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Assessment of the Factor Structure of test Tokyo University Egogram (TEG 3) on women and men in Iran

Mojgan. Amini Khalaf Badam[1], Nasrin. Bagheri[2*]

[1] Master student of General Psychology, Department of Psychology, Roudehen Branch, Islamic Azad University, Roudehen, Tehran, Iran
[2] Assistant Professor, Department of Psychology, Roudehen Branch, Islamic Azad University, Roudehen, Iran

*** Corresponding author email address**: na.bagheri@iau.ac.ir

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A B S T R A C T

Objective: Understanding personality characteristics can help us understand how individuals manifest their personality through their thoughts, feelings, and behaviors. Among numerous tools available to assess personality, one of them is the Egogram questionnaire. Accordingly, the purpose of this research was to standardize the Tokyo University Egogram questionnaire (TEG3).

Methods and Materials: The present research was a descriptive correlation study with a standardization approach. The statistical population of the study included women and men aged 20 to 40 in Tehran in 2021. 2707 participants, including 1585 women and 1122 men, were selected through convenience sampling. The Egogram questionnaire was designed based on the transactional analysis theory, which included 5 factors: the criticizing parent, the supportive parent, the adult, the natural child, the adapted child, and the Q validity scale and L lie scale. Data were analyzed using exploratory and confirmatory factor analysis, Cronbach's alpha, and SPSS.22 software.

Findings: The results of the validity, internal consistency, and reliability of the tool using Cronbach's alpha, exploratory and confirmatory factor analysis showed that the Egogram questionnaire consists of 5 factors in the Iranian culture, and the Cronbach's alpha coefficient of all the factors is above 0.7. Also, the Pearson correlation coefficient showed an acceptable internal consistency within the questionnaire factors among women and men.

Conclusion: This questionnaire can be used as a practical and new tool in the field of personality psychology and approaches such as schema therapy.

Keywords: *Egogram, Normalization, Transactional Analysis*

1. Introduction

For decades, mental health in social relationships has been important as it affects various aspects of an individual's life and provides opportunities for personal and social progress (Rahmati et al., 2020). On the other hand, the increasing complexities of technology, information, and communications have had various and significant effects on individuals (Ostad Ramazan, Manavipour, & Sedaghati Fard, 2014). Individuals are seeking to evaluate their physical and mental health to maintain their desirable mental health (Yokoyama & Bando, 2023). In the history of

psychology, one of the useful theories in examining mental health in relationships was proposed by Eric Berne (1978) and presented in 1961, called Transactional Analysis (TA). This theory helps us understand how humans reveal their personality through their behaviors (Aghjane et al., 2021). Transactional Analysis theory predicts that each person has a set of behavioral standards that are transmitted through daily interactions in relationships and expressed in different states or modes known as ego states or personality. Ego states are represented by a three-dimensional psychological structure consisting of three main concepts called "Parent (P)," "Adult (A)," and "Child (C)." This primary structure has functional dimensions that are divided into critical or blaming parent (CP), nurturing parent (NP), adult (A), natural child (FC), and adapted child (AC) (Bando, 2018; Vos & van Rijn, 2021a). The concept of ego states refers to a set of thoughts, feelings, and behavioral patterns that sometimes change based on circumstances. However, all these states have a trajectory and form a cohesive personality (Solomon, 2003).

In general, from the perspective of psychology and psychiatry, research on the ego-gram is related to personality and communication skills (Yokoyama & Bando, 2019), and specifically, the ego-gram is used to assess the performance of states of mind or ego. States of mind indicate individuals' habits and tendencies in thinking, feeling, and behavior during interactions with others (self-states), which are associated with specific disorders (Darabian et al., 2021). TEG has five main ego-grams, and each factor can be calculated with points ranging from 0 to 20 (Shinoda et al., 2018). The goal of the ego-gram is to display a schematic representation of perceived behavior of the self in different states of mind, which is a technique widely used by TA physicians as well as in other behavioral fields. This tool represents an individual's representation of themselves based on the intensity of experienced behavior in each state of mind. The importance of the ego-gram lies in its ability to guide the diagnostic process and self-awareness of patients regarding their communication patterns, as well as to map out the underlying therapeutic process (Yanagihara et al., 2016). This tool has applications in several fields such as medicine, industry, and education, and has been widely used in various mental health and psychiatric situations (Morimoto & Ito, 2020; Yokoyama & Bando, 2023). It can be used to evaluate and improve mutual relationships between parents and children, couples, and work environments, as it can increase individuals' understanding of themselves and provide opportunities for improving daily life and work (Bando & Yokoyama, 2021). Understanding one's existence and personality traits is a crucial factor in personal success (Shinoda et al., 2018).

Although this questionnaire and its theoretical strategies can be effective in self-compassion (Aghjane et al., 2021), resolving marital conflicts, intimacy, self-esteem, and depression (Golshan, Zargham Hajebi, & Sobhi-Gharamaleki, 2021), coping with distress, and solving social problems (Rahmati et al., 2020), marital adjustment, cognitive assessment (Morimoto & Ito, 2020), and physical illnesses (Bando, 2018; Bando & Yokoyama, 2021; Yokoyama & Bando, 2019, 2023) and can have positive effects on individuals' communication skills towards personal success (Shinoda et al., 2018), this questionnaire has not been studied in Iran. The only study conducted on the measurement of theoretical factors of transactional analysis in the country is the Harris questionnaire in 1977, which only indicates the internal consistency of the scale questions and does not include concepts such as reliability, predictability, repeatability, and reproducibility (Darabian et al., 2021). On the other hand, since personality traits have been the focus of researchers for a long time, various questionnaires have been developed to assess human personality. Among these, the ego-gram questionnaire can evaluate the relationship between an individual's self-states of mind and mental energy and provide new information about the structure and dynamics of individuals' personalities with or without disorders (Vos & van Rijn, 2021b). Therefore, this questionnaire can help psychologists identify the current status of their clients and their relationships with others. Therefore, the purpose of this study is to investigate the psychometric properties of the Tokyo University Ego-Gram questionnaire.

2. Methods and Materials

2.1. Study Design and Participants

The present research method was a descriptive-correlational study with a standardization approach. The statistical population of the study included women and men aged 20 to 40 in Tehran in 2021. The sampling method was available. The sample size was 2707 (1585 women and 1122 men) which was collected through an online questionnaire created on the Porsline website and distributed on social networks. Respondents voluntarily answered the questions, and if they did not respond to some questions, they were asked again to ensure a response. Users who answered a

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question twice were considered spam and removed from the data collection.

2.2. Measures

2.2.1. Tokyo Ego Gram 3 (TEG3)

The Tokyo University Ego-Gram questionnaire (TEG3) was used to collect data, which targets individuals over the age of 16. The questionnaire consists of 53 items with three options (Yes: 2 points, Neither: 1 point, and No: 0 points) and identifies 5 personality states: Critical Parent (CP), Nurturing Parent (NP), Adult (A), Free Child (FC), and Adapted Child (AC). Each scale contains 10 questions, and 3 questions are related to the validity of the scale. The L scale and Q scale were used for the reliability of the questionnaire. The L scale is used when the score is higher than 4, which indicates poor reliability and confidence in response, and accuracy should be considered in judgment. For the Q scale, it is better to consider a score of 44 or higher for judgment and diagnosis. The ego-gram is self-reported and, to collect more accurate information, questions about each respondent's characteristics such as place and region of residence, gender, age, etc., were asked and completed. It takes about 10 minutes to answer the questions (Shinoda et al., 2018). In general, the process of forming the foundational components of the ego-gram questionnaire was such that five psychiatrists independently proposed and presented multiple-choice questions and new factors for the new version of TEGII based on their concepts. As a result of their synthesis, 155 factors (30 CP factors, 33 NP factors, 29 A factors, 31 FC factors, and 32 AC factors) were presented as candidates for questions related to psychological states in the new version of TEG3. In addition, for the new version of TEG3, the validity scale (L scale, Low Frequency Scale) was also accepted, and 11 L factors were considered as candidates. For each factor, five psychiatrists independently examined and summarized their suitability or unsuitability, and discussed those factors that had disagreements until they reached a consensus. Finally, 96 factors (19 CP factors, 16 NP factors, 17 A factors, 16 FC factors, 21 AC factors, and 7 L factors) remained as candidates. In actual surveys, to prevent response bias, factors were randomly presented, and finally, respondents answered 53 questions (Yokoyama & Bando, 2023).

2.3. Data analysis

The Cronbach's alpha was used to find the reliability of the Ego-Gram questionnaire of Tokyo University (TEG3), and confirmatory and exploratory factor analysis was used for its validity. Raw scores were normalized using T and Z tests and SPSS 22 software.

3. Findings and Results

In this study, 2,707 participants (1,585 women and 1,122 men) with an mean age of 30.37 and a standard deviation of 6.71 years participated.

In addition to the mean and standard deviation of each item of the questionnaire, the skewness and kurtosis values of each item were examined separately for men and women. The results showed that except for items 5, 20, 27, and 40, the skewness and kurtosis values of other items were within ±2 in both men and women. This indicates the normal distribution of the data related to these items. Since items 20, 27, and 47 were related to the lie scale of the questionnaire, their non-normal distribution was expected. On the other hand, considering the skewness and kurtosis values obtained for items 5 and 40 in both genders, it can be said that these items are not very compatible with the culture of our country, and therefore, their information was excluded from this study.

To determine the underlying factors of the questionnaire for both men and women, exploratory factor analysis was performed using the principal component analysis approach. The data from the participants were divided into two groups (Group 1 with 1,354 participants and Group 2 with 1,353 participants) for this purpose. In Group 1, there were 793 women and 561 men, while in Group 2, there were 792 women and 561 men. The data from Group 1 were used to determine the underlying factors of the questionnaire for both genders, and the data from Group 2 were used to evaluate the fit of the data with the Ego-Gram questionnaire model for both genders.

In the first step of the exploratory factor analysis, the aim was to find the underlying factors of the questionnaire. The use of the principal component analysis method showed that the Kaiser-Meyer-Olkin (KMO) index was 0.843 for women and 0.835 for men. This index indicates that the sample size is sufficient for conducting exploratory factor analysis. Also, the results showed that the Bartlett's test of sphericity was statistically significant for women ($p<0.001$) and for men ($p<0.001$).

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Since the Bartlett's test of sphericity was significant at the 0.01 level, it can be concluded that the variables were not independent of each other, and there was an acceptable level of correlation among them, which could lead to the emergence of clusters. The initial analysis extracted 12 components with an eigenvalue greater than one for both groups, explaining a significant amount of the total variance. However, the scree plot evaluation showed that for both groups, the scree curve broke at the location between factors 5 and 6, indicating that the scree plot considered five factors. This suggestion was consistent with the underlying theory of the questionnaire.

Figure 1

Scree plot (females)

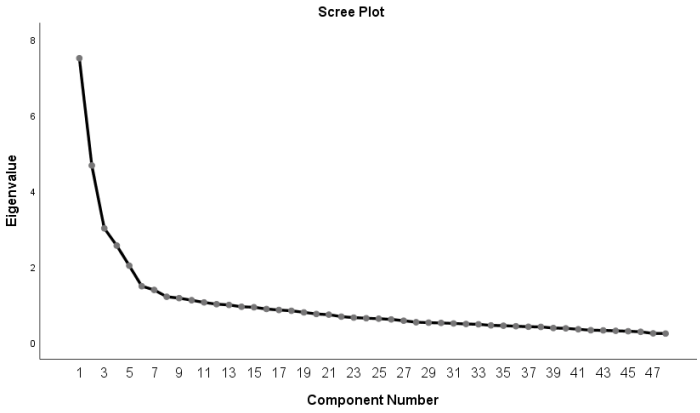
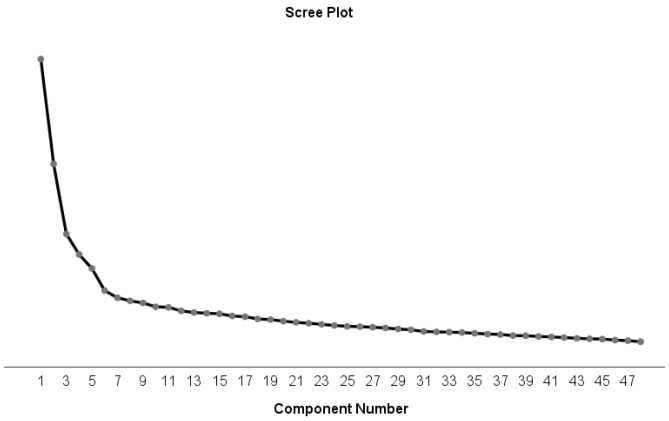


Figure 2

Scree plot (male)



Following the determination of the number of components, the analysis with a fixed number of factors was repeated using a five-factor solution with varimax rotation to extract the components. Table 1 shows the rotated factor loadings in principal component analysis for both men and women.

Table 1

Rotated factor loadings of the remaining items of the egogram questionnaire for the group of females and males in the analysis of the main components

Item	Factors												
	Factor one		Item	Factor two		Item	Factor three		Item	Factor four		Item	Factor five	
	Females	Males		Females	Males		Females	Males		Females	Males		Females	Males
14	0.755	0.746	4	0.730	0.694	13	0.723	0.717	10	0.616	0.531	39	0.696	0.642
51	0.733	0.728	31	0.689	0.726	52	0.716	0.722	45	0.583	0.619	12	0.661	0.623
2	0.712	0.714	1	0.658	0.686	32	0.696	0.741	44	0.581	0.713	16	0.643	0.713
50	0.695	0.676	19	0.636	0.528	48	0.659	0.591	49	0.550	0.573	38	0.639	0.624
26	0.666	0.648	7	0.592	0.678	21	0.645	0.640	3	0.529	0.501	6	0.614	0.542
41	0.641	0.624	34	0.561	0.586	35	0.644	0.429	17	0.521	0.531	11	0.586	0.480
24	0.631	0.661	28	0.548	0.524	25	0.575	0.515	30	0.493	0.467	42	0.523	0.508
29	0.629	0.661	46	0.538	0.489	8	0.566	0.605	18	0.480	0.522	33	0.507	0.615
23	0.610	0.645	36	0.521	0.518				37	0.450	0.456	43	0.469	0.490
53	0.602	0.649	9	0.510	0.496				22	0.434	0.511	15	0.461	0.618
Eigenvalue	5.12	5.30	4.53		4.56	3.96		3.86	3.31		3.45	2.86		2.75
Extracted variance	10.67	11.04	9.43		9.49	8.25		8.03	6.89		7.19	5.97		5.73

As Table 1 indicates, all items of the questionnaire loaded only on one factor. Accordingly, items 2, 14, 23, 24, 26, 29, 41, 50, 51, and 53 formed Factor 1, items 1, 4, 7, 9, 19, 28, 31, 34, 36, and 46 formed Factor 2, items 8, 13, 21,

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25, 32, 35, 48, and 52 formed Factor 3, items 3, 10, 17, 18, 22, 30, 37, 44, 45, and 49 formed Factor 4, and items 6, 11, 12, 15, 16, 33, 38, 39, 42, and 43 formed Factor 5 according to the questionnaire key. These factors were named CP for Factor 1, AC for Factor 2, NP for Factor 3, FC for Factor 4, and A for Factor 5. To evaluate the structure of the Ego-Gram questionnaire using confirmatory factor analysis (CFA), the data from Group 2 were analyzed using AMOS version 24.0 software with maximum likelihood estimation (ML). The analysis included all items of the questionnaire and each item was constrained to load only on its respective factor. Table 2 shows the goodness-of-fit indices of the measurement model of the Ego-Gram questionnaire for both men and women.

Table 2

Fit indices of measurement models for both groups

Index	Model		Cutoff point
	Females	Males	
$^{2}\chi$.df	2.79	3.15	< 3
GFI	0.828	0.776	> 0.9
AGFI	0.801	0.730	> 0.85
CFI	0.768	0.720	> 0.9
RMSEA	0.048	0.062	> 0.08

As Table 2 indicates, the results of the confirmatory factor analysis did not support the fit of the five-factor structure of the Ego-Gram questionnaire with the collected data, except for the RMSEA index. Therefore, to address this issue, the technique of item parceling was employed based on the results of exploratory factor analysis from Group 2 data for both genders.

Table 3

Integration of the items of five ego-gram components

CP	NP	A	FC	AC
1: 24 & 51	6: 16 & 25	10: 11 & 15	15: 18 & 45	21: 4 & 34
2: 14 & 23	7: 8 & 25	11: 6 & 16	16: 10 & 22	22: 1 & 46
3: 2 & 41	8: 32 & 35	12: 12 & 39	17: 44 & 3	23: 9 & 19
4: 50 & 52	9: 21 & 48	13: 33 & 43	18: 37 & 49	24: 7 & 26
5: 26 & 29		14: 38 & 42	19: 17 & 30	

After item parceling, the measurement model of the Ego-Gram questionnaire was evaluated again using confirmatory factor analysis for both genders. Table 4 shows the goodness-of-fit indices of the measurement model of the Ego-Gram questionnaire after item parceling.

As Table 4 shows, the use of confirmatory factor analysis after item parceling demonstrated that the obtained goodness-of-fit indices for the measurement model of the Ego-Gram questionnaire were acceptable for both men and women with the collected data. Additionally, Table 5 presents the standardized factor loadings of each indicator after item parceling for both genders.

Table 4

Fit indices after the integration of items

Index	Model	
	Females	Males
$^{2}\chi$.df	1.94	2.12
GFI	0.921	0.918
AGFI	0.878	0.874
CFI	0.941	0.936
RMSEA	0.034	0.045

Table 5

Parameters of the measurement model of ego-gram questionnaire in both groups after the integration of the items

Hidden variable - indicator	B		β		SE		C.R	
	Females	Males	Females	Males	Females	Males	Females	Males
p1 – CP	1	1	0.790	0.804				
p2 – CP	0.949	1.013	0.810	0.835	0.040	0.046	23.98**	22.03**
p3 – CP	1.045	1.037	0.788	0.786	0.045	0.051	23.22**	20.37**
p4 – CP	0.988	1.042	0.756	0.820	0.045	0.048	22.12**	21.52**
p5 – CP	1.056	1.041	0.746	0.796	0.049	0.050	21.78**	20.72**

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p6 – NP	1	1	0.749	0.744				
p7 – NP	0.960	0.893	0.740	0.665	0.051	0.063	18.65**	14.24**
p8 – NP	0.818	1.034	0.728	0.806	0.044	0.063	18.40**	16.51**
p9 – NP	0.870	0.803	0.724	0.636	0.047	0.059	18.31**	13.64**
p10 – A	1	1	0.677	0.456				
p11 – A	0.723	1.457	0.512	0.774	0.063	0.164	11.50**	8.88**
p12 – A	0.835	1.015	0.569	0.551	0.067	0.126	12.51**	8.07**
p13 – A	1.225	1.039	0.580	0.370	0.097	0.154	12.69**	6.35**
p14 – A	0.841	1.313	0.567	0.592	0.067	0.158	12.47**	8.33**
p15 – FC	1	1	0.535	0.686				
p16 – FC	0.854	1.011	0.475	0.691	0.86	0.079	9.90**	12.79**
p17 – FC	1.289	0.894	0.696	0.593	0.104	0.078	12.39**	11.43**
p18 – FC	1.091	1.073	0.594	0.647	0.095	0.088	11.44**	12.23**
p19 – FC	1.224	0.772	0.712	0.513	0.098	0.076	12.50**	10.13**
p20 – AC	1	1	0.412	0.617				
p21 – AC	1.781	1.306	0.684	0.715	0.179	0.103	9.94**	12.70**
p22 – AC	2.053	1.545	0.666	0.757	0.208	0.118	9.86**	13.11**
p23 – AC	1.841	1.245	0.683	0.696	0.185	0.100	9.94**	12.48**
p24 – AC	1.657	0.890	0.660	0.510	0.169	0.090	9.83**	9.89**

**p<0.01

Note that the unstandardized factor loadings (b) of indicators p1, p6, p10, p15, and p20 were fixed at 1, so their standard errors (SE) and critical ratios (CR) were not calculated. Based on the results presented in Table 4, all indicators had standardized factor loadings greater than 0.32. In the women's group, the highest factor loading belonged to indicator p2 (β=0.810) and the lowest belonged to indicator p20 (β=0.412). In the men's group, the highest factor loading belonged to indicator p2 (β=0.835) and the lowest belonged to indicator p13 (β=0.370). Therefore, it can be concluded that all indicators in both men and women have sufficient capacity to measure the five factors of the Ego-Gram questionnaire.

Table 6

Mean, Standard deviation (SD), Cronbach's Alpha, and the coefficients of correlation for all factors and for both groups

Variables	CP		CP		CP		CP		AC	
	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males
CP	-	-								
NP	-0.33**	-0.34**	-	-						
A	-0.20**	-0.17**	0.20**	0.13**	-	-				
FC	-0.32**	-0.23**	0.16**	0.32**	0.31**	0.24**	-	-		
AC	-0.02	-0.04	0.03	0.22**	-0.41**	-0.29**	0.18**	-0.11**	-	-
Mean	9.11	9.78	11.38	10.39	15.39	15.34	12.56	13.17	8.99	8.73
SD	3.30	4.17	4.17	4.46	3.67	3.64	3.58	3.88	2.67	2.93
Cronbach's Alpha	0.90	0.81	0.82	0.81	0.71	0.65	0.75	0.73	0.82	0.79

**p<0.01

Furthermore, Table 6 shows that Cronbach's alpha coefficients for all factors of the Ego-Gram questionnaire were greater than 0.70 for women, and factor A had a coefficient of 0.65 for men, while other factors had coefficients greater than 0.70. This indicates that the items of each factor of the questionnaire have acceptable internal consistency for both men and women. Additionally, Pearson correlation coefficients showed that the correlation between all factors of the questionnaire among men was significant at the level of 0.01, except for factor AC, and among women, the correlation between all factors was significant at the level of 0.01, except for factor AC. Overall, these findings indicate acceptable internal consistency and homogeneity of the Ego-Gram questionnaire factors among both men and women.

4. Discussion and Conclusion

The present study aimed to standardize the Ego-Gram questionnaire of the University of Tokyo (TEG3) on Iranian men and women. The results showed that the questionnaire

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consists of 5 factors and the main factors were confirmed for both genders in the confirmatory factor analysis. Additionally, the questionnaire had good internal consistency. This finding is consistent with the Dusek's study (1977) which showed that the questionnaire consists of 5 factors and has desirable internal consistency. However, no study in Iran has been consistent with this finding.

To standardize the questionnaire, exploratory factor analysis was used to extract acceptable and valid factors. The results at this level showed that the questionnaire consists of 5 factors including Criticizing Parent (CP), Nurturing Parent (NP), Adult State (A), Adapted Child (AC), and Free Child (FC). In other words, this study showed that this questionnaire is a useful and valid tool for psychologists to assess personality states and is effective in interpersonal relationships in Iranian culture. This is due to the strong theoretical background of the questionnaire and its ability to explain the structure of personality and its changes and factors affecting behavior. Therefore, through this theoretical background and many revisions made to complete this questionnaire, it has been able to be a valid questionnaire in various cultures, including Iran, and its main factors have been confirmed.

Additionally, this study showed that all 5 factors in the original version of the questionnaire were confirmed by confirmatory factor analysis and all fit indices supported the 5-factor model of the Ego-Gram questionnaire of the University of Tokyo. This finding is consistent with Dusay's study (1977) which showed that the Ego-Gram questionnaire of the University of Tokyo in its Persian version consists of 5 factors and 51 items (Dusay, 1977). It seems that Persian respondents and participants in this study had a similar understanding of the questionnaire items. Moreover, confirming the factor structure of the Ego-Gram questionnaire in the Iranian community, which has many cultural and social differences from Western society, indicates the high ability of this questionnaire to assess personality states. Additionally, all standardized factor loadings in the statistical analysis model were higher than 0.30, indicating significant prediction of the factors by the Ego-Gram questionnaire items.

Furthermore, this study demonstrated that the Ego-Gram questionnaire of the University of Tokyo has good internal consistency. The Cronbach's alpha coefficients for CP, NP, A, FC, and AC factors were 0.84, 0.89, 0.88, 0.84, and 0.90 for men and 0.78, 0.87, 0.86, 0.85, and 0.90 for women, respectively, which are sufficiently high values. This finding is consistent with previous studies that have reported high reliability of this questionnaire. Both the male and female versions of the questionnaire had good reliability in this study. The internal consistency obtained for all factors except for factor A in men ($\alpha = 0.73$) indicates acceptable internal consistency of the Ego-Gram questionnaire items. It can be concluded that the internal consistency of the Ego-Gram questionnaire of the University of Tokyo was confirmed using Cronbach's alpha coefficient. It seems that Iranian respondents had a similar understanding of the questionnaire items as Japanese respondents, which contributed to the internal consistency of the factors and items of the Ego-Gram questionnaire.

In conclusion, this study confirmed the factor structure and internal consistency of the Ego-Gram questionnaire of the University of Tokyo in Iranian men and women. The questionnaire consists of 5 factors including CP, NP, A, AC, and FC, which are valid and reliable tools for assessing personality states and interpersonal relationships i(Golshan, Zargham Hajebi, & Sobhi-Gharamaleki, 2021)n Iranian culture. This study also demonstrated that the Ego-Gram questionnaire is a useful tool for psychologists to assess personality states in different cultures.

5. Limitations & Suggestions

Overall, this study showed that the factor structure of the Ego-Gram questionnaire is confirmed in Iran, similar to its original version. Additionally, this questionnaire has good internal consistency, making it a valid and reliable tool for psychologists and researchers in various therapeutic and research settings. However, this study has some limitations that may restrict its generalizability, such as being conducted in one city (Tehran) and only including a specific age range (20-40). Furthermore, the original version of the questionnaire was in Japanese, which may limit access to it due to the high cost of translation. Due to these limitations, caution is recommended when generalizing the findings of this study. It is suggested that future research should investigate this questionnaire in other cities and different age ranges. Finally, it is recommended to use the proposed behavior modification content of this questionnaire, derived from the obtained Ego-Gram diagrams, in specialized communities for personality modeling and mutual behavior analysis workshops for research purposes.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethics Considerations

Ethical considerations were observed in this study, including confidentiality, privacy, and honesty. Participation in the study did not pose any potential harm to the participants.

Authors' Contributions

This article is extracted from the first author's master's thesis. The thesis topic was approved by the Education and Graduate Studies Council of the Psychology Department of Rodehen University on 2/12/2021 with a tracking code of 16240347.

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