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Psychometric Properties of the Turkish Version of the Dark Future Scale

ABSTRACT

Objective: This study aims to investigate the psychometric properties of the Turkish version of the Dark Future Scale that measures future anxiety.

Methods: The sample consisted of 478 university students aged 18-25 and used convenience sampling. They completed an online survey about sociodemographics, tobacco use, and life satisfaction, Dark Future Scale and Trait Anxiety Inventory-2 Trait Scale. Confirmatory factor analysis and Cronbach alpha values were used to test scale's structural validity and reliability. For convergent validity, we correlated the Turkish version of the Dark Future Scale with trait anxiety and examined the mean differences in smoking status and its association with life satisfaction.

Results: Majority of the participants were female (73.6%), with a mean age of 21.5 (SD = 1.67). Majority (53.6%) were regular tobacco users. Results of the confirmatory factor analysis revealed a 1-factor solution to be most optimal ($\chi^2 = 17.091$, df = 4, $P = .002$, $\chi^2/df = 4.3$, and root-mean-square error = 0.083, comparative fit index = 0.988, general fit index = 0.986, The Adjusted Goodness of Fit (AGFI) = 0.986, normalized fit index = 0.985). The alpha value for the scale reliability was 0.86. Turkish version of the Dark Future Scale was also significantly and positively correlated with trait anxiety ($r(478) = .67$, $P < .01$). Exploration of the association between smoking status and Turkish version of the Dark Future Scale showed that the mean score was significantly higher among smokers (M = 19.1, SD = 6.65) than nonsmokers (M = 17.7, SD = 7.69). Lastly, higher future anxiety was associated with lower life satisfaction ($r(478) = -0.42$, $P < .01$).

Conclusion: Turkish version of the Dark Future Scale is a reliable and valid scale to measure future anxiety. A brief and easy to apply, reliable, and valid future anxiety measure may be useful for many researchers in psychology and psychiatry.

Keywords: Anxiety, future anxiety, mental health, scale validation, psychometric properties

Three time orientations shape us: the past, the present, and the future, influencing our lived experience, decision-making, and emotional states.[1-3] Psychological studies have primarily focused on the effects of the past impacting our current behavior, emotional states, and decision making. However, past and future events can influence present behavior together. Hence, to understand the present experience, we also need to focus on how the future is perceived.[4,5]

Thinking about the future can be motivating if it involves hope.[8,10] However, the future also is full of uncertainty, which may trigger anxiety, and negative future-oriented thinking can expose future anxiety (FA).[6,7] Although FA is defined as the perceived threat of an event and low self-efficacy belief in coping with this threat,[8] FA does not need a concrete threat. Cognition about the possibility of negativities in one's future is enough to develop FA.[6] In short, FA is defined as the fear of ambiguity; planning and expectations are significant components of FA since one may need to assess possible outcomes and strategize how to deal with potential dangers and adverse states.[8,11] FA is an indicator of the impact of predictions about personal life on one's present emotional state. According to Eysenck,[11] FA does not

İbrahim Yakın[1]
Esin Temeloğlu Şen[2]

[1]*Department of Psychology, Florida International University Faculty of Sciences & Education, Florida, USA*
[2]*Department of Psychology, İstanbul University Faculty of Art, İstanbul, Turkey*

Corresponding author:
İbrahim Yakın
ibrahimyakin.iy@gmail.com

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mean to correspond to emotions like worry, and FA includes a cognitive processing process for the future. Therefore, FA indicates a stable mental pattern rather than an appearance quickly as worrying.[6]

Based on the cognitive and emotional background of the future, FA as a concept needs to be measured accurately. Zaleski[6] developed the first scale to measure FA, the Future Anxiety Scale. It is a 1-factor structure scale with 29 items. When a scale contains many items, it may be difficult to use in studies involving various scales due to taking much time to fill because it can be influenced by getting the participants' attention.[17] Thus, Zaleski et al[9] developed the short forms of the Future Anxiety Scale, Dark Future Scale (DFS). It is a 1-factor structure and has 5 items. Dark Future Scale was found as a valid and reliable scale for measuring FA. Chronbach alpha score of DFS was 0.90, and the test–retest evaluation was $r = 0.62$ ($P < .001$).[9]

None of the studies has examined psychometric properties of DFS for Turkish population. Therefore, in the current study, we aim to investigate the psychometric properties of the DFS-TR. Regarding the convergent validity of DFS-TR, we primarily aim to examine the relationship between trait anxiety and DFS-TR. Zaleski[8] found that FA is significantly correlated with trait anxiety. Besides, numerous studies have been conducted to investigate the association between FA and trait anxiety, which defines assuming situations are more dangerous, feeling evoked, and avoiding threatening stimuli. High-level trait anxiety is associated with anxiety disorder as a vulnerability factor.[12] Therefore, it has been searched that high-level trait anxiety may result in FA and have been found as a significant predictor FA.[8,13] In other words, FA is more common in people with high-level trait anxiety.

To support the convergent validity of DFS-TR, we also aim to examine the relationship between FA and life satisfaction and the mean differences of FA in terms of smoking status. On the one hand, life challenges may be related to mental health symptoms and well-being and may also cause anxiety about the future and general worries.[14] These circumstances can increase threat perception, and people often experience FA. Regarding the potential economic or/and health risks, high FA can cause high stress and low life satisfaction.[14,15] On the other hand, future orientation is related to addictive behaviors such as smoking.[1,16] For instance, FA moderates the relationship between perceived risk and outcome evaluation among smokers. Furthermore, the outcome evaluation and the intention of quitting were moderated by emotional support.[1]

FA is a significant concept related to stable personal qualities such as trait anxiety, health behaviors (e.g., tobacco use), and life satisfaction. Thus, validating a psychometrically robust scale that assessed FA, DFS-TR contributes to Turkish literature on psychiatry and psychology. Although there is a scale measuring attitudes toward the future in Turkish,[18] DFS-TR keeps its position as a valid scale for the Turkish population to evaluate the FA concept. Thus, the primary goal of this study is to validate the Turkish adaptation of the DFS.

MAIN POINTS

- *Confirmatory factor analysis confirmed that Turkish version of the Dark Future Scale is a 1-factor scale that contains 5 items.*
- *The Cronbach alpha value was 0.86.*
- *There was a strong correlation between trait anxiety and future anxiety.*
- *The Turkish version of the Dark Future Scale has been found to be a reliable and valid scale to measure future anxiety.*

Methods

Procedure and Sample

Participants for this study were recruited from 4 private universities in Istanbul and Izmir. The only inclusion criterion for participation was age (18-25 years old). Ethical approval for the participants was obtained from Kadir Has University University Ethics Review Board (82741295-900-E.34577). After obtaining the ethical approval, the announcement of the study was made via posters on the notice boards or orally during the lecture at Kadir Has University. Another announcement was made by the lecturers in 2 private universities in İstanbul and 1 private university in İzmir. A total of 478 individuals from these 4 universities responded to the announcements.

Participants who attended the same school as the first author were invited to a psychology laboratory. When they arrived at the laboratory, the aim of the study was explained to them, and consent forms were obtained. Participants filled out the sociodemographic form and self-report scales. Those participants in other universities participated via an online survey. Qualtrics—an online data collection software—was used to facilitate online data collection. Online surveys took approximately 10 minutes to complete.

Measures

***Sociodemographic Form*:** This form included demographic questions about the participants' age and gender.

***Dark Future Scale*:** Dark Future Scale[9] was a short form of the FA Scale developed by Zaleski.[6] It is a single-factor, self-report scale to measure FA with 5 items (e.g., "I am afraid that the problems which trouble me now will continue for a long time"). Items were rated on a 7-point Likert-type scale, ranging from "0 = Decidedly false" to "6 = Decidedly true." A total "FA score" is calculated by adding the item scores. The scale score ranges between 0 and 30. A higher score represents higher FA.

Dark Future Scale was translated and back-translated by the first author and a bilingual expert. The back-translated items were later compared with the original ones to create the final Turkish version of the scale and named DFS-TR.

***Trait Anxiety*:** Trait Anxiety was assessed by the State and Trait Anxiety Inventory-2 Trait Scale (STAI-2). State and Trait Anxiety Inventory-2 Trait Scale was developed by Spielberger.[19] Turkish adaptation was made by Öner and LeCompte.[20] This scale consists of 20 items (e.g., "I generally feel that difficulties are piling up so that I cannot overcome them") rated on a 4-point Likert-type scale ranging from "1 = Almost never" to "4 = Almost always". A total anxiety score is calculated by adding up the item scores (with 7 reverse codings). The scale score varied between 20 and 80. A higher score represents a higher level of trait anxiety. In this study, the Cronback alpha value was 0.89.

***Tobacco use*:** Tobacco use was measured with 1 question (How would you describe your current cigarette use?). Participants answered the question based on their frequency of smoking ("4 times a week or

more," "2-3 times a week," "2-4 times a month," "once a month or less," "did not use," "quit smoking"). Later, the participants who smoked 4 times a week and more were named smokers (n = 222). Other participants were named nonsmokers (n = 256).

Life Satisfaction: Life satisfaction was measured by a 10-point life satisfaction rating item ranging from "not at all satisfied"[1] to "very satisfied".[10]

Statistical Analyses

All analyses were performed using Statistical Package for Social Sciences software version 25.0 and AMOS version 23 (IBM SPSS Corp.; Armonk, NY, USA). *P*-value < .01 and <.05 were chosen to indicate a statistically significant difference. Descriptive statistics such as percentages and frequencies were utilized for categorical variables (sociodemographic variables and smoking status). Confirmatory factor analysis (CFA) was performed for the structure validity analysis. For the goodness of fit tests, we calculated the chi square index (chi square fit index/degrees of freedom (χ^2/df)), comparative fit index (CFI), general fit index (GFI), normalized fit index (NFI), and root-mean-square error (RMSEA).[22,23] The values CFI, GFI, NFI > 0.90, χ^2/df < 5, RMSEA < 0.0854 represented acceptable goodness of fit.[21,22] For the reliability analysis, the Cronbach Alpha value was calculated. Cronbach Alpha value < 0.80 represented high reliability of a scale.[23] We correlated DFS-TR and STAI-2 using Pearson Correlation Analysis for convergent validity. Correlation values between <0.50 and <0.69 represented moderate, <0.70 and <0.89 high correlation.[24] Furthermore, the independent samples *t*-test was used to investigate mean differences of DFS-TR by smoking status, and Pearson correlation analysis was used to investigate the relationship between life satisfaction and DFS-TR.

Results

Descriptive Statistics

The sample consists of 478 participants. The majority of the participants were female (73.6%). The mean age was 21.5 (standard deviation (SD) = 1.67). Half of the participants (53.6%) were regular tobacco users. The mean life satisfaction was 6.8 (SD = 1.47) out of 10. Descriptive statistics are shown in Table 1.

Table 1. Descriptive Statistics

Variables	Frequencies (%)/Mean (SD)
Sex	
Female	352 (73.6%)
Male	126 (26.4%)
Age	21.5 (1.67)
Tobacco use	
Regular users	222 (46.4%)
Non-regular users	256 (53.6%)
Life satisfaction	6.8 (1.47)

SD, standard deviation.

Structure Validity

Regarding structure validity, we used CFA to test the 1-factor model of the DFS, as investigated in the original article.[9] The model fit was excellent, with a minor modification: we correlated the errors of items 4 and 5. The model fit indices are represented in Table 2. The factor loadings were also acceptable and ranged from 0.57 to 0.86 (see Figure 1).

Reliability

We used Cronbach Alpha Values to investigate the reliability of the scale and found it to be 0.86. We also checked the alpha values to see if any items were to be deleted, and we confirmed that it was not necessary to delete any items. Moreover, the correlation values of each item with the entire scale were observed above the required value of 0.50.[24] The alpha value was 0.864. We confirmed that the Turkish version of the DFS was reliable for our sample. The minimum score of DFS-TR was 0, and the maximum score was 30. The mean DFS-TR score was 18.3 (SD = 7.25), and the variance was 52.54%. The values regarding reliability analyses and inter-item correlations are represented in Table 3.

Convergent Validity

We correlated DFS-TR with Trait Anxiety Scale (STAI-2) regarding the convergent validity. According to Pearson correlation analysis, DFS-TR was significantly positively correlated with STAI-2, $r(478) = 0.67$, $P < 0.01$. When the DFS-TR score increased, the STAI-2 score also increased. Accordingly, the strong correlation between STAI-2 and DFS-TR showed that the validity of DFS-TR was also high.

To investigate the mean differences of DFS-TR in terms of smoking status, we used independent samples *t*-test. Results showed that mean DFS-TR was significantly differentiated in terms of smoking status, $t(476) = -2.041$, $P < .05$. The mean score of the regular tobacco users (M = 17.7, SD = 7.69) were significantly higher than nontobacco users (M = 19.1, SD = 6.65).

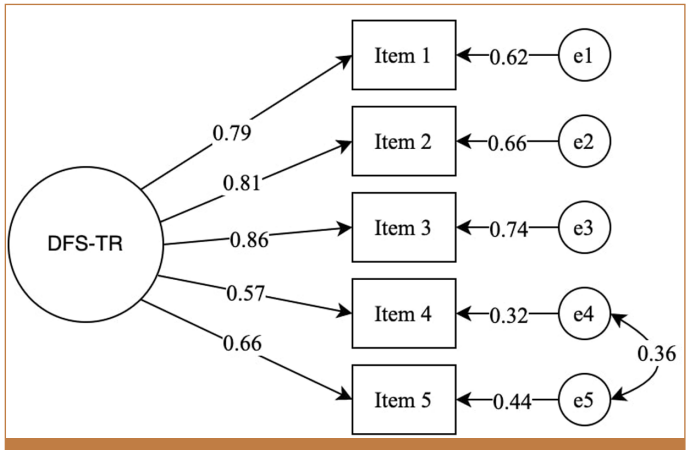


Figure 1. Factor Loadings of DFS-TR.
DFS-TR, Dark Future Scale-Turkish version

Table 2. Model Fit Indices on DFS-TR

	χ^2	df	*P*	χ^2/df	RMSEA	NFI	GFI	AGFI	CFI	S(RMR)
Initial (before modification)	73.568	5	.000	14.7	0.170	0.936	0.939	0.817	0.940	.06
Model modification I	17.091	4	.002	4.3	0.083	0.985	0.986	0.947	0.988	.02

CFI, comparative fit index; df, degrees of freedom; DFS-TR, Dark Future Scale-Turkish version; GFI, general fit index; NFI, normalized fit index; RMSEA, root-mean-square-error.

Table 3. Inter-Item Correlations and Statistics Regarding Reliability Analyses

Scale Items	Item 1	Item 2	Item 3	Item 4	Item 5	Mean (Standard Deviation)	Scale Variance If Item Deleted	Corrected Item-Total Correlation	Cronbach Alpha If Item Deleted
Item 1	1.00	.67	.66	.44	.51	3.3 (1.89)	33.635	.702	.833
Item 2		1.00	.70	.41	.50	3.3 (1.84)	34.107	.702	.833
Item 3			1.00	.53	.60	3.2 (1.84)	32.789	.775	.813
Item 4				1.00	.60	4.3 (1.71)	37.398	.585	.860
Item 5					1.00	4.2 (1.71)	35.872	.669	.841
Cronbach alpha coefficient									.864

To investigate the relationship between DFS-TR and Life Satisfaction, we used Pearson correlation analysis. According to the results, DFS-TR was significantly correlated with Life Satisfaction, $r(478) = -0.42$, $P < 0.01$. As life satisfaction increased, the DFS-TR score decreased.

Discussion

The current study examined the psychometric properties of the Turkish version of the DFS (DFS-TR), which aims to measure FA. Results showed that DFS-TR is reliable, and self-reports are valid scales to measure FA among young population (18-25 years old) in Turkey. First, we used CFA to test the structural validity.[21] CFI, GFI, NFI, χ^2/df, and RMSEA represent model fit indices. If CFI, GFI, and NFI are higher than 0.90, the χ^2/df is below 5, the RMSEA is below 0.85, and S(RMR) is below .08, the model shows an excellent fit with the data.[21,22] Our model confirmed that the 1-factor model indicated an excellent fit with our data with a minor modification. Results showed that CFI, GFI, and NFI were higher than 0.90, the χ^2/df ratio was below 5, and the RMSEA was also below 0.85. Another significant indicator for CFA is factor loadings that represent the consistency of each item with the entire scale. It is recommended that the coefficients must be higher than 0.30.[26] The factor loadings for DFS-TR in this study were between 0.57 and 0.86.

We conducted a reliability analysis after structure validity. Reliability analysis indicates how much a scale consistently represents the construct that aims to measure.[23] A commonly used method to test the internal consistency of a scale is to calculate its Cronbach's alpha value.[23] The recommended alpha value for a scale with high internal consistency needs to be higher than 0.80.[24] We calculated it as 0.86, similar to the original article ($\alpha = 0.88$). DFS-TR has high reliability.

After the reliability analysis, we tested the validity of the scale. Validity represents the accuracy of a scale.[27] We used convergent validity to compare a scale with another reliable and valid scale that measures a similar construct.[27] Previous studies indicated that trait anxiety was significantly associated with anxiety and general anxiety symptoms predicted FA.[10,13] Thus, to test the convergent DFS-TR, we correlated the FA with trait anxiety. Results showed that they were positively correlated at a 0.67 level. That is, increased FA is associated with increased trait anxiety. It is accepted that above 0.70 indicated a high correlation.[24] Although our coefficients were slightly below 0.70, we may still say that trait anxiety and DFS-TR score showed a high correlation and met the validity requirement.

We also investigated FA mean differences among regular and non-regular tobacco users and the relationship between life satisfaction and FA to support the validity of DFS-TR. We found that regular tobacco users reported higher FA than non-regular users, and low life satisfaction was related to high FA. A systematic review of mental health and substance use found that anxiety is significantly associated with tobacco use among adolescents and young adults.[28] They may use smoking as a coping tool to reduce their stress level.[16] Besides, Paredes et al[24] found that FA is a mediator in the relationship between life satisfaction and stressful experience.[14] The effect of FA on life satisfaction may become more prominent in situations involving uncertainty, such as disasters, pandemics, or developmental crises. For instance, a study about the impact of COVID-19 on well-being showed that FA is a mediator in the association between perceived COVID-19 threat and subjective well-being.[14] Life satisfaction was one of the significant variable explaining anxiety; a low level of life satisfaction is related to increased anxiety among the young population.[29] We hope that our results will draw attention to FA and its relation to tobacco use and life satisfaction in Turkey's post-COVID context.

The current study has several limitations. First, the convergent validity was applied with the trait anxiety scale (STAI-2) as applied in a longer form of the FA scale, but we did not include Zimbardo Time Perspective Inventory and Future Time Perspective scales as in the shorter form of the FA scale (Dark Future Scale). Second, we were not able to run other reliability analyses, such as test-retest reliability. These are significant limitations of our study. Next, Life satisfaction was measured with a single 10-point item. Future studies may prefer to use a more detailed life satisfaction and well-being measures. Furthermore, the sample for the study is gender-skewed, in favor of young women. Future studies may prefer to recruit a more gender-equal sample to study possible gender differences in FA better. Lastly, the sample is also limited to 18-25-year-old young adults. Although the study of FA among emerging adult populations may have advantages since anxieties about the future are common and prominent in this age group [25], validating the scale with older and younger age groups may strengthen both the scale validity and conceptual clarity.

This study showed that the DFS-TR is a valid and reliable measurement tool for university students (18-25 years old) in Turkey. This scale will provide a basis for measuring FA in young adults, but we recommend to test in different groups to increase generalizabilty of the scale. In this way, it will shed light on new studies and intervention programs that target young people such as university students. Furthermore, considering that the coronavirus epidemic is still not over and that the epidemic may have a long-term and devastating effect on the psychological health of individuals. It will be a useful measurement tool for many researchers in the future since it does not contain many items and is easy to apply and score.

Ethics Committee Approval: *Ethical committee approval was received from the Ethics Committee of Kadir Has University, (Approval No: 82741295-900-E.34577).*

Informed Consent: *Written informed consent was obtained from all participants who participated in this study.*

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Author Contributions: *Concept – I.Y.; Design – I.Y.; Supervision – I.Y., E.T.Ş.; Materials – I.Y.; Data Collection and/or Processing – I.Y.; Analysis and/or Interpretation – I.Y.; Literature Review – I.Y., E.T.Ş.; Writing Manuscript – I.Y., E.T.Ş.; Critical Review – I.Y., E.T.Ş.*

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