observations were included in each response category, (2) average measures increased monotonically with category (e.g., the measure estimation in the second category

is higher than the one in the first category), (3) outfit mean-square values were less than 2.0, and (4) investigate whether the frequency of category use is irregular because of step disordering through step calibrations (Andrich, 1978; Linacre, 2002).

4) Differential item functioning (DIF) psychometric analysis

As the final step in examining the quality of the scale, it was investigated whether the evaluation items were suitable for specific respondent group (sex, age). Because sex and age differences in stress reactivity occur, a DIF analysis of COPE is necessary (Bale & Epperson, 2015; Folkman et al., 1987). The items could have differential meanings for different groups (Bond et al., 2020). Two DIF analyses for sex (male/female) and age within the older adults group (<76/76+) variables were performed based on the hypothesis that no difference existed in the estimated item difficulty parameters of each demographic subgroup. The presence of DIF was determined by the magnitude of DIF (greater than 0.48) and its significance (p-value < .05) (Linacre, 2022).

Ⅲ. Results

1. Demographic characteristics

The total number of subjects was 480 adults. The majority of the sample was female (n = 315, 65.5%), with the mean age of 74.31 years old (SD = 7.6 years). The race of the sample was: White (n = 180, 37.5%), Black (n = 155, 32.3%), Hispanic/Latino (n = 97, 20.2%), Asian (n = 19, 4.0%), other (n = 27, 5.6%), and missing value (n = 2, 0.4%).

2. Factor Analysis (PCA)

The PCA revealed that the test items met the unidimensionality assumption. Approximately 44% of the total variance in the items was explained by one dimension with no critical unexplained variance remaining in the first contrast (eigenvalue = 1.78). Therefore, in this study, Rasch analysis was performed using COPE-12.

3. Rasch analysis

Item 2 (Infit MnSq = 1.33, Infit ZSTD = 5.05, Outfit MnSq = 1.56, Outfit ZSTD = 7.15) was considered a misfit through Rasch analysis and thus, removed (Appendix 2). Table 1 shows item fit statistics and item difficulty hierarchies for the remaining 11 items. The 11 non-misfit items met the Rasch analysis assumptions. The COPE-11 showed a high person strata value of 3.10, which corresponds to a reliability index value of 0.81.

The person-item map shows that the 11 items contained a wide spectrum of the person measure distribution (Figure 1). However, COPE-11 has a ceiling effect of 3.3% and a floor effect of 1.9%. The most used stress coping skill item was the item 1, "I turned to work on other substitute activities to take my mind off things" (0.83 logits), and the least used stress coping skill item was the item 12, "I thought about how I might best handle the problem" (-0.54 logits). The Rasch analysis estimated the average person measure as 0.55 logits (SD = 1.48).

Table 1. Item Fit and Item Difficulty Hierarchy Results (11 items)

Item	Measure (*logits*)	Model *SE*	Infit		Outfit	
			MnSq	*ZSTD*	*MnSq*	*ZSTD*
Item 1."I put aside other activities in order to concentrate on this."	0.83	0.06	1.35	5.31	1.34	4.42
Item 3."I focused on dealing with this problem, and if necessary let other things slide a little."	0.35	0.06	0.92	-1.43	0.99	-0.17
Item 4."I made a plan of action."	0.27	0.06	1.28	4.27	1.37	4.87
Item 5."I tried hard to prevent other things from interfering with my efforts at dealing with this."	0.16	0.06	1.03	0.49	1.08	1.19
Item 6."I took direct action to get around the problem."	0.05	0.06	1.00	-0.05	1.01	0.21
Item 7."I thought hard about what steps to take."	-0.18	0.06	0.83	-2.94	0.77	-3.38
Item 8."I did what had to be done, one step at a time."	-0.20	0.06	1.19	2.92	1.32	4.00
Item 9."I took action to try to make the situation better."	-0.21	0.06	1.01	0.22	1.06	0.87
Item 10."I concentrated my efforts on doing something about it."	-0.24	0.06	0.86	-2.29	1.00	-0.04
Item 11."I tried to come up with a strategy about what to do."	-0.28	0.06	0.72	-4.80	0.69	-4.54
Item 12."I thought about how I might best handle the problem."	-0.54	0.06	0.85	-2.40	0.86	-1.79

MnSq=Mean Square; SE=Standard Error; ZSTD=Standardized z-Statistics

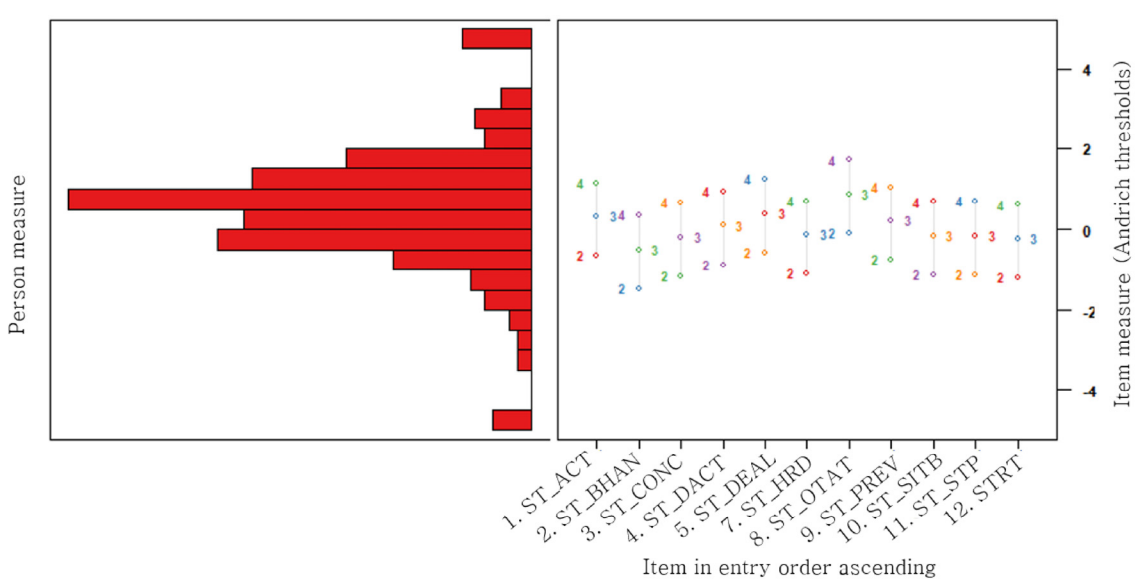

Figure 1. Person Item - Map

Table 2. The Revised COPE-11 Rating Scale

Category label	Observed count %	Observed average	Sample expect	Infit *MnSq*	Outfit *MnSq*	Step calibration	Category measure
1. I usually do not do this at all	787, 15%	-0.73	-0.90	1.31	1.48	-	(-2.25)
2. I usually do this a little bit	1,141, 22%	-0.14	-0.01	0.77	0.76	-0.92	-0.63
3. I usually do this a medium amount	1,512, 29%	0.61	0.64	0.88	0.86	0.04	0.64
4. I usually do this a lot	1,840, 35%	1.39	1.34	0.96	1.03	0.88	(2.23)

COPE=Coping Orientation to Problems Experienced; MnSq=Mean Square

4. Rating scale analysis

The COPE-11 had an observed count of more than 10 in each response category. The average of the COPE-11 category measures increased continuously from -2.25 to 2.23, showing that the thresholds were aligned. Also, the outfit MnSq for all categories was less than 2.0. Finally, step calibrations were investigated and showed values of -0.96 and +0.96 (Table 2).

5. Differential item functioning (DIF) psychometric analysis

Those who responded to the 11 COPE scale items did not show DIF for sex (male/female) and age within the older adults group (less than 76 years old vs. 76 or over). We also did not find significant DIF for the age group as the DIF contrast values were 0.27 and 0.26, which was less than our a priori criteria for DIF magnitude (Appendix 3). Therefore, it shows that the responses to the items did not differ according to gender and age.

Ⅳ. Discussion

The current study examined the item-level psychometrics of the COPE-12 and revealed that the COPE-11 has adequate psychometric properties. We have several new findings from this Rasch analysis. First, the test items were successfully calibrated into a linear interval scale (logits) and demonstrated a logical item difficulty hierarchy. While one test item was removed due to item misfit, the remaining 11 items showed no DIF for sex and age. These findings are meaningful, since the COPE is widely used in occupational therapy studies and the Rasch analysis demonstrated that the psychometric properties of the instrument can be improved at an item level.

The COPE inventory has been studied by several researchers. Similar to our study, others have examined if the scale is unidimensional. Pang et al. (2013) analyzed 47 items of the COPE inventory using confirmatory factor analysis (CFA) and exploratory factor analysis (EFA). They reported that 47 items did not assume unidimensionality. Su et al. (2015), analyzed 28 items of the Brief COPE scale using CFA, but the 28 items did not assume unidimensionality. This is because the original COPE inventory contains useful and non-useful coping

styles and because the brief COPE contains two themes, useful and ineffective coping styles. A possible explanation for why our results achieved unidimensionality could be that we used 12-item combination scales, unlike the 46 items and 28 items tested in the aforementioned study.

In this study, only item 2 "I kept myself from getting distracted by other thoughts or activities," was removed due to misfit. Except for this misfitting item, the COPE-11 consists of test items addressing direct efforts, plans, and strategies to cope with stress. The stress coping in item 2 assesses how to avoid being distracted by other thoughts or activities. This stress coping method can be thought of as an avoidance method, rather than problem-centered and emotion-centered. According to the study on stress coping behaviors and stress responses in older adults, the level of stress coping behaviors of older adults was highest in problem-focused coping, but lowest in avoidant emotion-focused coping (Sung, 2009). In another study, the higher the quality of life of older adults, the more efficiently they coped with stress, whereas older adults with a low quality of life tended to avoid stress (Kim & Kwon, 2012). Lastly, according to a study on the effect of older adults in the community on suicidal ideation, it was investigated that depression and stress avoidance coping methods affect suicidal ideation in older adults (Chang, 2018). Failure to manage continuous and repetitive stress can lead to emotional exhaustion and lethargy, leading to psychological exhaustion (Park & Lee, 2009). Stress is directly related to psychological adaptation between active coping behavior and problem-oriented coping (Folkman & Moskowitz, 2004). For this reason, it is expected that item 2 will not be suitable for coping with stress. However, after removing this item from the instrument, our findings revealed that the remaining 11 items can sufficiently evaluate stress coping.

The physical, mental, and social health of older adults is associated with stress (Min & Yoo, 1998; Schultchen et al., 2019). According to a study investigating the relationship between cognition and stress in older adults subjects, it was reported that individuals with a lot of stress had lower cognitive function than individuals with low stress (Korten et al., 2017). In addition, a study examining the association of acute stress between leisure self-determination and leisure social support reported that leisure self-determination and leisure social support had a negative correlation with acute stress (Chang, 2015). Another study reported that stress was also associated with hearing loss in older adults (Jayakody et al., 2018). In addition, the health of older adults may vary depending on how to cope with stress. According to a study examining the association between stress coping and depression, positive problem solving reduced depression, while avoiding stress negatively correlated with depression (Murayama et al., 2020). COPE-11, which was finally selected by analysis in this study, can prevent and manage physical, mental, and social health in older adults stage by evaluating older adults' stress coping methods.

Our study had several limitations. First, we selected only 12 items from the COPE on which to conduct the analysis. The original COPE scale comprised 60 items, and the COPE items used in the Well Elderly 2 study included 36 items. Of these 36 items, 12-item combination scales were specified in the Well Elderly 2 study. As our research was

conducted with only 12 items, future studies would need to analyze the item-level psychometrics of the original 60 items of the COPE inventory. Second, since the data used in this study are relatively old data from 2004 to 2008, it is difficult to generalize. Finally, this study was conducted as a COPE analysis on stress-coping behaviors in the elderly. In this study, the average age was 74.31 years old, and the subjects were the elderly. Therefore, it is necessary to analyze the collection of various age groups in future research.

V. Conclusion

We investigated psychometric properties using the COPE-12 combination scale provided by the Well Elderly 2 study. The original 60 items had unstable factors, but COPE-12 assumed one-dimensionality. In addition, we selected COPE-11, which can properly evaluate stress coping by removing one inappropriate item through Rasch analysis. COPE-11 solved the 60 shortcomings of the original COPE, such as long evaluation time and unstable factors. Thus, COPE-11 will be helpful to researchers, clinicians, and respondents (patients) seeking a time-efficient assessment.

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국문초록

스트레스 대처 척도 12개 항목에 대한 심리측정 속성

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목적 : 본 연구는 라쉬 분석을 이용하여 12개 항목의 스트레스 대처 척도의 항목 심리측정 속성을 조사하고자 하였다.

연구방법 : 본 연구는 ICPSR(Inter-university Consortium for Political and Social Research)에서 제공하는 공공 자료를 활용하여 로스엔젤레스에 거주하는 노인 480명을 대상으로 조사하였다. 주성분 분석을 사용하여 척도의 일반적 요인을 조사하였다, 라쉬 분석의 내・외적합 지수의 제곱평균(Mean Square)과 표준값(ZSTD)를 통해 항목 적합도를 알아보고, 척도의 신뢰도와 쉬운 항목과 어려운 항목을 식별하기 위해 항목-난이도 계층을 조사하였다. 마지막으로 성별과 연령 그룹에 대해 차등 항목 기능을 조사하였다,

결과 : 주성분 분석을 통해 스트레스 태처 척도의 12개 항목이 하나의 요인으로 구성되었음을 가정하였다. 라쉬 분석을 통하여 항목 2번이 부적합한 결과로 제거되었다(내적합 제곱평균=1.33, 내적합 표준값=5.05, 외적합 제곱평균=1.56, 외적합 표준값=7.15). 항목 2번을 제외한 11개 항목의 평가자 층(Person Strata)은 3.10으로 신뢰도 지수 0.81에 해당하는 값을 보였다. 차등 항목 기능을 조사한 결과 성별과 연령 그룹에 대한 차등 항목 기능은 없었다.

결론 : 라쉬 분석을 통해 개정된 COPE-11은 항목 간 심리측정 속성이 적절하여 측정 시 시간 단축과 정확한 측정이 가능할 것으로 사료된다.

주제어 : 노인, 라쉬, 설문, 스트레스 대처 기술, 신뢰도

Appendix 1. Item-Level Psychometrics of the 12 items of the Coping Orientation to Problems Experienced Scale

Name	Question #	Item
ST_REL	1	I tried to find comfort in my religion.
ST_HAP	2	I looked for something good in what was happening.
ST_ACT	3	I made a plan of action.
ST_SLP	4	I slept more than usual.
ST_STP	5	I did what had to be done, one step at a time.
ST_BLM	6	I've been blaming myself for things that happened.
ST_ALC	7	I used alcohol or drugs to make myself feel better.
ST_IDE	8	I got used to the idea that it happened.
ST_DIS	9	I kept myself from getting distracted by other thoughts or activities.
ST_DAYD	10	I daydreamt about things other than this.
ST_SPIR	11	I tried to find comfort in my religion or spiritual beliefs.
ST_CONC	12	I concentrated my efforts on doing something about it.
ST_ACPT	13	I accepted that this had happened and that it couldn't be changed.
ST_GUP	14	I gave up trying to deal with it.
ST_SITB	15	I took action to try to make the situation better.
ST_CRIT	16	I've been criticizing myself.
ST_DIFL	17	I tried to see it in a different light, to make it seem more positive.
ST_GOD	18	I put my trust in God.
ST_STRT	19	I tried to come up with a strategy about what to do.
ST_DEAL	20	I focused on dealing with this problem, and if necessary let other things slide a little.
ST_COPE	21	I gave up the attempt to cope.
ST_OTAC	22	I turned to work or other substitute activities to take my mind off things.
ST_BHAN	23	I thought about how I might best handle the problem.
ST_PREV	24	I tried hard to prevent other things from interfering with my efforts at dealing with this.
ST_TVM	25	I went to movies or watched TV to think about it less.
ST_REAL	26	I accepted the reality of the fact that it happened.
ST_DACT	27	I took direct action to get around the problem.
ST_GROP	28	I tried to grow as a person as a result of the experience.
ST_RED	29	I reduced the amount of effort I was putting into solving the problem.
ST_ALCD	30	I used alcohol or drugs to help me get through it.
ST_LIVE	31	I learned to live with it.
ST_OTAT	32	I put aside other activities in order to concentrate on this.
ST_HRD	33	I thought hard about what steps to take.
ST_QUIT	34	I admitted to myself that I couldn't deal with it, and quit trying.
ST_EXP	35	I learned something from the experience.
ST_PRAY	36	I have been praying or meditating.

Response category.

1. I usually didn't do this at all
2. I usually did this a little bit
3. I usually did this a medium amount
4. I usually did this a lot

Algorithm:

Sum Items listed, with no reversal of coding

Scoring of Items: 10 different scales of coping; and 1 combination scale

- Active coping: 5, 12, 15, 27: Variable name=AACpe
- Planning:3, 19, 23, 33: Variable name=APln
- Suppression of competing activities: 9, 20, 24, 32: Variable name=ASup
- Positive reinterpretation and growth: 2, 17, 28, 35: Variable name=PRtrp
- Acceptance: 8, 13, 26, 31: Variable name=Acct
- Religious coping: 1, 11, 18, 36: Variable name=Relig
- Behavioral disengagement: 14, 21, 29, 34: Variable name=BhvDs
- Mental disengagement: 4, 10, 22, 25: Variable name=MntDs

* Sum each scale above and divide by 4

- Self-Blame: 6, 16: Variable name=SlfBlm
- Drugs & Alcohol: 7, 30: Variable name=DrgAl

Sum each scale (SlfBlm & DrgAl) and divide by 2

- Combination scale: sum AACpe, Apln, ASup (3,5,9,12,15,19,20,23,24,27,32,33) and divide by 12; variable name=ACTV

Range of scores: 1-4

Source: https://www.icpsr.umich.edu/web/ICPSR/studies/33641#

Appendix 2. Item Fit and Item Difficulty Hierarchy Results (12 Items)

Item	Measure (*logits*)	Model *SE*	Infit		Outfit	
			MnSq	*ZSTD*	*MnSq*	*ZSTD*
Item 1. ST_OTAT "I put aside other activities in order to concentrate on this."	0.74	0.06	1.32	4.91	1.32	4.29
Item 2. ST_DIS "I kept myself from getting distracted by other thoughts or activities."	0.49	0.06	1.33	5.05	1.56	7.15
Item 3. ST_DEAL "I focused on dealing with this problem, and if necessary let other things slide a little."	0.29	0.06	0.88	-2.14	0.93	-1.09
Item 4. ST_ACT "I made a plan of action."	0.21	0.06	1.23	3.63	1.26	3.57
Item 5. ST_PREV "I tried hard to prevent other things from interfering with my efforts at dealing with this."	0.11	0.06	0.98	-0.24	1.03	0.52
Item 6. ST_DACT "I took direct action to get around the problem."	0.00	0.06	1.00	0.02	1.04	0.65
Item 7. ST_HRD "I thought hard about what steps to take."	-0.22	0.06	0.81	-3.31	0.75	-3.68
Item 8. ST_STP "I did what had to be done, one step at a time."	-0.24	0.06	1.15	2.31	1.24	3.12
Item 9. ST_SITB "I took action to try to make the situation better."	-0.25	0.06	0.96	-0.68	0.98	-0.23
Item 10. ST_CONC "I concentrated my efforts on doing something about it."	-0.27	0.06	0.83	-2.91	0.95	-0.66
Item 11. ST_STRT "I tried to come up with a strategy about what to do."	-0.31	0.06	0.72	-5.01	0.68	-4.81
Item 12. ST_BHAN "I thought about how I might best handle the problem."	-0.56	0.06	0.84	-2.55	0.85	-1.94

MnSq=Mean Square; SE=Standard Error; ZSTD=Standardized z-Statistics

Appendix 3. Differential Item Functioning for Sex and Older Age With the 11 Non-Misfit Items

Item	Male vs. Female		Less than 76 years old vs. 76 years old or over	
	DIF contrast	Probability	DIF contrast	Probability
Item1. ST_OTAT	0.00	1.00	0.27	0.02
Item 3. ST_DEAL	0.09	0.46	0.02	0.84
Item 4. ST_ACT	0.03	0.83	0.06	0.64
Item 5. ST_PREV	0.00	1.00	0.02	0.08
Item 6. ST_DACT	0.19	0.13	0.00	1.00
Item 7. ST_HRD	0.20	0.11	0.07	0.58
Item 8. ST_STP	0.03	0.83	0.18	0.13
Item 9. ST_SITB	0.10	0.45	0.26	0.04
Item 10. ST_CONC	0.11	0.39	0.04	0.73
Item 11. ST_STRT	0.09	0.51	0.00	1.00
Item 12. ST_BHAN	0.21	0.11	0.10	0.46

DIF=Differential Item Functioning; Reference group(Sex=Male; Age=Less than 75 years old)