



Development and Validation of a Two-Dimensional Scale to Measure Family Functions

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Abstract

Background: Family has a great impact on the formation of people's expectations and beliefs, and its role in the health, well-being, and promotion of various skills in children is very prominent.

Objectives: The current study aimed at designing and constructing a valid and reliable scale to evaluate two aspects of family functions including problem-solving and communication skills.

Methods: Based on the McMaster model, the family functions scale was developed and tested in the current study. By random clustering sampling, 706 high school students (285 male and 421 female) from Babolsar city that enrolled in the academic year 2017-2018 were selected as participants and they completed the scale. The data were analyzed with SPSS version 22 and AMOOS version 22 software. Factor analysis was performed by exploratory and confirmatory analyses.

Results: The results of the exploratory factor analysis showed two dimensions (problem-solving and communication). These two dimensions explained 51.38% of the variance of the scale (the problem-solving function was 35.97% and the communication function was 15.41%). Also, the confirmatory factor analysis confirmed the two-dimensional structure of the scale (RMSEA = 0.046 and $\chi^2/df = 2.517$). The reliability of the problem-solving and communication dimensions by Cronbach's alpha was 0.91 and 0.90; respectively, and by test-retest method was 0.86 and 0.88, respectively.

Conclusions: The current study results showed that the scale could be used in studies related to the student community.

Keywords: Development of Scale, Factor Analysis, Family Functions, Problem-Solving, Communication

1. Background

Family has a great influence on shaping the expectations, beliefs, and norms of life of individuals, as well as how they look and interact with the universe (1). In the growth process, in particular the cognitive development of children (2, 3), and in the improvement of their health and promotion of their various skills (4, 5), the role of family is very prominent. Hence, researchers are interested in exploring the characteristics of the family that improve children's skills and increase their chances of success both in personal and family life (6).

In this regard, various theoretical frameworks are presented in this social institution. Each of these theoretical frameworks, according to their assumptions, emphasize on different dimensions of the subject of the family. Among these theoretical frameworks, systemic theories are noteworthy (7). In systemic theories, the family acts as a human body. It means that each member affects other members on one hand, and is influenced by them on the

other hand (8). One of the most important issues in systemic theories is the concept of family functioning (9).

Since the late 1960s, psychological studies in the field of family functioning expanded considerably (10). Based on these studies, although family consists of a number of members that have a share in the characteristics of the family, each of these members is also affected by the characteristics of the family. Therefore, two categories of family-orientation are formed, which in fact depends on the characteristics of the family itself. The first one, which is result-oriented and defines the function of the family through its specific features, is most famously represented by Olson. The other one is process-oriented, describing family function based on the tasks families need to complete (2).

The process orientation approach to family functioning believes that the family, not through structural features, but through its various functions, develops the physical and psychological well-being of individuals. In fact,

this approach, instead of emphasizing on the structure, pays more attention to the importance of the process (2). Among the famous models in relation to family functioning, it can be referred to McMaster model.

The McMaster family process model (11) focuses on the family system process, assuming that the core function of the family is to provide a good environment that helps the physical, psychological, and social development of the members. According to this model, the family system should perform important tasks for proper functioning. Hence, the family system helps its members to grow by integrating a series of tasks and assignments (2). According to Banovcinova and Levicka (12), families with proper functioning create optimal conditions for the social functioning of their members. Such families create safe conditions for their members; hence, they can grow in such a condition, have a dynamic life, and enjoy it.

According to Epstein et al. (13), the theoretical basis of this model is a systemic view of the family. In addition, the family is linked to other systems and all are inside larger systems. Hence, the focus of this model is mainly on the individual within a family. In terms of time, the McMaster model emphasizes the issues here and now, and opposes intergenerational patterns, the origins and past factors of the problems, or the systematic analysis of childhood issues. It means that what should be considered in the health and well-being of individuals is today and what is happening now rather than what happened in the past (14).

The McMaster model expresses six characteristics for healthy and successful families. Accordingly, families that have a positive and proper function in terms of such characteristics can more effectively face the challenges and the routine changes in life, as well as inevitable and critical situations. On the contrary, families that have problems with these features have more unresolved issues. By assessing these six dimensions, it can be concluded whether or not family functioning is appropriate. These dimensions include problem-solving, communication, emotional response, family roles, emotional concern, and behavior control (11, 13).

Problem-solving is one of the key elements of a successful family function (15). According to Peterson and Green (16), a family issue represents a topic that is not simple and easy to solve; at the same time, family health is threatened if it is not resolved. Problem-solving is the ability to achieve a solution that preserves family function at a desirable level (17). Family issues have different types and vary in terms of depth and breadth (16). One problem can be related to the usual routine life or in relation to the emotions

and feelings of the family or even associated with both cases (15). According to Epstein et al. (17), healthy and competent families, when faced with a problem, use their best endeavors to resolve it, and in this way, use negotiation, cooperation, and collaboration, compromise, or other effective measures. On the other hand, families that avoid solving problems or lack the capacity to deal with problems are more likely to encounter problems. To find the optimal level of problem-solving skills, the family should understand the problem-solving process. In fact, families with growing skills to manage problems are aware of the process of problem-solving and its stages, and they are always considering this process to resolve various issues (16-18).

From a systemic perspective, communication is an essential dimension of the functioning of each system. Therefore, the discussion of communication in family environments, as social systems, is a common, inevitable, and extremely important subject. The reason is that through communication, individuals can share their needs, desires, and concerns, and they can discuss different problems (16).

Communication is manifested as an important element in the function of the family (18), both in verbal and non-verbal forms (17). Communication expresses the quality of information exchange among family members. The focus of verbal communication is whether the verbal messages have clear content and if they are transmitted directly and with respect (13). According to Manap et al. (18), favorable communication conditions allow family members to express their needs, desires, concerns, interests, and love. In addition, effective communication within the family creates a space in which members can speak about their differences as they express their love to one another.

In this regard, the existence of valid and reliable tools to assess family functions is important both in problem-solving skills and the quality of communication between members. These tools help researchers identify, on one hand, the factors that predict family skills, and, on the other hand, examine the role of family skills in predicting other variables and thus contribute to the health of family members. To date, tools are developed to measure family functions (2). A review of previous studies suggests that tools are developed to measure family functions (2); but most of these tools are culture-dependent. This feature caused researchers from other communities to hesitate to use them. The current study tried to select the questions with the least impact on the culture of societies.

2. Objectives

The current study aimed at designing and constructing a valid and reliable scale to evaluate two aspects of family functions including problem-solving skills and communication skills.

3. Methods

3.1. Population, Sample, and Selected Methods

The statistical population of the current study included all female and male students of the 9th, 10th, and 11th grades of Babolsar schools in the academic year 2017-2018. By the multi-stage cluster sampling method, 706 students (421 females and 285 males) were selected as the study subjects. Their age ranged 14 to 19 years (mean = 16.24, standard deviation (SD) = 0.88). Six secondary schools were randomly selected, and from each school, students of the ninth grade class responded to the questionnaires as the study subjects. Also, four high schools were selected, and from each school students of six classes (three 10th grade and three 11th grade classes) responded to the questionnaires. Of these, 177 students were in the 9th grade, 267 students in the 10th grade, and 209 students in the 11th grade. Meanwhile, 53 students did not report their grade. It was explained to the subjects that the obtained information was confidential and used only in a research work, and their participation in the study was voluntary. A sample size of 500-1000 subjects is suitable for a factor analysis method (19). Since the final cluster was classroom, the criterion for the placement of individuals in the sample group was their presence on the sampling day; therefore, those who were absent on that day were excluded from the sampling process.

3.2. Research Instruments

3.2.1. The Connor-Davidson Resilience Scale

CD-RISC is a 25-item scale developed by Connor and Davidson (20) to measure resilience. It uses a five-point Likert scale to score the items ranging from 0 ("not true at all") to 4 ("true nearly all the time"), with a total score ranging from 0 to 100. A preliminary study on the psychometric properties of the scale in a general population and a patient sample indicated adequate reliability and validity (20). Sample item is: "I believe in my abilities". Different studies confirmed validity and reliability of CD-RISC (21). In the current study, Cronbach's alpha coefficient was 0.89. The correlation among the items and the total scale score ranged 0.36 to 0.60, significant at the level of 0.001.

3.2.2. Educational Stress Scale

ESS (22) is a self-reporting scale that includes 16 statements to assess five factors of educational stress including pressure from study (PF), self-expectation (SE), worry about grades (WG), despondency (D), and workload (w). The 16 items are scored based on a five-point Likert scale (from disagree to agree) scored from 1 to 5, respectively. Sun et al. (22) used factor analysis to measure the validity of the scale through principal component analysis and Varimax rotation and their results showed that the Kaiser-Meyer-Olkin (KMO) test and Bartlett coefficients were significant and acceptable. Also, they used Cronbach's alpha and measured the reliability of the total score of the scale as 0.81. In Iran, the validity and reliability of ESS was studied by Akbari et al. (23). In their study, to evaluate the validity of the scale, factor analysis was used; results of confirmatory factor analysis confirmed the six-dimensional structure of the scale (RMSEA = 0.028 and $\chi^2/df = 1.22$). The internal consistency estimate of reliability for this scale and its subscales were in the range of 0.62 to 0.80 (23).

3.3. The Process of Designing a Two-Dimensional Scale of Family Function

The two-dimensional scale of family function assessment (problem-solving and communication) was developed in a five-step process as follows: (1) According to theoretical foundations, the initial version contained 48 items; (2) in order to ensure that all participants have the same understanding of the content of the items, this initial version was presented to a sample group of 40 students, and they were asked to express their perceptions about each question. (3) After collecting the data and feedback from the participants, the necessary corrections were made in the initial version. At this stage, 11 items were deleted and nine items were revisited; (4) the 37-item version of the scale was administered to 102 subjects and the process of item analysis was performed. In this way, the correlation of each item with the total scale score was calculated. This step was important to provide the final version of the scale to the final sample group. According to the results of this stage, four other items were found inadequate (their correlations with the total scale score were not significant) and were excluded from the analysis. In the dimension of problem-solving function, the correlation coefficient between each item and the total score ranged 0.56 to 0.84 and in the family communication dimension, the coefficient ranged 0.71 to 0.81. At this stage, the reliability of each dimension was investigated using Cronbach's alpha coefficient, which was 0.89 for the problem-solving dimension and 0.91 for the communication dimension; (5) finally, the

number of items was reduced to 33, and the scale was administered to the final sample group. At this stage, data were analyzed with SPSS version 22 and AMOOS version 22 software, and factor analysis was performed by exploratory and confirmatory analyses.

4. Results

The results of exploratory factor analysis showed that the KMO coefficient of this analysis was 0.941, which indicated the adequacy of the collected data for factor analysis. The value of the Bartlett coefficient test was 7147.84, which was statistically significant ($P < 0.001$, $df = 231$). The eigenvalue higher than 1 and the scree plot confirmed the two-dimensional structure of the scale (Figure 1). The eigenvalue for the problem-solving and communication dimensions were 7.91 and 3.39, respectively. Meanwhile, these two dimensions explained 51.38% of the variance of the scale (the problem-solving function was 35.97% and the communication function was 15.41%).

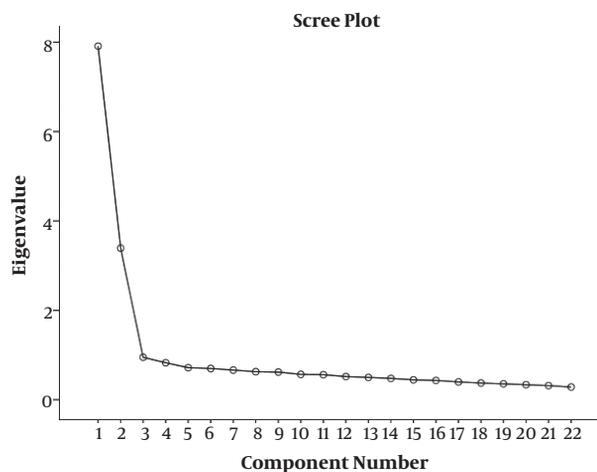


Figure 1. The scree plot of the two-dimensional scale of family functions

Table 1 shows the content of the items, their factor load, and the eigenvalue of each of the factors. It should be noted that the criterion to select each item for each of the factors or dimensions was a factor load higher than 0.40. Therefore, items not loaded on any of the factors (less than 0.40), or items loaded close to the two factors were removed. To assess the reliability of the scale, Cronbach's alpha and test-retest methods were used. The reliability of the problem-solving and communication dimensions using Cronbach's alpha were 0.91 and 0.90, respectively. In addition, test-retest method with a three-week interval was

employed to check the reliability of the scale ($n = 55$). The obtained coefficients for problem-solving and communication dimensions were 0.86 and 0.88, respectively. The items were scored based on a five-point Likert scale from 1 (completely disagree) to 5 (completely agree).

As Table 1 shows, the factor load of items related to the problem-solving dimension varies from 0.730 to 0.572 and the factor load of items related to the dimension of communication varies from 0.774 to 0.687. The correlation between the two dimensions was 0.393, which was significant ($P = 0.001$). The descriptive findings of the scale are presented in Table 2.

In addition, the scales of resilience and educational stress (20, 22) were used to examine the convergent and divergent validity of the scale. The results indicated that the convergent and divergent validities of the scale were desirable (Table 3).

Cronbach's alpha coefficient and test-retest were used to determine the reliability of each of the two dimensions as well as the whole scale. The coefficient obtained from the Cronbach's alpha method for problem-solving, communication, and total scale scores were 0.90, 0.91, and 0.95, respectively. In addition, to test the reliability, the test-retest method was used with an interval of three weeks ($n = 55$). The coefficients derived from this method were 0.86, 0.83, and 0.88 for problem-solving, communication, and total scale scores, respectively. The results showed that each dimension and the whole scale had a satisfactory reliability.

4.1. Fitness

In order to assess the fitness of the two structures of the scale, AMOS version 22 and confirmatory factor analysis were employed, results are provided in Figure 2 (all regression weights were significant at 0.001 level).

According to the indices obtained in Table 4, it can be concluded that the two-dimensional scale of family functions had a good fit with the Iranian students society. Table 5 shows the regression coefficients of the items.

5. Discussion

The current study aimed at designing a tool to measure two important dimensions of family functions including problem-solving and communication. For this purpose, the two concepts of problem-solving and communication were firstly defined according to the literature. Then, the items were designed in accordance with these concepts. The results of the data analysis showed that the designed scale had a desirable validity and reliability. Therefore,

Table 1. The Content of the Items and Their Factor Load in Each of the Scale Factors

Item	Factor 1	Factor 2
1- In our family, when there is a problem, we think well about all aspects of it.	0.676	0.230
2- In our family, after identifying possible solutions, we consider the strengths and weaknesses of each solution.	0.635	0.156
3- In our family, when facing a complex issue, we collect information about it as much as possible.	0.714	0.155
4- In our family, to solve a problem, we try to identify all the factors that led to it.	0.714	0.070
5- In our family, to solve a problem, we identify all possible solutions.	0.709	0.149
6- In our family, we try to anticipate the consequences of every solution.	0.730	0.096
7- In our family, if we fail in our quest to solve the problem, we will look for other methods.	0.700	0.163
8- In our family, when faced with a problem, we think about different solutions.	0.667	0.117
9- In our family, if the solution is not successful, we investigate the reasons for its failure.	0.621	0.140
10- In our family, we can solve problems, although initially it seems that there is no solution to it.	0.572	0.107
11- In our family, in most cases, we find effective ways to solve problems.	0.636	0.190
12- In our family, we have learned that a solution, in addition to being good, should be applicable.	0.708	0.095
13- In our family, if the solution to an issue is not functional, we will consider alternative solutions.	0.620	0.125
14- In our family, we talk to each other in a very friendly manner.	0.181	0.741
15- In our family, we help each other to achieve our goals.	0.227	0.698
16- In our family, we show interest toward each other.	0.094	0.765
17- In our family, we enjoy having time to talk to each other.	0.196	0.764
18- My parents spend enough time on family talks.	0.193	0.732
19- We all have enough energy and motivation to join family talks.	0.162	0.752
20- In our family, we respect each other's thoughts and opinions.	0.088	0.774
21- In our family, we are always ready to hear each other's opinion.	0.154	0.737
22- In our family, we can easily talk about our thoughts and feelings.	0.078	0.687
Eigenvalue	7.91	3.39

Table 2. Descriptive Findings of the Study Variables

Factor	Mean \pm SD	Maximum	Minimum
Problem-solving	48.31 \pm 7.85	63	26
Communication	32.30 \pm 7.19	44	11
Total	80.61 \pm 12.56	105	43

Table 3. Correlation of Scale With Resilience and Educational Stress^a

Factor	Problem-Solving	Communication	Total
Resilience	0.419	0.343	0.459
Educational stress	- 0.22	- 0.16	- 0.23

^a All coefficients are significant at 0.01 level.

this scale can be employed in further studies to determine the family functions in the two dimensions of problem-solving and communication.

In this regard, validity was the most important feature of a scale. Hence, content validity, construct validity, and

divergent validity were used to assess the validity of the scale. Content validity implies whether the content of the scale reflects the characteristics of that concept, which can lead to the conclusion that this scale has content validity. In addition, the coordination of the factor structure of this

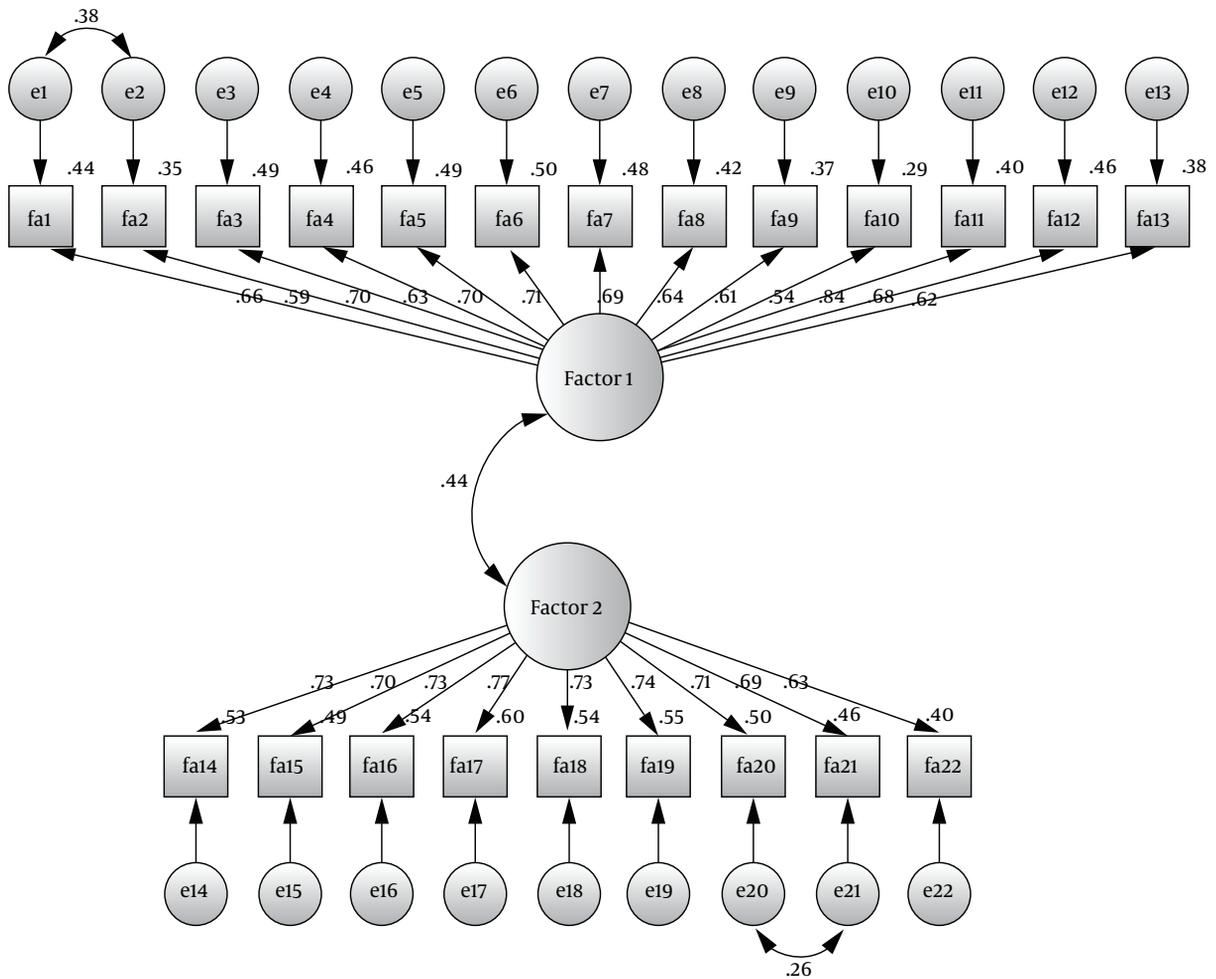


Figure 2. Standardized estimates

Table 4. Indices of the Two-Factor Model of Family Functions

Variables	Values
GFI	0.938
NFI	0.928
CFI	0.955
RMSEA	0.046
AGFI	0.923
IFI	0.956
χ^2/df	2.517

scale with its theoretical structure was the most important indicator to verify the construct validity of the scale. In this regard, Kerlinger stated that the method of factor analy-

sis is a powerful and optimum method in construct validity. According to the obtained indices such as KMO coefficient and special value higher than 1 for each dimension as well as the percentage of variance explained by each dimension, it can be claimed that this scale has desirable construct validity.

Cronbach's alpha and test-retest were performed to verify the reliability of the instrument. The results obtained by both methods indicated the optimal reliability of each dimension and the total scale. The appropriateness of the obtained validity and reliability indices showed that this scale was suitable to measure the dimensions of problem-solving and communication in the Iranian context. At the same time, more studies should be conducted in this regard, and by expanding the theoretical founda-

Table 5. Regression Weights in Confirmatory Factor Analysis^a

Item	β
1	0.660
2	0.593
3	0.701
4	0.676
5	0.703
6	0.708
7	0.694
8	0.644
9	0.606
10	0.539
11	0.636
12	0.677
13	0.620
14	0.730
15	0.698
16	0.733
17	0.774
18	0.734
19	0.740
20	0.711
21	0.691
22	0.629

^aAll coefficients are significant at 0.01 level.

tions of the concepts, there may be more comprehensive measures to expand the existing scale.

Footnotes

Conflict of Interests: None declared.

Ethical Considerations: The article was approved by the ethics committee of Mazandaran University. The present paper was extracted from a PhD dissertation (code: 1372745).

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References

- Fitzpatrick MA, Ritchie LD. Communication schemata within the family: Multiple perspectives on family interaction. *Hum Commun Res.* 1994;**20**(3):275-301. doi: [10.1111/j.1468-2958.1994.tb00324.x](https://doi.org/10.1111/j.1468-2958.1994.tb00324.x).
- Dai L, Wang L. Review of family functioning. *Open J Soc Sci.* 2015;**3**(12):134. doi: [10.4236/jss.2015.312014](https://doi.org/10.4236/jss.2015.312014).
- Alves AF, Gomes CMA, Martins A, da Silva Almeida L. Cognitive performance and academic achievement: How do family and school converge? *Europ J Educ Psychol.* 2017;**10**(2):49-56. doi: [10.1016/j.ejeps.2017.07.001](https://doi.org/10.1016/j.ejeps.2017.07.001).
- Tucker MC, Rodriguez CM. Family dysfunction and social isolation as moderators between stress and child physical abuse risk. *J Fam Violence.* 2014;**29**(2):175-86. doi: [10.1007/s10896-013-9567-0](https://doi.org/10.1007/s10896-013-9567-0).
- Nordenmark M. The importance of job and family satisfaction for happiness among women and men in different gender regimes. *Society.* 2018;**8**(1):1. doi: [10.3390/soc8010001](https://doi.org/10.3390/soc8010001).
- Spengler M, Damian RI, Roberts BW. How you behave in school predicts life success above and beyond family background, broad traits, and cognitive ability. *J Pers Soc Psychol.* 2018;**114**(4):620-36. doi: [10.1037/pspp0000185](https://doi.org/10.1037/pspp0000185). [PubMed: 29504796].
- Klein DM, White JM. *Family theories: An introduction.* London, New Delhi: Sage Publication International Educational and Professional Publisher, Thousand Oaks;1996.
- Sigelman CK, Rider EA. *Life-span human development.* United State: Cengage Learning;2014.
- Olson DH. Empirical approaches to family systems. *J Fam Ther.* 2000;**22**(2):121-7.
- Olson DH. Marital and family therapy: Integrative review and critique. *J Marriage Fam.* 1970:501-38. doi: [10.2307/350249](https://doi.org/10.2307/350249).
- Miller IW, Ryan CE, Keitner GI, Bishop DS, Epstein NB. The McMaster approach to families: Theory, assessment, treatment and research. *J Fam Ther.* 2000;**22**(2):168-89. doi: [10.1111/j.1467-6427.00145](https://doi.org/10.1111/j.1467-6427.00145).
- Banovcinova A, Levicka K. The impact of the financial income on the family communication. *Rev Romaneasca pentru Educatie Multidimensionala.* 2015;**7**(2):35-46.
- Epstein NB, Baldwin LM, Bishop DS. The McMaster family assessment device. *J Marital Fam Ther.* 1983;**9**(2):171-80. doi: [10.1111/j.1752-0606.1983.tb01497.x](https://doi.org/10.1111/j.1752-0606.1983.tb01497.x).
- Ryan CE, Epstein NB, Keitner GI, Miller IW, Bishop DS. *Evaluating and treating families: The McMaster approach.* 1st ed. New York: Routledge; 2005.
- Torres E. *Problem solving in latino families [dissertation].* Logan: Utah State; 2012.
- Peterson R, Green S. *Families first-keys to successful family functioning. An introduction. Virginia cooperative extension: Knowledge for the common wealth. Publication Number 350-092.* 2009. Available from: <http://pubs.ext.vt.edu/350/350-092/350-092.html>.
- Epstein NB, Bishop DS, Ryan CE, Miller I, Keitner GI. The McMaster model: View of healthy family functioning. In: Walsh F, editor. *Guilford family therapy series. Normal family processes.* New York: Guilford Press; 1993.
- Manap J, Hoesni SM, Hamzah MR. Family communication amongst conventional malay man. *Malayas J Commun.* 2018;**34**(1). doi: [10.17576/JKMJC-2018-3401-14](https://doi.org/10.17576/JKMJC-2018-3401-14).
- Meyers LS, Gamst G, Guarino AJ. *Applied multivariate research: Design and interpretation.* London: Sage Publications; 2006.
- Connor KM, Davidson JR. Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety.* 2003;**18**(2):76-82. doi: [10.1002/da.10113](https://doi.org/10.1002/da.10113). [PubMed: 12964174].
- Naderi H, Akbari A, Abbasi-Asl R. Mediating role of resilience in relationship between attachment style dimensions and quality of life in high school students. *Int J School Hlth.* 2016;**3**(4). doi: [10.17795/intjsh-36096](https://doi.org/10.17795/intjsh-36096).
- Sun J, Dunne MP, Hou XY, Xu AQ. Educational stress scale for adolescents: Development, validity, and reliability with Chinese students. *J Psychoeduc Assess.* 2011;**29**(6):534-46. doi: [10.1177/0734282910394976](https://doi.org/10.1177/0734282910394976).
- Akbari A, Baezzat F, Abbasi-Asl R. A study of factor structure and psychometric adequacy of the educational stress scale (ESS). *Int J School Hlth.* 2018;(In Press). doi: [10.5812/intjsh.63128](https://doi.org/10.5812/intjsh.63128).