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Psychometric features of the Five Dimensional Curiosity Scale among University Students

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Abstract

This study was conducted to review the psychometric features of the five-dimensional curiosity scale in Iranian university students. This is a methodologic study. First, the Five-Dimensional Curiosity Scale was translated. Then, the face validity and content validity of the scale were studied. A total of 365 students (213 women) who were studying in universities were selected by multi-stage cluster sampling. Confirmatory factor analysis were used to evaluate the structural validity. The goodness-of-fit indices showed that, the structural model of the scale fitted well with subscales of joyous exploration, deprivation sensitivity, stress tolerance, social curiosity, and thrill-seeking(P=0.001, RMSEA=0.05, IFI=0.94, CFI=0.94, GFI=0.9). The reliability of the scale by Cronbach's alpha coefficient was α = 0.82 (N = 365). The Translated version of the five-dimensional curiosity scale has appropriate validity and reliability among university students and can be used by scholars to evaluate the curiosity feature in various studies.

Keywords: Psychometric, Validity, Reliability, Curiosity

1. Introduction

One of the strongest aspects of human motive is curiosity[1]. The researchers define curiosity as an eagerness which incline the deep attention of the human to the recognition, follow up, input assessment, and new experiences[2]. Regardless of severity, repetition, and duration, this structure somehow exists in all creatures, and it is permanent during lifetime[3]. Curiosity makes individuals to be eager to search for and receive new information, discover opportunities, and overcome the problems by nurturing and provoking the active behaviors[4]. Also, curious people assess and solve their mental problems during an inert attitude and inactive behavior[5]. The researchers claim that the curiosity plays an important and undeniable role in learning, emotional intelligence, mental wellbeing, meaning in life, and distress tolerance, and it has a positive effect on the increase of knowledge and interpersonal intimacy[6]. This structure is related to the traumatic behaviors such as drug and alcohol abuse and high-risk sexual behaviors, and there is a positive correlation between the curiosity and creativity and academic achievement[1]. Curiosity increases the compatibility, the feeling of eligibility by gaining new skills, the feeling of happiness, and as a result, the improvement of the performance quality of the individuals[7, 8]. Similar to the various definitions for curiosity, many researches have been conducted to make an accurate tool to measure this structure; many tools measured curiosity based on the limited aspects of the existing definitions which wasn't a positive point for the measurement of curiosity as a multi-dimension trait and other tools try to measure structures similar to curiosity. These instruments measure structures such as "openness to experience", "epistemic curiosity", "social curiosity" and "intrapersonal and interpersonal curiosity"[9-12]. But some other researchers have emphasized the multidimensional aspects of the curiosity trait. For example, Kashdan and Roberts [13] designed Exploration and Curiosity Inventory (CEI-I) that assessed two aspects of curiosity. This inventory assesses the curiosity and exploratory behavior by 7 items and 2 factors of exploration and absorption. The reliability of CEI-I in students and a web-based sample assessed and confirmed. Cronbach's alpha of CEI-I in Kashdan and Roberts [13] was from 0.72 to 0.8, and in the study of Čavojová and Sollár [14] was from 0.58 to 0.72. Iranian researchers also reported a coefficient of internal consistency of this tool of 0.84 [15]. In an additional study, two factors of Stretching and Embracing were identified as components of the curiosity and exploration inventory (CEI-II). The internal consistency of these components in Kashdan's study was between 0.76 and 0.79, and for the total was 0.83 [1]. In another study, the internal consistency coefficient of the components of CEI-II was reported from 0.66 to 0.79 [16]. Finally, Kashdan, Stiksma [17] presented the Five-dimensional Curiosity Scale (5DC) to complete the previous tools. This tool measures curiosity more extensively. 5DC has 25 items, and it measures curiosity by 7-point Likert scale in 5 corresponding dimensions and subscales. People who score high on joyous exploration (JE) are usually receptive to new experiences and see them as opportunities to learn. They feel positive about gaining new experiences and enjoy exploring them [13]. The high scores on the deprivation sensitivity (DS) indicate that these people are interested in engaging with ideas and trying to solve problems. They feel that there is a gap in their information, so they try to fill this knowledge gap by obtaining information [9, 18]. For the first attempt, Kashdan, Stiksma [17] measured people's perceptual ability to cope with the stress of exposure to novel issues. The stress tolerance (ST) subscale assesses the amount of stress people face when confronted with new situations, new places, and so on. High scores on ST subscale indicate that individuals tend to tolerate the stress of facing an ambiguous, unexpected, and complex situation [19, 20]. A study by Renner [10] found that people with high scores of social curiosity (SC) tend to seek out and pay attention to gossip.

Thus, high scores on the SC subscale indicate the willingness of people to gather information from those around them [17]. People with high Thrill-seeking (TS) scores are looking for a variety of emotional experiences and are prepared to face physical, social, and financial risks. Despite efforts to measure curiosity so far, the history of measurement of curiosity in Iran is not long. The Iranian researchers have used the Non-common questionnaires, CEI-I and CEI-II, and Melbourne Curiosity Inventory (MCI) in their studies [21]. Except for CEI-I, the psychometric features, validity, and reliability of the translated version of other tools have not yet been assessed [15]. Without knowing about the psychometric features of the research tools, the accuracy of the data and the obtained results are not reliable [22]. A specific measurement tool may be valid to assess a specific characteristic in a population, while it is not valid to assess the similar characteristic in another population; therefore, it is needed to use a valid tool to measure this characteristic in order to expand and benefit from the researches in the field of curiosity. Due to the lack of a comprehensive, valid, and reliable tool to assess curiosity in Persian, and according to the importance of a valid tool in the curiosity researches, the present study was administered to translate and assess the validity and reliability of 5DC among the students to provide a valid and reliable tool for assessing the curiosity trait of Persian-speaking people.

2. Method

2.1. Participants

The present research is methodological study with a factor analysis approach, which assesses the validity and reliability of the Persian and translated version of 5DC. The statistical population of this research consists of all the Iranian students in the universities and higher education centers in Mazandaran province in 2018-2019. The minimum sample size in the confirmatory factor analysis is determined based on the factors rather than the variables. According to Jackson and Gao Smith [23], the minimum sample size for each factor is 20 other researchers also claimed that at least 200 samples are needed for 10 factors. The sample size in this study is estimated by the degree of freedom, effect size (0.5), and significance level (α=0.5) in Gpower, and 345 individuals are suggested to be the minimum needed sample. Therefore, 365 individuals were selected by the multi-stage cluster random sampling. For sampling, first, the list of the universities and higher education centers of Mazandaran province (87 centers with student admission in the intended year) was prepared. Then, public universities, Farhangian university campuses, Payam Noor university centers, Azad University centers, and private higher education institutes were considered as the clusters. Next, 2 centers from each cluster and 2 classes from each center were selected. The researcher went to the selected centers for 5 months since the beginning of the winter of 2018, explained the goals of the study to the students, and obtained their consent.

2.2. *Translation process of the scale:* prior to the beginning of the translation of the scale, the permission was obtained from Kashdan, Stiksma [17] as authors. Then, 5DC was translated from English into Persian based on IQOLA protocol [24]. In the first step, two Persian translators who were not familiar with 5DC translated it into Persian separately, and then, they agreed upon a single translation during a thinking meeting. In another meeting, the researchers and the translators discussed the difficulty, incompatibility, and ambiguity of the translation, and some items were reviewed. Again, everybody agreed upon a single translation of the 25 items. Finally, the translated items were translated back into English and were confirmed by the authors of the Scale. This way, the Persian version of the 5DC was prepared to assess the psychometric features in the research population. This protocol was completed at Bollinger's suggestion [25].

2.3. Assessment of the validity and reliability of the scale

Two main characteristics of the psychometric features are validity and reliability. Messick [26] believed that one form of validity is not enough for the assessment of the validity of a tool. Therefore, face validity, content validity, structural validity were assessed and confirmed for the psychometric features of the 5DC in the present study.

2.3.1. *Face validity assessment*

To assess the face validity, the impact score was used. A 5-point Likert scale for each item (from completely agree=5 to completely disagree=1) was given to 10 students of the population, and the impact score was calculated for each item [27].

2.3.2. *Content validity assessment*

The content validity of 5DC was assessed using Content Validity Index (CVI). The experts were asked to determine the relation of each item with the structure using a 4-point Likert scale. 11 faculty members of the universities of Mazandaran with at least 8 years of experience in teaching psychology cooperated with the researcher for this part of the study. The score of CVI (S-CVI) was calculated by dividing the sum of items' CVI (I-CVI) over total items of the index [28].

2.3.3. *Structural validity assessment*

Since there was a hypothesis based on the five-dimensional model, to assess the structural validity of the study, confirmatory factor analysis was used. The researcher began the confirmatory factor analysis with a hypothesis about the correlation between the observed variables and the latent variables and the correlation of one latent variable with the other latent variable. Then, the parameters of the primary model were estimated using maximum likelihood [29]. To

assess the agreement and compatibility of the model with the data, the goodness of fit of the model was studied using the Chi-square statistics (χ^2), goodness of fit index (GFI), comparative fit index (CFI), root mean square error of approximation (RMSEA). When the GFI and CFI indices are greater than 0.9, the RMSEA index is less than 0.1, and the proportion of chi-square to the degree of freedom (χ^2/df) is between 1 and 5, the model fits well [30]. Where needed, the model was revised using the relationship between the residual error variance of the variables, and the goodness of fit of the indexes was assessed again [31].

2.3.4. *Reliability Assessment*

To assess the reliability of the 5DC, the internal consistency coefficient of the items of 5DC was calculated by using Cronbach's alpha [32].

2.4. Study tools

Five Dimensional Curiosity Scale: the main tool used in this study was 5DC. Five subscales of this tool were JE (items 1 to 5), DS (items 6 to 10), ST (items 11 to 15), SC (items 16 to 20), and TS (items 21 to 25). These subscales were assessed using a 7-point Likert scales (from 'doesn't describe me at all'=1 to 'completely describes me'=7). To calculate the curiosity score of each participant, after the reverse scoring of the ST items, the mean scores of each subscale was computed. Therefore, the mean of curiosity ranges from 1 to 7 for each subscale. Kashdan, Stiksma [17] has assessed the psychometric features of this tool in 3 studies with 3 different samples, and he showed that 5DC is valid for the adult population in the U.S. He also assessed the reliability of 5DC in two studies, and their Cronbach's alpha of the subscales ranged from 0.81 to 0.9.

3. Results

In this study 365 people participated, 58% of them were male students (n=152) and 42% of them were female students (n=213). The mean of the participant's age was 22.73 years (SD=4.91), 65% of students were 18 to 22 years old and 23% were 23 to 27 years old. The other students were over 28 years old. Their minimum and maximum ages were 18 and 61 years, respectively and the mother language of all participants was Persian. Among all participants, 2.2% were associate students, 77% were Bachelor, 16.4% were master students, and 4.4% of students were studies Ph.D. Also, 61% of the participants were unemployed students. In the process of assessing the face validity using the impact score, all the items gained scores more than 1.5, and they all were accepted. Next, to assess the content validity, 11 psychology experts used CVI. The S-CVI was 0.94. The mean curiosity scores of the participants were the highest in the subscale of Joyous exploration (M=4.74±1.25) and the lowest in the subscale of social curiosity (M=3.61±1.43). Given that the participants' curiosity scores on subscales had not a normal distribution, the correlation between subscales were calculated by using Spearman correlation test. To assess the reliability of 5DC, Cronbach's alpha coefficient was estimated for each subscale. Stress tolerance had the minimum internal consistency (α=0.71), and social curiosity had the maximum internal consistency between the items (α=0.81). Cronbach's alpha coefficient of 5DC in the main sample (N=365) was α=0.82. All descriptive results are visible in Table 1.

Table1. Correlations, means, standard deviations, and alphas for the 5DC on Total Sample (n=365).

Subscales	α	M	SD	Total	TS	SC	ST	DS	JE
Joyous Exploration	0.78	4.74	1.25	0.65*	0.43*	0.08	0.02	0.41*	1
Deprivation Sensitivity	0.74	4.13	1.23	0.63*	0.22*	0.14*	0.15*	1	
Stress Tolerance	0.71	3.64	1.18	0.43*	0.05	0.2*	1		
Social Curiosity	0.81	3.61	1.43	0.56*	0.22*	1			
Thrill Seeking	0.74	3.77	1.32	0.62*	1				
Total Score	0.82	3.98	0.77	1					

Note: Spearman Correlation for study (n=365) are presented above the diagonal. JE= Joyous Exploration, DS= Deprivation Sensitivity, ST= Stress Tolerance, SC= Social Curiosity, TS= Thrill Seeking.
* Significant correlations at the 0.01 level in the two tailed.

The confirmatory factor analysis is based on a predetermined structure, and it confirms the accuracy or the lack of any evidence to reject the goodness of the model. Therefore, after editing the 5DC structural model, the paths were determined. Then, the goodness of fit of the model was assessed and edited for each subscale. This process continued until the structural model of the subscales and 5DC approached the closest point to the fitted structural model. The findings showed that the primary models of JE, DS, ST, SC, and TS subscales don't have appropriate goodness of fit. Therefore, it was suggested to revise the models by adding the relationship between the residual error variance of some items. After the revisions were performed, the amount of chi-square index, the χ^2/df, and the RMSEA decreased. And

so on, the amounts of GFI, AGFI, NFI, RFI, IFI, and CFI increased. The significance test showed that there was no significant difference between the best fit model and the revised model (P<0.05). At the next stage, the relationship of the residual error variance between items 19 and 20, items 23 and 24, and items 24 and 25 was considered. In this step, the amounts of the goodness of fit didn't show any fit of the model. Therefore, it was suggested to perform similar subscale revisions on the 5DC structural model. As mentioned previously, Develop and structural change of this scale was not the aim of the study, just the least revisions needed to make the best fit model was considered. After these revisions, $\chi 2$, $\chi 2$/df, RMSEA decreased, and GFI, IFI, and CFI increased. The significance level of the goodness of fit test showed that even after the final revision, this model has a significant difference from the best fit model (P<0. 05), however, other indexed denoted that the revised model has an appropriate fit. These revisions and paths are shown in figure 1 and the amounts of the goodness of fit indices of the 5DC scale are shown in table 2.

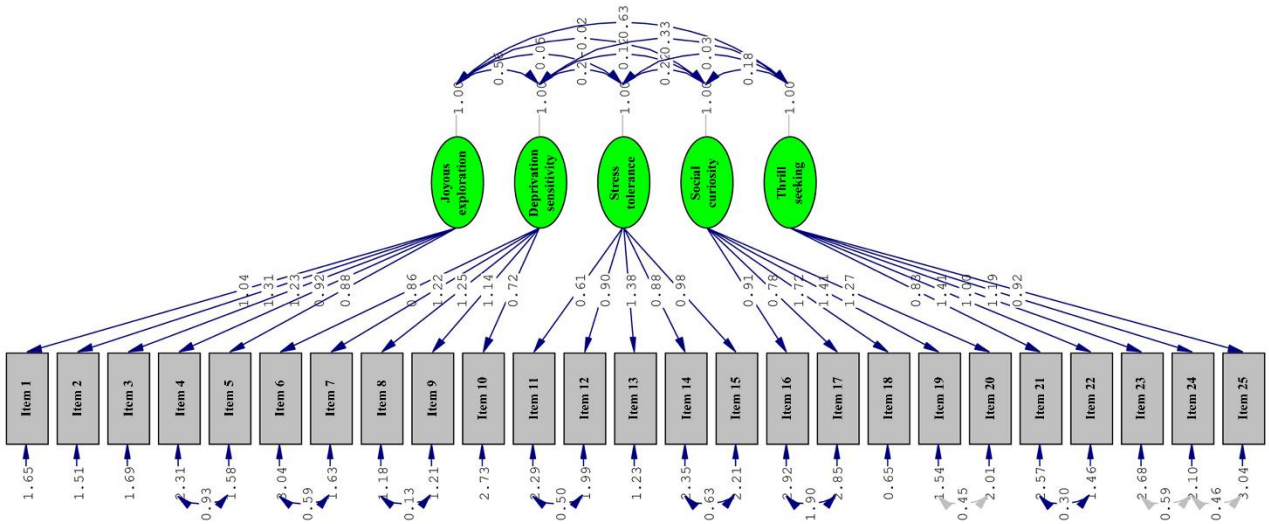

Figure 1. 5DC Model's structure

Table2: Goodness of fit indices of 5DC after the modification on total sample (n=365).

Models	χ^2	df	χ^2/df	RMR	RFI	NFI	GFI	AGFI	IFI	CFI	RMSEA	P
JE	7.55	5	1.51	0.08	0.98	0.99	0.99	0.98	1	1	0.03	0.18
DS	13.22	5	2.64	0.11	0.95	0.98	0.99	0.96	0.99	0.99	0.06	0.02
ST	7.06	5	1.41	0.07	0.97	0.98	0.99	0.98	1	1	0.03	0.22
SC	1.09	5	0.21	0.02	1	1	1	1	1	1	0.00	0.96
TS	13.9	5	2.78	0.11	0.95	0.97	0.99	0.96	0.98	0.98	0.06	0.01
5DC*	900	265	3.39	0.25	0.8	0.82	0.83	0.79	0.87	0.87	0.08	0.000
5DC**	536.51	258	2.07	0.22	0.88	0.89	0.9	0.87	0.94	0.94	0.05	0.001

Note: JE= Joyous Exploration, DS= Deprivation Sensitivity, ST= Stress Tolerance, SC= Social Curiosity, TS= Thrill Seeking. $\chi 2$= chi-square, df= degree of freedom, RMR= root mean square residual, GFI= goodness-of-fit index, AGFI= adjusted goodness-of-fit index, NFI= normed fit index, RFI= Relative Fit Index, IFI= incremental fit index, CFI= comparative fit index, RMSEA= Root Mean Square Error of Approximation. *5DC on the first row shows the initial indices. **5DC the second row shows the indices after final path reforms.

The effect size of this study was calculated using Gpower. In so doing, the goodness of fit test, which is a member of chi-square test family was selected. Considering the sample size of 365 participants, degree of freedom equals to 285, and significance level of α=0.05, the effect size of this study is 0.48, and the power of the study is 0.95.

4. Discussion and Conclusion

The goal of this study was to assess the validity and reliability of the translated version of 5DC among the students. 5DC is a multi-dimensional tool that holds various definitions of curiosity, the participants encounter a comprehensive

concept of curiosity, and they can easily relate to it. Furthermore, the sentences of the items of this Scale are as simple as possible, which helps the more understanding and identifying of the notions of curiosity. Therefore, the results of the *face validity* assessment showed that 5DC measures the face of the curiosity from the target population perspective. Similarly, the total CVI of 5DC shows that this scale has appropriate *content validity*, and the experts believe that its items have a close relationship with curiosity. Therefore, according to Polit, Beck [33], CVI is accepted. The results of the internal consistency assessment of 5DC showed that the items of this scale have an appropriate internal consistency. Among the subscales, ST had the minimum alphas Cronbach coefficient. It seems the reverse scoring of this subscale, and the nature of this dimension of curiosity may be the reasons for it. Interestingly, ST and JE had the maximum internal consistency in Kashdan, Stiksma [17] study (α=0.87). Therefore, another reason for this difference in the internal consistency of the two studies can be the different aspects of the characteristics of the two populations; so, more adaptive studies are needed for a detailed assessment of this issue. Since Only SC includes the term 'curiosity' in its sentences, and its items are specifically assessed curiosity in society, The SD had the maximum alphas Cronbach coefficient. Therefore, the score of this subscale has led to its acceptable internal consistency. This subscale also showed an appropriate internal consistency in Kashdan, Stiksma [17] study (α=0.86). The internal consistency of TS, DS, and JE also was appropriate. The Cronbach's alpha coefficient of 5DC and its subscales in the total participants showed 5DC is reliable. These findings confirm the results obtained from other studies[17, 34]. Many definitions have been proposed for curiosity so far. Some of these definitions emphasize on the information gap and the tendency to gain knowledge from the environment. Some other focuses on an internal motive. The structure designed for curiosity was the result of the integration of different aspects of this characteristic, and the most important related theories have a representative in this structure. Based on an integrative framework presented, the structural model of this scale was designed by the integration of all the designed dimensions, and the validity of the structure was assessed using confirmatory factor analysis and the goodness of fit index. The subscale of JE had a good fit after the revision. The revision consisted of consideration of the relationship between the residual error variance of items 4 and 5, and it showed that there is a correlation between the out of control factors of the measurement of these items. Item 4 was 'I enjoy learning about subjects that are unfamiliar to me' and item 5 was 'I find it fascinating to learn new information. These items measure one dimension; however, they are affected by a variable that is out of the control of the research. These findings confirm the theory of Engel [35] who believes the cognitive curiosity of the children is affected by the parents' upbringing. In other words, the joy of gaining knowledge and filling the information gap of the child depends on the quality of parents' response. Therefore, the parenting style of the parents and their reaction to the exploratory behavior of their child is an out of control factor, which makes the knowledge exploration enjoyable for the child and correlates the residual error variance of items 4 and 5. All in all, the structural model of the subscale of JE estimated by the maximum likelihood estimation confirms the studies of Berlyne [36] and Hume [37] that emphasized the cognitive dimension of curiosity. The primary model of the subscale of DS also didn't have a good fit. The revision of this model consisted of considering the relationship between the residual error variance of items 6 and 7 and also items 8 and 9. The revised model had a good fit. Item 6 was 'Thinking about solutions to difficult conceptual problems can keep me awake at night' and item 7 was 'I can spend hours on a single problem because I just can't rest without knowing the answer'. These items indicate some studies that confirmed that curiosity summons strong willpower and determination [38]. The relationship between the residual errors of these two items confirms this idea. Item 8 was 'I feel frustrated if I can't figure out the solution to a problem, so I work even harder to solve it' and item 9 was 'my work relentlessly at problems that I feel must be solved'. These two items denote the perseverance to solve problems. Some studies present curiosity leads the organism toward problem-solving [39, 40]. And also some lab studies showed that determination, willpower, and perseverance activate the curiosity and learning structures in the brain of the organism [41]. Therefore, the relationship between the residual errors of these items can originate from the aforementioned out-of-control factors, and it can affect the structure of curiosity. The revised structural model of ST confirms the theories of Loewenstein [2] and McReynolds, Acker [42]. This model accepts the management power of the organism facing an ambiguous situation as a variable of the exploratory behavior, and it shows the importance of self-regulatory in compatibility with a stressful situation. The revised structural model of SC had the best fit among other subscales. For the revision of this model, a relationship was made between the residual error of item 16 'I like to learn about the habits of others' and 17 'I like finding out why people behave the way they do' and also item 19 'When around other people, I like listening to their conversations' and 20 'When people quarrel, I like to know what's going on'. The path between the residual errors of these items showed that there are some out of control factors affecting the SC of the individuals. In line with these findings, Berlyne [36] believed that curiosity is also stimulated environmentally. Fowler [43] completed this theory by claiming that strength is the stimulator in the production of an effective curious response. The general structure of this subscale is compatible with the description of Hume [37]. They believed that curious individuals have an insatiable tendency to know about the situations and activities occurring around them. Similarly, Taberner and Siggins [44] claimed that curious individuals

look for other individuals' perspectives. Therefore, the general structure of this subscale is compatible with the theoretical history of curiosity concepts. The strength of the stimulators can be an out-of-control variable that relates to the residual error of the items. The structural model of TS also had a good fit after being revised. For the revision of this model, a relationship was made between the residual errors of item 21 'The anxiety of doing something new makes me feel excited and alive' and 22 'Risk-taking is exciting to me'. The new path between the residual errors of these items showed that an out-of-control factor affected the measurement of the items and the TS for the individuals as a variable of curiosity. The general structure of this subscale is compatible with the theory of Fowler [43]. Then, this theory was expanded by Luna and Renninger [45]. They believed that curious individuals are constantly looking for a surprise, and they enjoy the stress of facing the surprise. According to the perspectives mentioned so far, it can be concluded that TS is a variable of curiosity. The final 5DC model was designed by integrating all the dimensions, and it was assessed by the goodness of fit index. This model was revised in two stages by considering the relationship between the residual errors of the items. The goodness of fit improved significantly after the final revision. The goodness of fit tests showed that the 5DC model had an appropriate fit after the revisions and paths between the residual errors of the items. These findings were expected as the 5DC structural model and its variables consisted of the theoretical perspectives mentioned in the previous studies. The results of the confirmatory factor analysis of this study confirm the findings of Kashdan, Stiksma [17]. Even in the most favorable condition, there is some limitation in the conduction process of research; in this study Simple random sampling required lots of time and budget, and it wasn't Affordable. Therefore, multi-stage cluster sampling was used instead, which is less accurate in comparison to the former sampling method. Furthermore, 5DC is designed for the adult population, and it is not limited to a particular social group. However, due to the occupational limitations, the researcher limited the population to the student group. Despite all the limitations, this scale was used in Iran for the first time, and its validity was assessed on Iranian students. The present study showed that the translated 5DC has an appropriate validity and reliability for Iranian students, and it can be used by other researchers.

References

[1] Kashdan, T. B., Gallagher, M. W., Silvia, P. J., Winterstein, B. P., Breen, W. E., Terhar, D., & Steger, M. F. (2009). The curiosity and exploration inventory-II: Development, factor structure, and psychometrics. *Journal of Research in Personality*, *43*(6), 987-998.
[2] Loewenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. *Psychological bulletin*, *116*(1), 75.
[3] Kashdan, T. B., McKnight, P. E., Fincham, F. D., & Rose, P. (2011). When curiosity breeds intimacy: Taking advantage of intimacy opportunities and transforming boring conversations. *Journal of personality*, *79*(6), 1369-1402.
[4] Peterson, J. B., Driver-Linn, E., & DeYoung, C. G. (2002). Self-deception and impaired categorization of anomaly. *Personality and Individual Differences*, *33*(2), 327-340.
[5] Wu, C. h., & Parker, S. K. (2012). The role of attachment styles in shaping proactive behaviour: An intra‐individual analysis. *Journal of Occupational and Organizational Psychology*, *85*(3), 523-530.
[6] Kaczmarek, L. D., Kashdan, T. B., Kleiman, E. M., Baczkowski, B., Enko, J., Siebers, A., . . . Baran, B. (2013). Who self-initiates gratitude interventions in daily life? An examination of intentions, curiosity, depressive symptoms, and life satisfaction. *Personality and Individual Differences*, *55*(7), 805-810.
[7] Ye, S., Ng, T. K., Yim, K. H., & Wang, J. (2015). Validation of the Curiosity and Exploration Inventory–II (CEI–II) among Chinese university students in Hong Kong. *Journal of Personality Assessment*, *97*(4), 403-410.
[8] Park, N., Peterson, C., & Seligman, M. E. (2004). Strengths of character and well-being. *Journal of Social and Clinical Psychology*, *23*(5), 603-619.
[9] Litman, J. A., & Spielberger, C. D. (2003). Measuring epistemic curiosity and its diversive and specific components. *Journal of Personality Assessment*, *80*(1), 75-86.
[10] Renner, B. (2006). Curiosity about people: The development of a social curiosity measure in adults. *Journal of Personality Assessment*, *87*(3), 305-316.
[11] Costa Jr, P. T., & McCrae, R. R. (2008). *The Revised Neo Personality Inventory (neo-pi-r)*: Sage Publications, Inc.
[12] Litman, J. A., Robinson, O. C., & Demetre, J. D. (2017). Intrapersonal curiosity: Inquisitiveness about the inner self. *Self and Identity*, *16*(2), 231-250.
[13] Kashdan, T. B., & Roberts, J. E. (2004). Trait and state curiosity in the genesis of intimacy: Differentiation from related constructs. *Journal of Social and Clinical Psychology*, *23*(6), 792-816.
[14] Čavojová, V., & Sollár, T. (2007). The curiosity and exploration inventory: structure and reliability. *Studia psychologica*, *49*(1), 89-100.
[15] Kaveh Farsani, Z., Zafarizadeh, A., Bahrami, F., Marzban, A., Jelodari, A., & Ghasemi, Z. (2016). Psychometric Properties of Curiosity and Exploration Inventory: Exploratory and Confirmative Factor Analysis. *Educational Innovations*, *15*(2), 151-164.
[16] Balgiu, B. A. (2018). Psychometric Properties of Curiosity and Exploration Inventory-II (CEI-II) in the Case of A Sample of Romanian Students. *Rev de Psihol*, *64*, 102-114.
[17] Kashdan, T. B., Stiksma, M. C., Disabato, D. J., McKnight, P. E., Bekier, J., Kaji, J., & Lazarus, R. (2018). The five-dimensional curiosity scale: Capturing the bandwidth of curiosity and identifying four unique subgroups of curious people. *Journal of Research in Personality*, *73*, 130-149.
[18] Litman, J. A., & Jimerson, T. L. (2004). The measurement of curiosity as a feeling of deprivation. *Journal of Personality Assessment*, *82*(2), 147-157.
[19] Silvia, P. J. (2005). What is interesting? Exploring the appraisal structure of interest. *Emotion*, *5*(1), 89.
[20] Silvia, P. J. (2006). *Exploring the psychology of interest*: oxford university Press.
[21] Jarihi, a., Fardanesh, h., & Geramipour, m. (2015). Educational Plan Effects of Curiosity Booster on the 5th Grade Pupils' Learning. *Educational Psychology*, *11*(35), 181-196.

[22] Grossnickle, E. M. (2016). Disentangling curiosity: Dimensionality, definitions, and distinctions from interest in educational contexts. *Educational Psychology Review, 28*(1), 23-60.
[23] Jackson, C., & Gao Smith, F. (2003). Sample size and power. *Key Topics in Clinical Research. Oxford: BIOS Scientific Publishers Ltd*, 50-54.
[24] Aaronson, N., Acquadro, C., Alonso, J., Apolone, G., Bucquet, D., Bullinger, M., . . . Keller, S. (1992). International quality of life assessment (IQOLA) project. *Quality of life research, 1*(5), 349-351.
[25] Bullinger, M., Alonso, J., Apolone, G., Leplège, A., Sullivan, M., Wood-Dauphinee, S., . . . Bech, P. (1998). Translating health status questionnaires and evaluating their quality: the IQOLA project approach. *Journal of clinical epidemiology, 51*(11), 913-923.
[26] Messick, S. (1995). Standards of validity and the validity of standards in performance asessment. *Educational measurement: Issues and practice, 14*(4), 5-8.
[27] Zamanzadeh, V., Ghahramanian, A., Rassouli, M., Abbaszadeh, A., Alavi-Majd, H., & Nikanfar, A.-R. (2015). Design and implementation content validity study: development of an instrument for measuring patient-centered communication. *Journal of caring sciences, 4*(2), 165.
[28] Polit, D. F., & Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research in nursing & health, 29*(5), 489-497.
[29] Eliason, S. R. (1993). *Maximum likelihood estimation: Logic and practice*: Sage.
[30] Hooman, H. A. (2016). *Structural equation modeling with Lisrel application* (7 ed.): The Center for Studying and Compling University Books in Humanitics (SAMT). Institute for Research and Development in the Humanities.
[31] Schreiber, J., Nora, A., Stage, F., Barlow, L., & King, J. (2006). Confirmatory factor analyses and structural equations modeling: an introduction and review. *Journal of Educational Research, 99*(6).
[32] Schmitt, N. (1996). Uses and abuses of coefficient alpha. *Psychological assessment, 8*(4), 350.
[33] Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in nursing & health, 30*(4), 459-467.
[34] Maureira, M. A. G., & Kniestedt, I. (2018). *Games that Make Curious: An Exploratory Survey into Digital Games that Invoke Curiosity.* Paper presented at the International Conference on Entertainment Computing.
[35] Engel, S. (2015). *The hungry mind*: Harvard University Press.
[36] Berlyne, D. E. (1954). A theory of human curiosity. *British Journal of Psychology. General Section, 45*(3), 180-191.
[37] Hume, D. (2019). *A treatise of human nature*: e-artnow.
[38] Johansson, K., Österberg, S. A., Leksell, J., & Berglund, M. (2016). Patients' experiences of support for learning to live with diabetes to promote health and well-being: A lifeworld phenomenological study. *International journal of qualitative studies on health and well-being, 11*(1), 31330.
[39] Damerius, L. A., Graber, S. M., Willems, E. P., & van Schaik, C. P. (2017). Curiosity boosts orang-utan problem-solving ability. *Animal Behaviour, 134*, 57-70.
[40] Hardy III, J. H., Ness, A. M., & Mecca, J. (2017). Outside the box: Epistemic curiosity as a predictor of creative problem solving and creative performance. *Personality and Individual Differences, 104*, 230-237.
[41] Jepma, M., Verdonschot, R. G., Van Steenbergen, H., Rombouts, S. A., & Nieuwenhuis, S. (2012). Neural mechanisms underlying the induction and relief of perceptual curiosity. *Frontiers in behavioral neuroscience, 6*, 5.
[42] McReynolds, P., Acker, M., & Pietila, C. (1961). Relation of object curiosity to psychological adjustment in children. *Child Development*, 393-400.
[43] Fowler, H. (1965). *Curisosity and exploratory behavior*: The Macmillan Company.
[44] Taberner, K., & Siggins, K. T. (2015). *The power of curiosity: how to have real conversations that create collaboration, innovation and understanding*: Morgan James Publishing.
[45] Luna, T., & Renninger, L. (2015). *Surprise: Embrace the unpredictable and engineer the unexpected*: TarcherPerigee.

Appendix B.

Five-Dimensional Curiosity Scale (5DC)

Below are statements people often use to describe themselves. Please use the scale below to indicate the degree to which these statements accurately describe you. There are no right or wrong answers.

1 – Does not describe me at all
2 – Barely describes me
3 – Somewhat describes me
4 – Neutral
5 – Generally describes me
6 – Mostly describes me
7 – Completely describes me

Joyous Exploration:

1. I view challenging situations as an opportunity to grow and learn.
2. I am always looking for experiences that challenge how I think about myself and the world.
3. I seek out situations where it is likely that I will have to think in depth about something.
4. I enjoy learning about subjects that are unfamiliar to me.
5. I find it fascinating to learn new information.

Deprivation Sensitivity:

6. Thinking about solutions to difficult conceptual problems can keep me awake at night.
7. I can spend hours on a single problem because I just can't rest without knowing the answer.
8. I feel frustrated if I can't figure out the solution to a problem, so I work even harder to solve it.
9. I work relentlessly at problems that I feel must be solved.
10. It frustrates me not having all the information I need.

Stress Tolerance: (entire subscale reverse-scored)

11. The smallest doubt can stop me from seeking out new experiences.
12. I cannot handle the stress that comes from entering uncertain situations.
13. I find it hard to explore new places when I lack confidence in my abilities.
14. I cannot function well if I am unsure whether a new experience is safe.
15. It is difficult to concentrate when there is a possibility that I will be taken by surprise.

Social Curiosity:

16. I like to learn about the habits of others.
17. I like finding out why people behave the way they do.
18. When other people are having a conversation, I like to find out what it's about.
19. When around other people, I like listening to their conversations.
20. When people quarrel, I like to know what's going on.

Thrill Seeking:

21. The anxiety of doing something new makes me feel excited and alive.
22. Risk-taking is exciting to me.
23. When I have free time, I want to do things that are a little scary.
24. Creating an adventure as I go is much more appealing than a planned adventure.
25. I prefer friends who are excitingly unpredictable.

Scoring instructions:
Compute the average for each dimension and analyze each dimension separately (remember to reverse score the items for Stress Tolerance). Randomizing the items will likely lead to similar results.