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An Instrument for Assessing Evolutionary or Distal Causes of Psychiatric Disorders: Psychometric Properties of Persian Version of Evolutionary Fitness Scale

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Abstract

Background: Evolutionary perspectives have recently received significant attention for better understanding psychological disorders and providing effective interventions. Evolutionary perspectives have been very effective in studying psychological disorders to help consider the distal causes of such disorders.

Objectives: This study aimed to investigate the psychometric properties of the Persian version of the Evolutionary Fitness Scale (EFS) among Iranian students.

Methods: The statistical population included students studying at the Iran University of Medical Sciences in 2019 - 2020. In total, 266 students were selected using a convenience sampling method. The participants completed the EFS, Depression, Anxiety, and Stress Scale (DASS-21), and Rosenberg's Self-esteem Scale (RSES). The EFS reliability was assessed by internal consistency and test-retest. The validity was evaluated by convergent and divergent validity and confirmatory factor analysis (CFA). The data were analyzed using SPSS 24.0 and LISREL 8.80.

Results: The CFA demonstrated that the two-factor model of the EFS (personal adaptedness and partner and offspring fitness) had a suitable fitting. This scale had significant negative and positive correlations with DASS and RSES, respectively. Internal consistency was obtained using Cronbach's alpha: 0.96 for personal adaptedness, 0.94 for partner and offspring fitness, and 0.97 for the whole scale. Test-retest reliability was 0.81 for personal adaptedness, 0.80 for partner and offspring fitness, and 0.83 for the whole scale.

Conclusions: This study could complement the cross-cultural literature on EFS by examining its construct, convergent, and divergent validity and reliability. The EFS had good validity and reliability among students. Thus, it could be a suitable tool in research and clinics.

Keywords: Evolutionary Fitness Scale, Evolutionary Psychology, Evolutionary Causes of Behavior

1. Background

Tinbergen (1963) stated that four groups of knowledge are required to understand human behavior: (1) causation or mechanism leading to the formation of specific behavior, (2) development or ontogeny, which indicates how a particular behavior is developed, (3) evolution, which manifests how specific behavior evolves, and (4) function or value of the survival of a particular behavior. The first two items are considered immediate causes of behaviors, while the last two are remote causes. Most studies dealing with etiology in neuroscience and clinical psychology ignore evolutionary functions and remote causes (1).

Psychologists often point to immediate causes when examining psychological disorders (2). However, many psychiatric conditions, such as depression and mood problems (2, 3), addiction (4, 5), obsession, hyperactivity, and even schizophrenia spectrum disorders, can be evaluated evolutionarily (6). Therefore, a tool should be developed to investigate the remote causes of psychiatric disorders (7).

Cognitive-behavioral therapy (CBT) focuses on changing dysfunctional cognitions to make changes in clients. Dysfunctional thoughts are considered the immediate cause of the disorder. However, some researchers argue that cognitive distortions could result from the disease

and cannot be its cause. In other words, the underlying evolutionary cause or remote cause that may lead to the disorder and dysfunctional thinking is not directly addressed in this therapeutic approach. Therefore, a comprehensive evolutionary view is required for explaining the remote or ultimate causes of diseases. Some therapists have modified CBT to align this approach with more updated theories of evolution (8), one of which uses the evolutionary fitness scale (3, 7). Fitness is among the essential concepts in evolutionary biology that can be defined in two dimensions: considering the results (success in reproduction) or independent criteria generally regarded as adaptation. These properties and capacities make the organism more successful in reproduction (9).

Fisher considers fitness as the objective reemergence of genes in the future (10). Some researchers maintain that the frequency of fitter traits increases with increasing fitness, while less fit traits decline (11). Definitions focusing on independent and general adaptive traits state that fitness is an organism's ability to survive and reproduce in its own environment; thus, fitness refers to one's adaptation to its environment (12). Dent believes that fitness refers to one's ability to solve adaptative problems throughout human evolution (13).

The evolutionary fitness scale measures independent elements of fitness and determines the extent of the organism's adaptation to its environment (14). This scale examines remote and evolutionary causes (7). Fitness-related issues often involve achieving positive outcomes in such areas as shelter, security, nutrition, health, sex, mate choice, attractiveness, protection, parenting, and in-group and out-group communication (15). Evolutionary psychology shows us that individuals feel happy and well when they successfully meet these goals (16). However, failure or false perception of failure in meeting these goals leads to unhappiness, stress, and despair (16).

Cognitive-behavioral therapy has paid less attention to remote (evolutionary) causes of disorders such as inclusive fitness and reproductive success. However, considering the degree of evolutionary fitness can improve CBT and encourage us to perform interventions for increasing the person's evolutionary fitness by providing information about the adaptive value of some symptoms. Furthermore, attention should be paid to destructive behaviors reducing evolutionary fitness (8).

2. Objectives

Because this tool has not been translated into Persian yet, the present study aimed to investigate the psychometric properties of an instrument for the cross-cultural development of the evolutionary fitness scale. Moreover, examining a tool in different cultures can represent cultural dynamics.

3. Methods

The present correlational study is in the field of psychometry. The statistical population included students studying at the Iran University of Medical Sciences in 2019 - 2020. According to Klein, the sample size required for confirmatory factor analysis (CFA) was about 200 people (16). Therefore, 266 individuals were selected for this study by a convenience sampling method.

According to the Intercultural Adaptation Guide, the Evolutionary Fitness Scale (EFS) was developed (17, 18). First, the original English version of the EFS was translated into Persian by four clinical psychology professors, and then it was back-translated by two mental health professionals who were fluent in both English and Persian. In the next step, the authors examined the translation of the scale in terms of comprehensibility. The initially translated instrument was performed on a sample of 25 students to check the questions' comprehensibility for the participants and correct the items in a pilot study. Errors in the questions were corrected based on a preliminary study. After preparing the final version of the scale, students were asked to complete the research questionnaires using Google Doc. The inclusion criterion was being a student, and the exclusion criterion was no severe medical illness.

3.1. Instruments

3.1.1. Evolutionary Fitness Scale

It is a 58-item self-report scale that examines individuals' perceptions of their evolutionary fitness. Created by Giosan in 2018, the Evolutionary Fitness Scale (EFS) includes two subscales: Personal adaptedness and partner offspring fitness. Each item is scored from 1 (strongly disagree) to 5 (strongly agree). The higher the scores, the greater the individuals' perceptions of their fitness (7). The EFS has been correlated with the following variables.

(1) Motor activity: Our ancestors had a significantly more active lifestyle than us. They had to travel long distances to get food and escape from the dangers threatening them. Furthermore, they had to hunt and migrate with seasonal changes (14). Numerous studies have shown the effect of motor activity on health (17). Moreover, motor activity can affect mental health (18).

(2) Health of self and others: Our ancestors' diet typically included fruits, vegetables, oilseeds, honey, eggs, and meat. Their diets did not mainly include legumes, dairy products, and cereals before the agricultural era. They absorbed vitamins more. Also, they consumed meat that

probably had less saturated fat (14). Numerous studies have indicated that the diet of hunting-gathering ancestors could have many positive effects (19). Those who are in good health and have access to health care services can live longer and are more likely to be preferred as mates. As a result, they have a higher chance of passing their genes to the next generation. People with health problems are more prone to disability and mortality (14). In a study conducted on 37 different cultures, health was essential for mate selection among men and women (20).

(3) Attractiveness of self and others: Attractiveness is usually associated with increased health and fertility (14). It has been reported that attractiveness increases the probability of marriage for women (21).

(4) Environmental fitness: Economic and social progress is among the most pervasive features for choosing a spouse (22). Promotion can increase the number of mates and lead to resistance to transmissible infections (23). There is ample evidence that individuals tend to pair with others similar to themselves (24). Living in crime-prone areas and having threatening jobs can devastate individuals' fitness (14).

(5) Social capital: Humans are highly social. Their survival and reproduction are strongly associated with social interactions and cooperation (25).

(6) Sex life: Mate value is associated with increased sexual relations and multiple sexual partners (26). There are differences in the elements of mate value between men and women. Men usually achieve this value by having high social status, intelligence, interpersonal dominance, fame, and being an athlete, while women typically achieve this value through attractiveness and age. However, the result is the same: higher mate value is associated with more mating opportunities. For this reason, mate value is among the critical elements of adaptation.

(7) Kinship: Inclusive fitness theory states that evolutionary fitness occurs by investing in children and relatives with common genes (27). In other words, investing in extended family members can improve evolutionary fitness (14).

3.1.2. Depression, Anxiety, and Stress Scale-21 Items

The Depression, Anxiety, and Stress Scale (DASS) was developed by Lovibond and Lovibond (1995) (28). It is a set of three self-report subscales designed to assess negative emotional states of depression, anxiety, and stress. To complete this scale, people should determine how they experienced each symptom during the past week. Each subscale consists of seven items, and the final score is obtained by summing the relevant items' scores. This scale has good psychometric properties among foreign samples (29). Its validity and reliability were evaluated in Iran. The retest validity was 0.80, 0.76, and 0.77 for depression, anxiety, and stress, respectively. Cronbach's alpha was 0.81, 0.74, and 0.78 for depression, anxiety, and stress, respectively. The validity of this scale was assessed using CFA and principal component analysis (PCA). Based on factor analysis, depression, anxiety, and stress were extracted as the subscales, precisely equated to the original sample (30).

3.1.3. Rosenberg's Self-esteem Scale

The Rosenberg's Self-esteem Scale (RSES) (1965) measures overall self-esteem and self-worth. This scale includes 10 items assessing life satisfaction and the extent of feeling good about self. The RSES is among the most common scales for measuring self-esteem. It is a valid scale because it uses a concept similar to the one presented in psychological theories about "self" for self-esteem. This tool was developed to provide an overview of positive and negative attitudes about self (31, 32). It showed good psychometric properties in Iran (33).

The DASS and the RSES were selected because they are associated with evolutionary fitness perception (2).

3.2. Statistical Analysis

The data were first screened. The EFS construct validity was assessed by CFA and divergent and convergent validity. The CFA evaluated the fitness of the two-factor model. Divergent and convergent validity was assessed using Pearson's correlation among subscales. The reliability of the scale was assessed by internal consistency and retest reliability. Cronbach's alpha measured the internal consistency of the scale. The ICC assessed the retest reliability of the EFS. The data were analyzed by SPSS 24.0 and LISREL 8.80. The chi-square divided by the degrees of freedom (X^2/df), comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), incremental fit index (IFI), relative fit index (RFI), normed fit index (NFI), non-normed fit index (NNFI), standardized root mean squared residual (SRMR) index, and root mean squared error of approximation (RMSEA) index were used to fit the factor structure of this scale. The X^2/df ratio of less than 3 indicates the excellent fitness of the model. However, this index is strongly affected by sample size. Thus, values greater than 3 show the model's fitness based on the sample size. Generally, the RMSEA value of less than 0.08, SRMR of less than 0.09, CFI, GFI, AGFI, IFI, RFI, NFI, and NNFI of greater than 0.90 (values between 0.80 and 0.90 represent a suitable and boundary fit), and AGFI of greater than 0.85 indicate the acceptability of CFA fit indices (34, 35).

4. Results

In total, 266 students with a mean age of 27.11 ± 5.80 years, ranging from 18 to 52 years, participated in this study. Also, 153 (57.51%) students were male, and 113 (42.48%) were female. Moreover, 182 (68.4%) participants were single, and 84 (31.6%) were married. In terms of educational level, 139 (52.2%) participants had a diploma, 108 (40.6%) had a Bachelor's degree, and 19 (7.1%) had a Master's degree or higher.

Table 1 presents the inter-correlation between the subscales and their correlation with the overall EFS. The correlation coefficients ranged from 0.90 to 0.98.

4.1. Reliability

Internal consistency was obtained using Cronbach's alpha of 0.96 for personal adaptedness, 0.94 for partner and offspring fitness, and 0.97 for the overall scale. Test-retest reliability was 0.81 for personal adaptedness, 0.80 for partner and offspring fitness, and 0.83 for the overall scale.

4.2. Validity

The EFS validity was first assessed by the CFA. The fitting of the two-factor structure of the scale was assessed using CFI, NFI, NNFI, GFI, IFI, RMSEA, and SRMR. Table 2 presents the fit indices of the two-factor model.

Concerning convergent and divergent validity, there was a significant positive correlation between the EFS and its subscales and stress, anxiety, and depression, indicating the appropriate convergent validity of the scale (Table 3). However, there was a significant negative correlation between the EFS and its subscales and self-esteem, representing the appropriate divergent validity of the scale.

5. Discussion

The phylogenetic view has not yet been recognized in contemporary psychiatry, and evolutionary theory has never been strictly applied to the medical field, which can be considered a severe shortcoming in therapeutic processes (36). The EFS can be an essential step in achieving this goal and considering the evolutionary causes of disorders in psychiatry. The study showed good internal consistency for the scale (Cronbach's alpha of 0.91). Moreover, it correlated with physical health, life quality, social functioning, occupational functioning, and mate value (7).

The present study evaluated the validity and reliability of the EFS among university students. The results showed that the two-factor structure of the scale was confirmed in the Iranian population. This finding was in line with the research conducted in the USA (7). In the main study, Cronbach's alpha was obtained at 0.91, and the tool had a highly convergent relationship with the scales of physical health, quality of life, and social and occupational performance (7).

The results of our study confirmed the two-factor structure of the scale, consistent with the original research that developed this tool (7). Moreover, the EFS showed good internal consistency and retest reliability. Divergent validity was assessed by DASS-21. The results indicated a negative correlation between the evolutionary fitness and anxiety, depression, and stress, confirming previous research (2, 37). It has been reported that when individuals' survival and reproduction are somehow compromised, they show anxiety, depression, and stress symptoms (2).

Convergent validity was assessed by RSES, which showed a desirable result. This finding is consistent with research reporting that high evolutionary fitness could increase individuals' self-esteem and sense of power (2, 38). One study demonstrated that even individuals who use drugs artificially intend to stimulate the brain regions associated with self-esteem due to some real or perceived threats to their own survival (39).

One of the limitations of this research was that the sample included only students. It is suggested that such research be performed on non-student samples.

5.1. Conclusions

This research can contribute to the existing literature evaluating the distal causes of psychiatric disorders and evolutionary fitness. Moreover, this study can complement the cross-cultural literature on the EFS by examining its construct, convergent, and divergent validity and reliability. The EFS could be a suitable tool for research and clinical work on psychiatric clients, especially those referred for psychotherapy. Furthermore, due to the need for standardizing tools in cultures with new and different dynamics before using them (40, 41), this research can help increase the external validity of the EFS.

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Footnotes

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Table 1. The Mean, Standard Deviation, and Correlation Between the Subscales and Overall EFS [a]

Variables	Mean ± Standard Deviation	1	2	3
Overall	170.16 ± 35.52	1	0.98**	0.96**
Personal adaptedness	108.40 ± 22.84		1	0.90**
Partner and offspring fitness	61.59 ± 13.51			1

[a] ** Correlation is significant at the 0.01 level.

Table 2. Fit Indices of Evolutionary Fitness

Fit Indices	X^2	DF	X^2/df	SRMR	GFI	IFI	CFI	RFI	NNFI	NFI	RMSEA
Two-factor	6171.43	1594	3.87	0.06	0.71	0.93	0.93	0.90	0.92	0.91	0.09

Table 3. Convergent and Divergent Validity

	Overall Scale	Personal Adaptedness	Partner and Offspring Fitness
Anxiety	-0.72**	-0.70**	-0.70**
Depression	-0.71**	-0.71**	-0.66**
Stress	-0.69**	-0.69**	-0.63**
Self-esteem	0.56**	0.58**	0.51**

of the authors is a member or reviewer of this journal. There was no personal or professional relationship with the organization, which was part of this article.

Data Reproducibility: The data presented in this study are openly available in one of the repositories or will be available on request from the corresponding author by this journal representative at any time during submission or after publication. Otherwise, all consequences of possible withdrawal or future retraction will be with the corresponding author.

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