



The design and psychometric evaluation of the Adolescents' Resilience in Disaster Tool (ARDT-Q37): A mixed method study

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ABSTRACT

Adolescent resilience after a disaster has been shown to be a protective factor against loss, trauma, and psychological distress. Its importance for successful disaster recovery is widely accepted by disaster risk management professionals, yet very few tools are available to assess adolescent resilience during an emergency or after a natural disaster has occurred. The aim of this study was to develop and evaluate the psychometric properties of a questionnaire designed to measure adolescents' resilience before, during or after a natural disaster. This mixed method study was carried out in three phases involving item generation, systematic review (phase one), qualitative analysis (phase two) and the reduction of items (phase three). The psychometric evaluation of the Adolescents' Resilience in Disaster Tool (ARDT) was conducted using the data from 599 high school students North of Iran (Golestan Province). The initial item pool included 80 items that were reduced to 37 after assessment of validity (face, content and structure) and reliability. Exploratory Factor Analysis found five factors that affect adolescents' resilience which included helping, trusting in God and hopefulness, adaptability, self-confidence and social support. The internal consistency was desirable ($\alpha = .86$ and ICC = .91; 95% CI: .849 to .948). The psychometric support for the 37-item version of the ARDT in this study indicates strong support for the ARDT-Q37 as a rapid assessment tool to evaluate resilience in adolescents aged 12–18 years old. Identifying the status of adolescents' resilience and determining their level of need for intervention during and after a natural disaster is critical for long- and short-term outcomes. Implications for policy makers and professionals involved in the preparedness, response and recovery from natural disasters are discussed.

1. Introduction

Resilience has become a key construct in the field of disaster management and recovery due to its role in buffering the impact of traumatic events [1, 2, 3]. For survivors of a natural disaster, resilience is a protective factor against negative psychological sequelae and mental health problems. Understanding and measuring resilience in adolescence is vital for the health and wellbeing of young people and should be a critical consideration in disaster management preparedness.

Researchers from different disciplines, particularly in the field of psychology [4], have paid much attention to resilience as a construct

related to psychological wellbeing, adjustment and coping [<https://www.palgrave.com/gp/book/9781137569233>]. According to Iacoviello, “resilience is broadly defined as adaptive characteristics of an individual to cope with and recover from adversity” [5]. However, complexities arise when conceptualizing resilience as a cross-disciplinary and cross-cultural construct as no single definition for resilience exists [6, 7, 8]. It is commonly agreed that resilience relates to an individual's ability to cope, tolerate and overcome adversity [4, 9, 10] which makes it an important construct to study in relation to disaster management, risk reduction and emergency management. Although multiple interpretations of resilience exist, the importance of effective measurement

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tools in disaster response and recovery remain essential.

Resilience plays an important role in the recovery from, or prevention against, long-term negative psychological sequelae following a natural disaster. For adolescents in particular, skills related to coping, adaptability and resilience have been found to be particularly important. The more resilient a young person is following a natural disaster, the more likely they will be able to adapt and overcome the hardship or trauma they have experienced [11, 12]. While it is widely established that resilience is important in adolescent health and wellbeing, the factors that predict resilience are less understood. Moreover, very few tools are available that measure resilience in adolescence specifically related to natural disaster and there is a dearth in the literature on cross-cultural applicability of resilience measures and nuances in individual characteristics in different contexts [18, 19].

Skills related to resilience can buffer the negative long-term physical and psychological effects that can occur following a natural disasters and adolescence is an optimal time to teach these skills [13, 14]. Given recent attention on social and emotional learning in schools around the globe [15, 16, 17], schools offer a suitable place for resilience promotion.

There are currently several questionnaires that measure resilience [20]. The most widely used questionnaire is Connor and Davidson's Resilience Scale (CD-RIS 2003) [2], which was designed for adults. This questionnaire has been translated into the Persian language with the Cronbach's alpha of .89 [21]. The CD-RIS is not a specific resilience tool for adolescents or children. Specific questionnaires for adolescents are limited, however the long Child and Youth Resilience Measure (CYRM) questionnaire with 28-items [22], and the short CYRM questionnaire with 12 items [23] have been widely used. Other questionnaires, such as the Adolescent Resilience Questionnaire (ARQ) [24], have been found to report good validity and reliability (Cronbach's alpha, .70). It also covers multiple domains of family ($\alpha = 0.85$), peers ($\alpha = 0.82$), school ($\alpha = 0.85$), and individual ($\alpha = .94$) across 87-items. However, the length of questionnaire poses a disadvantage, especially when there are time constraints (i.e., in a situation such as a natural disaster). It should be noted that the aforementioned questionnaires have examined resilience from a psychological perspective. No cross-disciplinary, cross-cultural measures of resilience exist that specifically relate to disaster risk management in adolescents. Therefore, given that resilience is a context-based concept, it is essential to identify the factors that affect resilience, and to design an appropriate tool which is compatible with the society and the native culture from which emergencies and disasters may take place. This study aimed to design and explore the psychometric properties of a measure of adolescents' resilience against natural disasters.

2. Method

2.1. Study design

This mixed method study was carried out in three phases that incorporated systematic review as well as qualitative and quantitative analysis. The systematic review and qualitative stages of the study were conducted for item generation, while the quantitative part of the study was employed for item reduction and evaluation of the measurement tool.

2.2. Item generation

2.2.1. First phase

The identification of skills related to resilience in adolescents was systematically reviewed using PUBMED, SCOPUS, WEB OF SCIENCE and PsycINFO databases between the 4th April till 14th of August 2016. The UNICEF, ERIC, UNISDR, APA PsycNET, Global Platform on DRR, and the International Building Resilience Conference websites were also explored as Gray Literature to extract components of resilience specific to adolescence [16]. In total, 28 related articles were extracted from 1838

articles found in the initial search. The phases were executed according to the PRISMA [25] guideline and 600 codes were extracted from the review of 28 articles [26]. The extracted codes were categorized according to the similarity of topics and concepts. Four sessions were held with the research team to categorize the components of adolescents' resilience in disasters until a consensus was achieved. For more information on findings from the first phase, see published systematic and protocol articles [16, 26].

2.2.2. Second phase

In order to reach a deep understanding of the concept of adolescents' resilience in the face of natural disasters, 22 semi-structured individual interviews and three focus group discussions were conducted. The participants were drawn from various fields, such as health, policy making, child psychology, teaching and training, and business. The criteria for choosing the interviewees included having managerial experience in disasters or having experience in working with adolescents, or both. Individual interviews lasted for 45-minutes on average. Three expert panel meetings with organizations working in the field of disaster and adolescents (i.e., the Red Crescent, the Ministry of Health and Medical Education, UNICEF, and the Ministry of Education) were also arranged.

Qualitative content analysis was used to extract the codes that reflect adolescent resilience during and following natural disasters from the interview and meeting transcripts. In facilitating the classification of the extracted codes, the MAXQDA/10 software was used. For more information on the findings from the second phase, see the published qualitative article [27].

2.3. Item reduction

2.3.1. Third phase

2.3.1.1. Integration of qualitative and systematic phases: providing the pool of items. In the systematic and qualitative phases, the components and characteristics of adolescents' resilience in natural disasters which had been extracted from phase one and two were merged together. For more information on this third phase, see the published articles [26, 27]. The tables extracted from each study phase were separated, and in this phase, all components and characteristics were placed together; repeated items were removed and similar ones merged. New categories and sub-categories were formed independent of the systematic review [26] and qualitative study [27]. Since the new categories and subcategories were the basis for constructing the pool of items, they were evaluated with greater sensitivity. Classification and naming of the categories were repeated for a total of 8 times during a two month period in order for the research team to reach a consensus. The 88 initial items in the questionnaire were designed to be age-appropriate for adolescents aged 12–18 years old. The final table, containing the themes, subthemes, and codes, expands the main characteristics of resilience as converted into items. Questions were examined by the research team, and some were removed and modified. The question format was simplified and edited to be appropriate for the average literacy skills of a typically-developing adolescent. Finally, the initial format of the adolescents' resilience questionnaire in natural disasters with 80 questions was prepared. The questionnaire is referred to as ARDT questionnaire (Adolescents' Resilience in Disasters Tool). Subsequently, the primary questionnaire was checked for validity. The psychometric properties of the ARDT was examined for face, content, and constructive validity, and reliability. The completed measure resulted in a 68 items self-report scale with response options based on a five-point Likert scale: "I completely agree, I agree, I don't agree nor disagree, I disagree, and I completely disagree". The questionnaire was designed using a flood hazard scenario.

2.3.1.2. Face validity. To determine the face validity of the ARDT, quantitative and qualitative methods [28] were used. For qualitative face

validity, an e-mail was sent to 10 different specialists in the field of child psychology, disaster management and health. Also, face-to-face interviews with six, 12 to 18-year old adolescents were conducted and they were asked to express their understanding of the designed questions. The issues that they considered inaccurate were corrected and re-examined. Experts were then asked to complete a survey that reflected the difficulty level, fitness, and ambiguity of the questions. They indicated whether there was a need to delete, merge or change the questions. Then, the questions were edited according to the recommendations of the experts.

In the quantitative face validity phase, 11 students aged 12–18 years old were asked to rate questions in terms of their clarity, and indicate one of the following responses for each question: "it is completely clear, it is clear, it is almost clear, it is a little clear, it is not clear at all". The scores were between 1 and 5, in which the score of 1 reflected the lowest and the score of 5 the highest significance. Impact score = Frequency (%) × Importance [29]. The score of impact was considered to be greater than 1.5 [30]. At this stage, no question was removed.

2.3.1.3. Content validity. To determine qualitative content validity, 10 experts with knowledge and experience in the field of psychometric evaluation, child psychology, emergency and disaster management and pediatric nursing were asked to submit their review of the questionnaire in terms of grammar, wording, item allocation, and scaling [31]. The questionnaire was then edited according to the experts' recommendations. Quantitative content validity was examined by measuring the content validity ratio (CVR), and content validity index (CVI). To determine the content validity ratio, 10 experts in the field of pediatric medicine, child psychology, emergency and disaster management, and pediatric nursing were asked to specify the necessity of each item. In this phase, the content validity ratio was calculated based on the Lawshe formula (1975) which is acceptable with the score of 0.64 or above [32]. The mean of content validity index scores was considered as an indicator of the questionnaire's content (Average of the I-CVI for all items in the scale). According to Poliet and Beck's (2006), the score of 0.9 is considered as excellent and 0.8 is regarded as acceptable [33]. Twelve unacceptable items were removed at this stage and a total of 68-items were entered into the cross-sectional study to examine the construct.

2.3.1.4. Participants and setting. Before examining the constructive validity, an item analysis was conducted with 60 high school male and female students as participants in order to identify the possible problems of the questionnaire and check its early internal consistency. The Cronbach's alpha was calculated to be .922 at this stage.

In the quantitative phase, a cross-sectional study was conducted in December 2017 to assess the constructive validity. Through cluster sampling, 599 students aged 12–18 years old from the Golestan province were chosen as participants. In order to assess the constructive validity, the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), convergence, divergent validity and comparison in known groups were used [28]. As a rule of thumb, estimation of the sample size indicated that 3 to 10 were appropriate for each item [34].

2.3.1.5. Construct validity. The Construct validity of the scale was evaluated using principal axis factoring with Promax rotation by SPSS₂₅ and the latent factors were extracted based on Horn's Parallel Analysis by SPSS R-menu v2.0 [35]. Kaiser-Meyer-Olkin (KMO) index was calculated to examine whether the sample size was adequate and a value of .8 or more was considered suitable for the factor analysis [36]. Bartlett's Test of Sphericity was performed for the suitability of the factor analysis model. The presence of a single item in the factor based on the formula $CV = 5.152 \div \sqrt{(n-2)}$ [37] was estimated to be around .3 (n is the sample size of the study) [38]. In this phase, any item that did not have a correlation coefficient of more than .3 with at least another item was removed from the questionnaire [34]. Also, the correlation coefficient

between the item and the whole questionnaire of less than .3 was removed [36]. In the next phase, the extracted factors were evaluated using the first and second order confirmatory factor analysis with the maximum likelihood estimation, and based on the fitting indexes of the model by AMOS₂₄.

2.3.1.6. Convergent and divergent validity. The convergent and divergent validity of the resilience of adolescents in disaster were evaluated based on the Fornell and Larker (1981) approach using Average Variance Extracted (AVE), Maximum Shared Squared Variance (MSV), Average Shared Square Variance (ASV) and Composite Reliability (CR). To establish the convergent validity, it should be $AVE > .5$ and $CR > AVE$, and to confirm the divergent validity, it must be $AVE > MSV$ [39].

2.4. Reliability

To assess the reliability, the internal consistency (Cronbach's alpha, McDonald's omega coefficients) and stability (ICC) of adolescents' resilience in disasters were measured [40]. Then, CR was calculated and values higher than .7 were considered as desirable reliability [39].

2.4.1. The normal distribution of data, outliers and missing data

The univariate normal distribution of the items was assessed using the Skewness: ± 3 ; Kurtosis: ± 7 and multivariate normal distribution by the Mardia coefficient (higher than 20). Multivariate outlier data were evaluated by Mahalanobis d-squared ($p < .001$) [41]. The percentage of missing data was evaluated using Multiple Imputation and then replaced by the average respondent response [39].

2.5. Ethical considerations

This study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.SPH.REC.1395.1542), [42]. All participants voluntarily participated in this study. In the qualitative phase of the study, with the permission of the participants, their voices were recorded. Names of the participants were not mentioned in the study, and instead of their names, codes were used in the interview texts. To maintain confidentiality, the statements of the participants were not discussed with other members of the research team.

2.6. Findings

2.6.1. First phase

In a systematic review, 600 codes of the components of adolescents' resilience were extracted from 28 related articles. The resilience components in this phase were classified into two main categories - internal (personal characteristics) and external (social interaction), and five subcategories including psychological, spiritual, physical, socio-behavioral, and environmental-ecological [26].

2.6.2. Second phase

In the qualitative phase, 416 codes were extracted from the characteristics of adolescents' resilience. After combining common concepts, the personal components were divided into internal and external categories, and five domains (mental-emotional, cognitive-mental, spiritual, physical-physical, social and behavioral) [27].

At the end of the second phase, the components extracted from the systematic phase [26] and the qualitative phase were combined and a common table was created. This final table was the basis for creating the item pool. The 80 constructed items in this stage were entered into the psychometric phase. After removing the repeated construct and integration, 68 items were prepared. In this study, inductive-deductive approach was used to produce the questionnaire's items. This approach has many benefits, such as acquisition of information directly from the participants and the use of available texts and tools, which covers all the

Table 1
Exploratory factors extracted from Adolescence Resilience in Disaster Tool (ARDT-Q37).

Factor Name	Items	Factor loading	h^2	% of variance	Eigenvalues
Helping	47.I can make my parents and friends calm in this situation	.762	.546	15.3	5.62
	46.I can help my parents and friends to get harm less	.727	.465		
	45. I can have a positive impact on others in this situation	.577	.406		
	48.My parents try to improve conditions because of me	.509	.288		
	54.I have a good relationship with my friends and peers	.446	.303		
	50.It doesn't matter what task they want me to do, I will do my best anyway	.431	.215		
	51.I can control myself in this situations and behave appropriately	.377	.375		
	57.I can take care of younger children in this situation	.369	.239		
	55.I have a sense of humor even when it's bad situation	.362	.193		
	42.I cooperate with friends and peers in group work	.347	.302		
Adaptability	12.In this situation, I have the power to cope with the problems	.599	.383	12.8	4.75
	17.I can be compatible with these conditions	.567	.318		
	13.It does not matter what I was missing in that situation, it's important to be alive	.512	.251		
	15. I still love the life even in this situation	.490	.247		
	11.I am able to return to normal situation when I face with problems	.488	.324		
	20.I know the risks (flood, earthquake, fire) and what should I do the time of event	.429	.242		
	21. I already used the educational and useful information of the Internet and the virtual network and now I am prepared for the risks of floods and earthquakes.	.416	.248		
	18. This event has its own condition, it does not relate to the previous events. I have to do something	.415	.182		
	25.I do not recall bad memories in my mind in this situation	.367	.219		
	28.I'm curious to look for new stuff	.645	.364		
Self-confidence	27.I learn new things quickly as I am smart	.620	.439	13.2	4.82
	32.I use my innovation to solve problems in this situation	.557	.345		
	36.I am agile and I quickly do my works	.477	.330		
	24.I'm using my mind to make better condition	.434	.366		
	26.In this situation, I get new ideas that others have not paid attention	.343	.183		
	10.In this situation, I do not allow anyone to disrespect me	.343	.094		
	37.I am physically strong and health	.325	.224		
Trusting in God and hopefulness	35.I calm myself down by praying to God in this situation	.645	.426	11.2	4.15
	33.My relationship with God helps me not to feel alone in this situation	.636	.409		
	34.I am sure God likes me and protects me in this situation	.621	.425		
	29.I am interested to learn more about the dangers of floods and earthquakes	.425	.279		
	19.hardships make me stronger	.334	.254		
Social supporting	64.In this situation, if I need help teachers help me	.579	.351	10.6	3.93
	67.My friends are really trying to help me	.568	.384		
	62.In these circumstances neighbors and friends are caring me, so I feel safe	.536	.385		
	68.I can talk about my own problems with my family	.485	.337		
	66.There is a special person that I can share my discomfort and pleasure	.462	.245		

dimensions of the desired subject.

2.6.3. Third phase

During the reduction of items in the third phase, 31 of the 68 items were removed and therefore, the final ARDT contained a total of 37 reliable and valid items. A total of 599 high school students 12–18 years old, 309 (52%) of which were female, participated in this study.

The Kaiser-Meyer-Olkin (KMO) index was .903 and Bartlett's test was 5442.66, $p < .001$. EFA extracted five factors - helping, trusting in God and hopefulness, adaptability, self-confidence and social support which explained 63.19% of the total variance. These five latent factors were allocated 5.62%, 4.75%, 4.89%, 4.15% and 3.93% eigenvalue, respectively (Table 1).

In the first-order confirmatory factor analysis, after modifying the model and drawing the correlation between the measurement error e5 and e7. The Chi-square test for goodness-of-fit was obtained as the first fitting index [χ^2 (313, $N = 200$) = 511.08, $p < .001$]. To evaluate the fitting of the model, other indices were evaluated (PCFI = .784, PNFI = .663, CMIN/DF = 1.63, RMSEA = .056, AGFI = .817, IFI = .901) which confirmed the final model perfectly (Table 2 and Fig. 1).

After the first-order CFA, a separate assessment of the factors of the adolescents' resilience in disasters and the correlation between its constructs was performed. The second CFA was conducted to confirm the general concept of "adolescents' resilience in disasters". Fig. 2 shows the structural model and the second order CFA of the ARDT with the standardized factor loading coefficients.

The amount of factor loading obtained for ARDT was more than .5 for all the items, being significant at $p < .001$. As shown in Table 3, AVE is

larger than MSV and $CR > AVE$ in all factors, which indicates that convergent and divergent congruity validity are appropriate.

3. Discussion

The purpose of this study was to design and evaluate the psychometric properties of an adolescents' resilience questionnaire applicable to natural disasters. The final ARDT questionnaire, which had the desired validity and reliability, included 37 items and 5 factors consisting of helping, trusting in God and hopefulness, adaptability, self-confidence and social support which explained 63.19% of the total variance. The domains of social support, trust in God and hopefulness (5 items), self-confidence (8 items), adaptability (9 items) and helping (10 items) varied in the number of items they reported. The number of items indicated the importance of relevant factors in the adolescents' resilience. According to the findings of the study, the correlation of the domains with the total resilience, and the low correlation of the domains with each other indicated that none of the domains was exactly the same. The domains were found to be different from each other and completely independent. In the reliability test, the ARDT showed an acceptable internal consistency. The reliability of the entire ARDT had an optimal alpha of .89, and also the θ and the Omega were excellent and acceptable.

In this study, the most common indicators of model fitness were evaluated, and all factor loads above .5 were indicative of a minimum acceptable factor load. Therefore, based on the confirmatory factor analysis results, all fitness indicators had a suitable standard level and the model fitness was appropriate.

The first CFA showed that a latent layer was existent, so the secondary

Table 2
Fit indices of the first- and second-order confirmatory factor analysis of the ARDT-Q37.

CFA Index	IFI	AGFI	PNFI	PCFI	RMSEA	CMIN/DF	P-value	df	χ^2
First-order after construct modification	.90	.81	.66	.78	.05	1.63	>.001	313	511.08
Second-order after construct modification	.90	.81	.66	.78	.05	1.68	>.001	316	530.96

Abbreviations; ARDT: Adolescence Resilience in Disaster Tool; CFA: Confirmatory Factor Analysis; CMIN/DF: Chi-square/degree-of-freedom ratio; RMSEA: Root Mean Square Error of Approximation; PCFI: Parsimonious Comparative Fit Index; PNFI: Parsimonious Normed Fit Index; AGFI: Adjusted Goodness-of-Fit Index; IFI: Incremental Fit Index; CFI: Comparative Fit Index. Fit indices: PNFI, PCFI, AGFI (>.5), CFI, IFI (>.9), RMSEA (<0.08), CMIN/DF (<3 good, <5 acceptable).

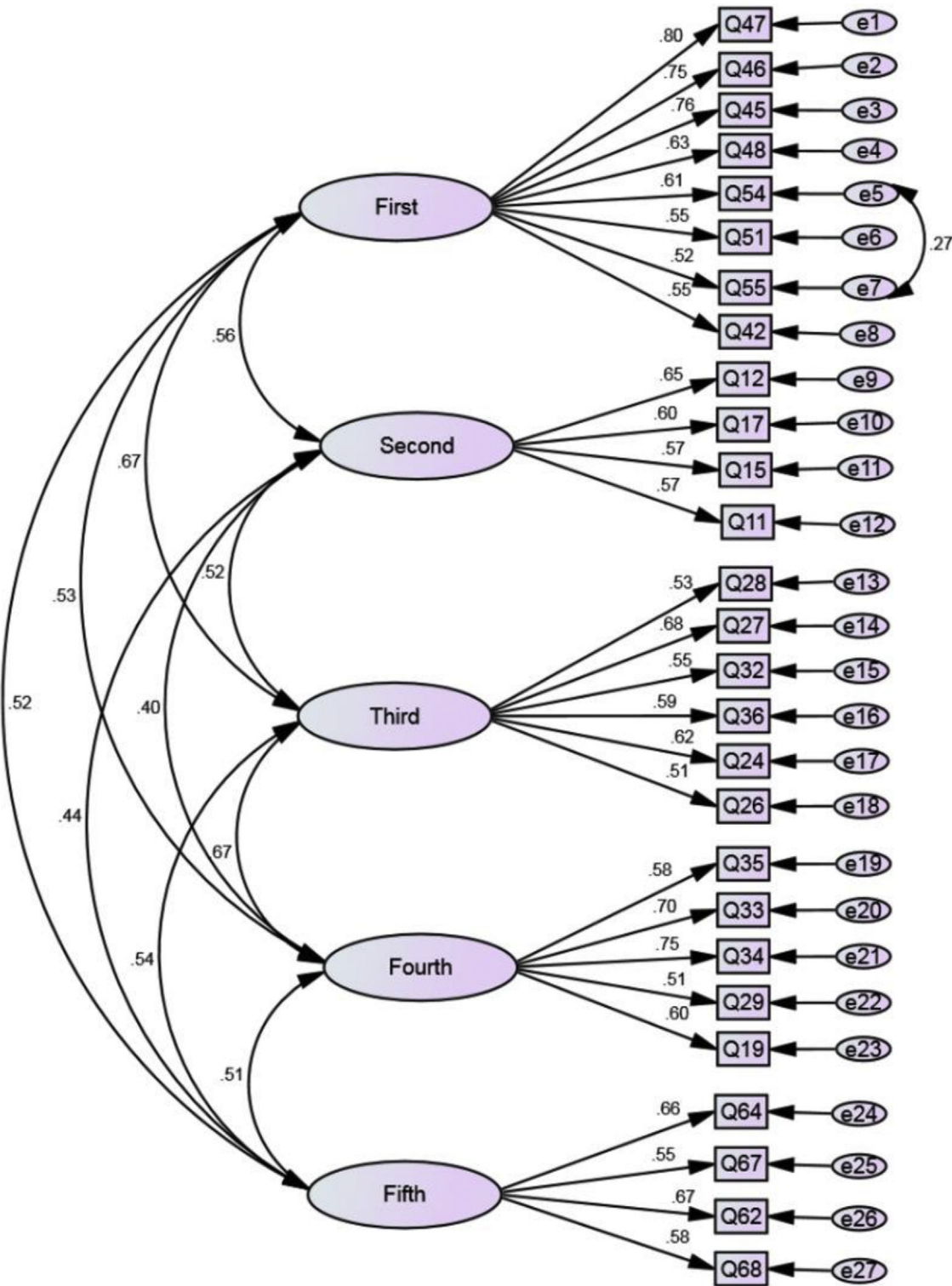


Fig. 1. ARDT construct: modified model of first-order confirmation factor analysis.

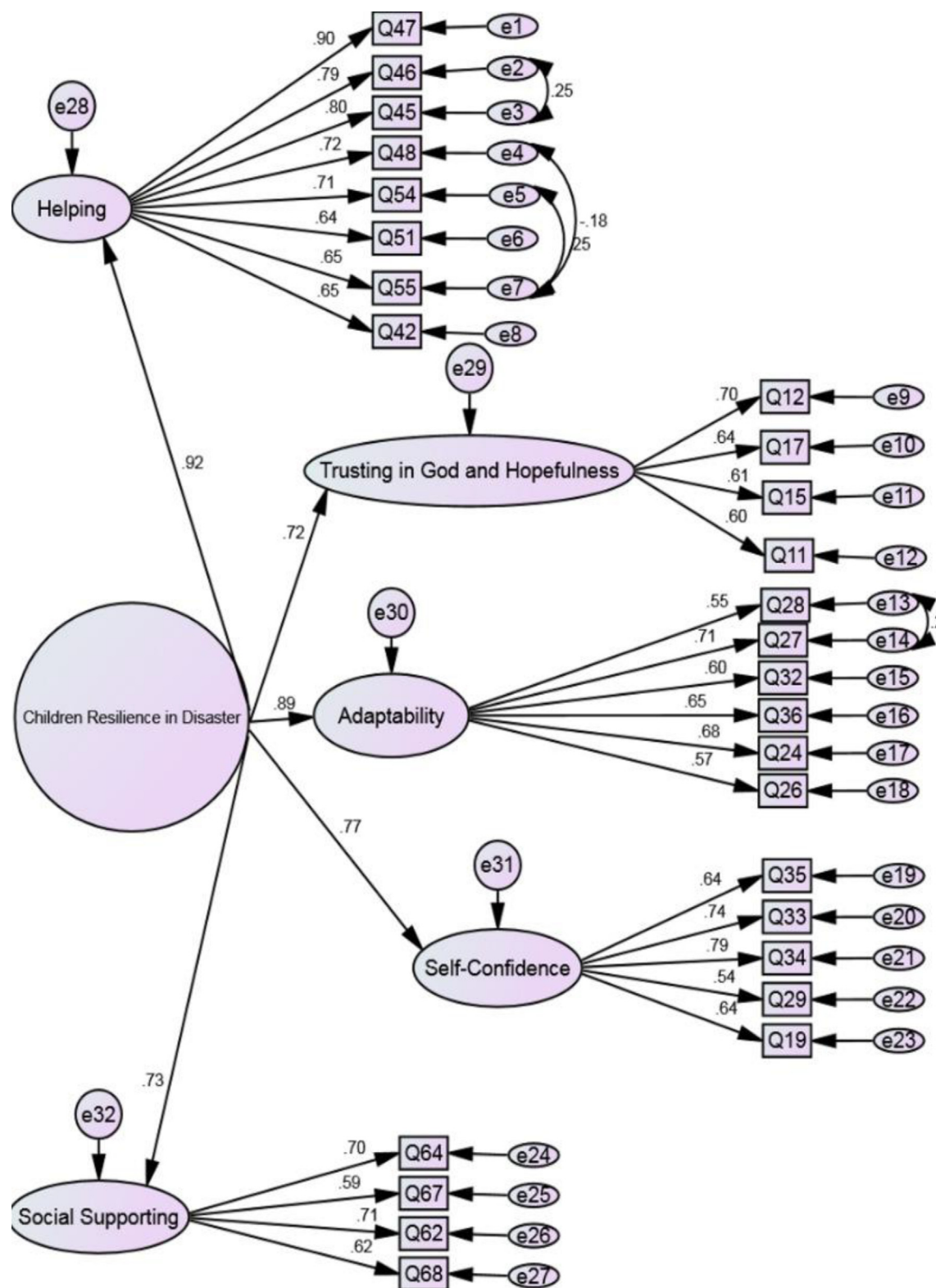


Fig. 2. ARDT construct: modified model of second-order confirmation factor analysis.

order CFA was used and confirmed the ARDT questionnaire with five domains and 37 items; thus, it is a suitable measurement with excellent reliability and validity that is designed to be used for 12-18-year-old adolescents.

The ARDT questionnaire, with a total Cronbach's alpha of .89, had better validity and reliability in comparison with the ARQ (Adolescent

Resilience Questionnaire) [24] which has a total Cronbach's alpha of .70. Although the ARQ questionnaire has been designed to measure the adolescents' resilience, it was not specific to disaster and emergency situations. Furthermore, this questionnaire includes 87 items, which arguably too long for adolescents to respond to, especially in a natural disaster situation. The ARQ domains that include family, peers, schools,

Table 3

Convergent and divergent validity, internal consistency of adolescence resilience in disaster (ARDTQ37).

Factors	α	Ω	CR	ASV	MSV	AVE
Helping	.803	.815	0.71	0.25	0.28	0.38
Adaptability	.735	.734	0.69	0.23	0.31	0.35
Self-confidence	.726	.741	0.75	0.36	0.45	0.33
Trusting in God and hopefulness	.713	.724	0.76	0.29	0.45	0.39
Social supporting	.704	.707	0.85	0.32	0.45	0.42

* **Abbreviations;** ARDT: Adolescence Resilience in Disaster Tool; α : Cronbach's alpha coefficients; Ω : McDonald omega coefficient; CR: Construct Reliability; AVE: Average Variance Extracted; MSV: Maximum shared Squared Variance; ASV: Average shared Squared Variance.

and individual areas has a Cronbach's alpha of .82–0.94, while the domains of the 37-item ARDT questionnaire that include helping, trusting in God and hopefulness, adaptability, self-confidence and social support has a Cronbach's alpha of .70–.89. Although Cronbach's alpha of the whole questionnaire was higher than the ARQ questionnaire, it was lower for the domains, particularly in the last two, which could be due to having fewer items in the questionnaire as compared to ARQ. The brief nature of the ARDT questionnaire enables it to be a more practical questionnaire in natural disaster situations, where time is crucial. Considering the challenges and unpredictable nature of a natural disaster, shorter questionnaires are more desirable. Therefore, the ARDT-37Q would be suitable instead of ARQ-87 to evaluate adolescents' resilience in disaster situations. The domains and overall resilience of the ARDT had a satisfactory ICC of 0.84 and 0.94, which is one of the advantages of this questionnaire.

The CD-RISC (Connor-Davidson Resilience scale) questionnaire [2], which is among the first resilience questionnaires, is suitable for all age ranges but was not specifically designed for adolescents, whereas the ARDT questionnaire is purposely designed for adolescents aged 12–18 years old.

Among the latest available questionnaire on adolescent resilience is the Child and Youth Resilience Measure (CYRM) questionnaire, which comes in two forms - a long version with 28 questions [22] and a short version with 12 questions [23]. It is believed that these questionnaires address only individual, social communication. The above factors were addressed in the ARDT questionnaire.

CYRM-12 is the short form of the CYRM-28 questionnaire and its validity has been examined in several countries such as Canada, USA, Colombia, China, India, Russia, Palestine, Tanzania, Gambia, and South Africa [23]. The complete format of the CYRM-28 questionnaire for resiliency assessment includes three domains of individual, caregiver and context in people aged 13–23 years old [22]. Researchers considered the 12-item version of the questionnaire a suitable measure for the assessment of resilience comparable to the 28-item version. The short version evaluates resilience in 10–22 year old people [23]. The Persian version of 28-item questionnaire (2013) with Cronbach's alpha of 0.85 and the short 12-item version of this questionnaire, was assessed by Mohammadinia (2018), with Cronbach's alpha of .70 and ICC = .88 (95%: .78 to .94), demonstrating that both tools were valid and reliable enough to measure the resilience of adolescents in Iran. However, both are not specific to natural disaster situations, and only address individual, social and psychological factors in adolescents. The ADRT-37Q questionnaire, on the other hand, was designed with the whole person in mind from a positivist perspective that focuses on the capacity and strengths of adolescents.

Adolescents' resilience questionnaires were mostly designed by psychologists, but in the present study, the questionnaire was designed by a disaster specialist and child psychology advisers. The socio-cultural context of Iranian society, which is an important factor in resilience, was only addressed in the ADRT questionnaire. The other adolescents' resilience questionnaires have all been designed in other countries, and have only been translated to Persian, whereas the ADRT questionnaire is

made by the indigenous people, although literature view has been used for comprehensiveness.

Finally, the findings of the study revealed that, the ADRT questionnaire consists of 37 items with five components had an acceptable face, content and constructive validity. This research is in line with the study of de Milliano (2015) [43], on conceptual model of resilience and the study of Cheraghi (2016) on the translation of the questionnaire (ARQ), which addressed the behavioral, cognitive, and social components that have been used to develop the items of this questionnaire. The ARDT questionnaire considered the adolescents' capacity in disaster conditions. Unlike other studies, this research did not include the external factors in the design of items and only emphasized the adolescents' potential as reflected in the valid and reliable 37 items of the questionnaire.

3.1. Limitations and strengths

Among the limitations of the study was the age range of adolescents. It is recommended that children under the age of 12 years should be included in future studies. Future research should also consider evaluating the questionnaire in a variety of cultural contexts. Among the strengths of this questionnaire is that it is context-based, which is extremely relevant in resilience discussions [24]. Furthermore, the study has used several methods to extract the items, including systematic review, qualitative study, interviews, and focus group discussions. In fact, it has used the resilience components in international research as well as experts' opinions in the design of item pool. While it may be argued that 37 questions cannot cover all areas of adolescents' resilience in disasters and there may possibly be other areas in different societies, these items represent a comprehensive outline of five factors that have the greatest impact on adolescents' resilience as indicated in qualitative and systematic studies.

4. Conclusion

The ARDT questionnaire with 37 items is valid and reliable, and can be used to measure adolescents' resilience in disasters and emergencies before, during and after the occurrence of such events. This questionnaire with five domains: helping, trust in God and hopefulness, adaptability, self-confidence and social support, is suitable for assessing the resilience of 12–18 year old adolescents affected by a natural disaster. Schools are a suitable place for Resilience Training and thus, adolescence is an opportune time to target these skills. The results of this questionnaire could also be used in schools to measure the resilience of adolescents of students and pave the way for proactive and preventative programs that teach resiliency to children and adolescents in order to protect them against future disasters and emergencies.

Declarations

Author contribution statement

L. Mohammadinia: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

A. Ebadi: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

H. Malekafzali: Conceived and designed the experiments.

K.A. Allen: Analyzed and interpreted the data; Wrote the paper.

H. SharifNia: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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