**Full title:**

**The Desire Thinking Questionnaire-Persian version (DTQ-P) and its association with addictive behaviors in individuals with Alcohol Use Disorder, nicotine dependence, and problematic social media use**

**Running Head:**

DTQ and problematic addictive behaviors

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**Highlights**

* The Persian version of the DTQ was examined in three groups with addictive behaviors.
* The Persian version of the DTQ replicated the original two-factor structure of the DTQ.
* The reliability and predictive and concurrent validity of the DTQ were confirmed.
* Desire thinking emerged as an important factor contributing to addictive behaviors beyond interfering factors.

**Abstract**

Desire thinking is an emerging construct which has been shown to play a role in addictive behaviors. The present study sought to validate a translated Persian version of the Desire Thinking Questionnaire (DTQ) in three groups of individuals with Alcohol Use Disorder (AUD; n=300), nicotine dependence (n=300), and problematic social media use (n=300). All three groups completed the translated Persian version of the DTQ, the Barratt Impulsiveness Scale-15 (BIS-15), the [White Bear Suppression Inventory (WBSI)](https://onlinelibrary.wiley.com/doi/abs/10.1002/per.478), and the Depression Anxiety and Stress Scale-21 (DASS-21). Measures of alcohol use, nicotine dependence and problematic social media use were also collected. The results confirmed a two-factor structure of the Persian version of the DTQ with good reliability and validity in all three groups. Furthermore, both the verbal perseveration and imaginal prefiguration components of the Persian version of the DTQ were found to predict addictive behaviors beyond demographic and clinical characteristics, negative affect, impulsiveness, and thought suppression.The study confirms the psychometric properties of the Persian version of the DTQ and the role of desire thinking as an independent predictor of AUD, nicotine dependence, and the problematic use of social media.

**Keywords:** Alcohol Use Disorder; desire thinking; nicotine dependence; problematic social media use; validation study.

**The Desire Thinking Questionnaire-Persian version (DTQ-P) and its association with addictive behaviors in individuals with Alcohol Use Disorder, nicotine dependence, and problematic social media use**

**1. Introduction**

The elaborated intrusion (EI) theory, as a framework for describing craving and desire, postulates that the urge to engage in substance use is a cognitive-affective experience brought about by a mixture of automatic and voluntary cognitive processes in which various external and internal stimuli activate associations linked to desired behaviors or targets. These associations, in turn, increase intrusive experiences (e.g., craving) (Kavanagh, Andrade, & May, 2005; Kavanagh et al., 2009; May, Kavanagh, & Andrade, 2015). One of the proposed conceptualizations related to this cognitive process is termed “desire thinking” (Caselli & Spada, 2010; 2011). Desire thinking is constituted by the voluntary elaboration of a desired behavior or target on two levels: imaginal prefiguration and verbal perseveration (Caselli & Spada, 2010; Kavanagh, Andrade, & May, 2004). Imaginal prefiguration refers to the allocation of attention to desired behaviors and targets which is characterized by the tendency to anticipate positive imagery and target-related memories. Verbal perseveration refers to repetitive and continuous ‘self-talk’ about ‘valid’ reasons for engaging in desired behaviors and targets (Caselli & Spada, 2014).

According to Caselli and Spada (2011), desire thinking is primarily aimed at controlling intrusive experiences linked to desired behaviors or targets. The authors argue that in the short run, desire thinking attenuates these intrusive experiences because it allows for the shifting of attention onto the elaboration of desired behaviors and targets – in other words, desire thinking provides a short-term distraction from intrusive experiences. However, in the medium to long run, engagement in desire thinking escalates emotional distress through increasing the salience of intrusive experiences (i.e., ‘imaging’ but not being able to obtain) and associated sense of deprivation, as the desired target is repeatedly imagined but not achieved. This, in turn, increases the probability of engaging in addictive behavior as the last resort to attain relief from escalating distress.

Desire thinking has been found to increase permissive beliefs about alcohol consumption despite the negative consequences associated with consumption in individuals with Alcohol Use Disorder (AUD) (Caselli et al., 2021). Individuals reporting high levels of desire thinking have been found to be more likely to engage in desire thinking across the spectrums of drinking behavior (Albery & Spada, 2021; Caselli, Canfora, et al., 2015; Caselli, Ferla, Mezzaluna, Rovetto, & Spada, 2012) and nicotine use (Caselli, Nikcevic, Fiore, Mezzaluna, & Spada, 2012), as well as being at higher risk for relapse during treatment (Martino et al., 2019).

In an attempt to measure desire thinking, Caselli and Spada (2011) designed a self-report measure, the Desire Thinking Questionnaire (DTQ), which assesses both imaginal prefiguration and verbal perseveration. Several studies have validated the DTQ in various languages including French (Chakroun-Baggioni, Corman, Spada, Caselli, & Gierski, 2017), Norwegian (Solem et al., 2020), Polish (Dragan & Grajewski, 2021), [Hebrew](https://akjournals.com/view/journals/2006/9/3/article-p797.xml) (Efrati, Kolubinski, Caselli, & Spada, 2020), Turkish ([Aydın](https://www.sciencedirect.com/science/article/abs/pii/S0306460321003142?via%3Dihub" \l "!) et al., In Press), German (Brandtner & Brand, 2021), and Dutch (Markus et al., 2018) with findings supporting a two-factor solution aligned to the original DTQ along with acceptable reliability and validity in various samples.

Empirical evidence has suggested that the construct of desire thinking plays an important role in addictive behaviors (Mansueto et al., 2019; Nikčević, Marino, Caselli, & Spada, 2017; Solem et al., 2020; Spada et al., 2015). This construct is thought to intensify craving in clinical and non-clinical samples (Caselli, Soliani, & Spada, 2013; Caselli, Gemelli, & Spada, 2017; Chakroun-Baggioni et al., 2017; Caselli, Manfredi, Ferraris, Vinciullo, & Spada, 2015; Fernie et al., 2014; Markus et al., 2018; Marino et al., 2019; Martino et al., 2017), especially alcohol craving (Caselli et al., 2017; Markus et al., 2018; Martino et al., 2017, 2019), Facebook use (Marino et al., 2019), nicotine use (Caselli, Nikcevic, et al., 2012), internet pornography (Allen, Kannis-Dymand, & Katsikitis, 2017) food consumption (Frings et al., 2019), gambling (Fernie et al., 2014), gaming (Brandtner, Wegmann, & Brand, 2020), and sexual behaviors (Efrati et al., 2020). Desire thinking has also been associated with problematic use of alcohol, cigarette, the Internet, and social media, even after controlling age, gender, negative affect, and craving (Faghani, Akbari, Hasani, & Marino, 2020; Solem et al., 2020; Spada, Caselli, Slaifer, Nikčević, & Sassaroli, 2014; Caselli, Nikcevic, et al., 2012).

Among factors affecting addictive behaviors, thought suppression, impulsivity, and negative affect have strong associations with alcohol use, nicotine use, and problematic social media use (Bravo et al., 2018; Bowen, Witkiewitz, Dillworth, & Marlatt, 2007; Efrati, Kolubinski, Marino, & Spada, 2021; Erskine, Ussher,  Cropley,  Elgindi,  Zaman,  & Corlett, 2012; Erskine et al., 2010; Kale, Stautz, & Cooper, 2018; Solem et al., 2020). Thought suppression refers to try to stop thinking about thought content as a self-regulatory strategy, increasing the frequency of such thought content (Abramowitz, Tolin, & Street, 2001). Impulsivity is defined as an action without any plans and thoughts without paying attention to outcomes of the given action. It is believed that thought suppression may intensify desire thinking, particularly imagery about the desired target (Kavanagh et al., 2009). In addition, desire thinking has been found to be associated with impulsive behaviors (Efrati et al., 2021) and negative affect (Solem et al., 2020).

The current study focused on validating the Persian version of the DTQ (DTQ-P) in terms of factor structure, reliability, and validity in three groups of individuals with AUD, nicotine dependence, and the problematic use of social media in the Iranian community. We expected the DTQ-P to replicate the two-factor structure similar to the original self-report measure. Furthermore, desire thinking was hypothesized to predict the severity of addictive behaviors, after controlling for the effects of demographic characteristics, negative affect, impulsivity, and thought suppression. These variables were chosen for the purposes of the current study as ‘controls’ because of their strong associations with desire thinking and also addictive behaviors, especially in the presence of intrusive thoughts and craving experiences (Efrati et al., 2021; Solem et al., 2020).

**2. Method**

*2.1. Participants*

The present study was ethically approved by Shahid Beheshti University of Medical Sciences (IR.SBMU.RETECH.REC.1400.263). Individuals with an AUD (n=300; aged 18-67 years), nicotine dependence (n=300; aged 14-75 years), and problematic social media use (n=300; age range=16-59 years) were selected for this study between October 2020 and February 2021. Individuals with nicotine dependence and AUD were seeking treatment and referred to addiction treatment clinics or hospitals, so they were assessed and completed the self-report measures in the clinics or hospitals in person. All diagnostic assessments for these two groups were performed by a clinical psychologist and/or a psychiatrist working in these clinics or hospitals. Individuals with problematic social media use were recruited online or in person, through sharing a post on Instagram personal pages of a clinical psychologist (an author of this study). Social media users following the Instagram page were invited to participate in the study among which 100 individuals were finally selected and evaluated and completed self-report measures online. Also, other social media users (n=200), who completed self-report measures in-person, were companions or relatives of individuals seeking treatment in clinics or hospitals. Social media users participating in the study, either online or in-person, were also interviewed by a clinical psychologist.

The nicotine-dependent group included individuals who met the inclusion criteria: 1) a score equal to 3 or greater on a measure evaluating nicotine dependence (i.e., FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991); and 2) smoking 10 or more cigarettes daily. A total of 470 smokers were interviewed of whom 300 individuals were finally selected based on inclusion criteria. In this group, nicotine dependence was the principal diagnosis. Individuals with AUD were selected using a structured clinical interview based on the DSM-5 (SCID-5; American Psychiatric Association, 2013; First, Williams, Karg, & Spitzer, 2014) and also obtaining a score equal to or higher than 15 as a cut-off point on a measure determining AUD (i.e., AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) demonstrating hazardous alcohol use (Johnson, Lee, Vinson, & Seale, 2013). According to the SCID-5, the presence of at least two symptoms was considered sufficient to diagnose AUD, but the present study was not limited to the specific severity of the disorder and the patients in this study were classified across three spectrums of mild severity (the presence of 2 to 3 symptoms), moderate (the presence of 4 to 5 symptoms) and severe (the presence of 6 symptoms or more). In this group, 390 participants with AUD were interviewed among whom 300 were finally recruited based on inclusion criteria. In the group, based on the SCID-5, individuals had a primary diagnosis of AUD.

In the literature, there is no general agreement on a specific scale having a cut-off point detecting individuals with problematic social media use. Furthermore, the Problematic Social Media Use Scale (PSMUS) used in the current study does not have any cut-off point. However, there is a theoretical model described by Griffiths (2005) which delineates six criteria for diagnosing a behavioral addiction. Based on this model, there are six criteria that can be checked relating to a behavioral addiction. These criteria include: 1- Salience (e.g., "Do you have a strong desire for social networks emotionally, cognitively and behaviorally?"), 2- Mood modification (e.g., "When you use social media use, will your mood or emotional states be improved?"), 3- Tolerance (e.g., "Do you spend more time to follow social media?") (In the current study, according to participants own report, they spent a large portion of their daily time using social media, approximately 7-8 hours every day), 4- Withdrawal (e.g., "When you do not use social media or social networks are restricted or stopped, do you experience unpleasant physical and emotional symptoms?"), 5- Relapse (e.g., "When you cannot use social media due to any reasons for a period of time, after that do you quickly return to your excessive use of social networks?"), and 6- Conflict (e.g., "When you use social media, do you experience interpersonal problems?"). Based on Griffiths, Kuss, and Demetrovics' (2014) postulations, “any behavior (e.g., social networking) that fulfills the aforementioned six criteria can be operationally defined as an addiction” (Pg. 121). In the present study, all questions in brackets were asked from all participants in the problematic social media use group and all participants selected met all six criteria are listed. A total of 980 participants were interviewed and 300 individuals were chosen based on these six criteria.

The existence of any intellectual disability, physical and neurological diseases, and personality and psychotic disorders were exclusion criteria in all three groups. In individuals with AUD and nicotine dependence, these criteria were checked based on their available recorded files or their self-report statements. Also, in individuals with problematic social media use, these criteria were checked based on their self-reported statements. Participants who were willing to take part in the study signed an informed consent form and participated in the study in accordance with the Helsinki Declaration.

*2.2. Measures*

*2.2.1. Completed measures in all three groups*

*2.2.1.1. The DTQ.* This self-report measure has been designed by Caselli and Spada (2011)and comprises 10 items assessing desire thinking on two factors including verbal perseveration (5 items) and imaginal prefiguration (5 items). All items on the measure are rated on a four-point Likert scale scoring from 1 (never) to 4 (always). A higher score on the measure indicates a higher tendency towards desire thinking. In this study, DTQ-P was administered based on the back-translation process, so that all items of the measure were translated into Persian, and then these items were again back-translated into English to be compared with the original measure. This comparison showed that the DTQ-P is appropriate. Finally, the DTQ-P was administered to a sample of individuals with AUD (n=20), nicotine dependence (n=20), and problematic social media use (n=20) to examine the understandability of the DTQ-P's items and, as a result, the measure’s items were found to be understandable.

*2.2.1.2. The Barratt Impulsiveness Scale 15 (BIS-15).* As a self-report measure, the BIS-15 was developed by Spinella (2007) to examine impulsivity using 15 items scored on a four-point Likert scale as follows: 1=never, 2=sometimes, 3=often, and 4=completely. A higher score on the measure indicates a stronger tendency towards impulsivity. This measure has been validated in Iran with good psychometric properties (Javid, Mohammadi, & Rahimi, 2012). Cronbach's alphas equal to 0.80, 0.79, and 0.70 were obtained for groups with AUD, nicotine dependence, and problematic social media use, respectively.

*2.2.1.3. The White Bear Suppression Inventory (WBSI*[*)*](https://onlinelibrary.wiley.com/doi/abs/10.1002/per.478)*.* As a self-report measure, the WBSI was designed by Wegner and Zanakos (1994) and includes 15 items that assess the tendency towards suppression of thoughts. The items in this measure are scored on a 5-point Likert scale (strongly disagree=1, disagree=2, no idea= 3, agree=4, and strongly agree=5). A total score is obtained by summing all questions' scores and is in the range between 15 and 75 with higher scores indicating more elevated tendencies towards thought suppression. The Persian version of this measure has been validated in Iran by Farrokhi and Mostafapour (2018) and its Cronbach's alpha and retest reliability coefficients were 0.87 and 0.86, respectively. In this study, the Persian version of the WBSI had good internal consistency reliability in groups with alcohol dependence (α=0.82), nicotine dependence (α=0.86), and problematic social media use (α=0.90).

*2.2.1.4. The Depression Anxiety and Stress Scale-21 (DASS-21*). The DASS-21 is a self-report measure designed by Lovibond and Lovibond (1995)and it contains 21 items to assess depression (7 items), anxiety (7 items), and stress (7 items) as self-report. The items of this measure are scored on a 4-point Likert scale from zero (never) to three (absolutely correct). A higher score on this measure denotes higher levels of negative affect. In Iran, Asghari, Saed, and Dibajnia (2008) confirmed the psychometric features of the measure and reported good reliability for the total measure (α=0.94), depression (α=0.85), anxiety (α=0.85), and stress (α=0.87). The DASS-21 showed good Cronbach's alphas for groups with alcohol dependence (α=0.91), nicotine dependence (α=0.93), and problematic social media use were (α=0.90).

2.2.2. *Completed measures in the group with AUD*

*2.2.2.1. The Alcohol Use Disorders Identification Test (AUDIT*; *Babor et al., 2001).* The AUDIT is a self-report measure containing 10 items to evaluate hazardous alcohol use or AUD. Scores on this measure range from 0 to 40, in which participants' higher scores reveal more elevated levels of hazardous alcohol use. A score ranging from >7 to 24, indicates hazardous alcohol consumption or AUD (Nadkarni et al., 2019). In Iran, this measure has been validated by Rafiemanesh et al. (2020), with good psychometric properties (Khosravani, Bastan, Ghorbani, & Kamali, 2017; Rafiemanesh et al., 2020). The Cronbach's alpha coefficient of this measure was 0.90 in individuals with AUD in this study.

2.2.3. *Completed measures in the group with* *nicotine dependence*

*2.2.3.1. The Fagerstrom Test of Nicotine Dependence (FTND)*. The FTND was designed by Heatherton et al. (1991) and has six self-report items examining dependency or problematic use of cigarettes. Scores on this measure range from 0 to 10, with a score of 3 or more indicating the likely presence of nicotine dependence (Heatherton et al., 1991). In Iran, this measure has been validated by Robabeh, Jalali, Mahnaz, and Amir (2017), with acceptable internal consistency reliability (α=0.71). Reliability for the measure was good (α=0.74) in individuals with nicotine dependence in this study.

2.2.3. *Completed measures in the group with* *problematic* *social media use*

*2.2.3.1. The Problematic Facebook Use Scale (PFUS; Marino, Vieno, Altoè, & Spada, 2016 – adapted to PSMUS*. The PFUS is a self-report measure which has 15 items to assess problematic Facebook use. In the current study, this measure was adopted to assess the problematic use of social media. Items on the original PFUS are scored on an eight-degree continuum scoring from 1=completely disagree to 8= completely agree. Participants who score high on this measure are more likely to present with higher levels of problematic social media use. The PSMUS showcased good internal consistency reliability (α=0.95) in individuals with problematic social media use in this study.

*2.3. Statistical analyses*

Each group with AUD and nicotine dependence was randomly divided into the first (n=150) and second subgroups (n=150), and then the first two subgroups were merged to be considered as the first mixed group (n=300). Also, the second two subgroups were merged to be considered as the second mixed group (n=300). To explore the factor structure of the DTQ-P, exploratory factor analysis (EFA) with principal component analysis using Oblimin rotation with Kaiser normalization was performed on the first mixed group. Also, to approve the factor structure of the DTQ-P, confirmatory factor analyses (CFAs) were conducted on the second mixed group and problematic social media use group. The study of the factor structure of the measure on two mixed samples, each including participants with AUD and nicotine dependence, was undertaken due to the fact that hazardous alcohol use and nicotine dependence mostly co-occur (Castillo-Carniglia, Keyes, Hasin, & Cerdá, 2019; Hayley, Stough, & Downey, 2017) and nicotine use is associated with alcohol dependence (Mallet et al., 2019). The comorbidity of AUD and nicotine dependence was high in the sample of the present study (see Table 1).

Also, CFAs were conducted in Mplus with maximum likelihood (ML) through robust standard errors. Mplus was used using a statistical software program (i.e., Jeffrey's Amazing Statistics Program designed at the University of Amsterdam; Love et al., 2019). In the CFAs, the goodness-of-fit should be checked and confirmed through fit indexes including the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMSR), the [Tucker-Lewis Index (TLI)](http://scholar.google.com/scholar?q=tucker-lewis+index+(tli)&hl=en&as_sdt=0&as_vis=1&oi=scholart), the comparative fit index (CFI), and the goodness-of-fit index (GFI). An acceptable model fit is defined as RMSEA and SRMSR <0.08 and TLI, CFA, and GFA equal to higher than 0.92 (MacCallum, Browne, & Sugawara, 1996; Hu & Bentler, 1999; Kline, 2015; Schermelleh-Engel, Moosbrugger, & Müller, 2003).

To examine the reliability of the DTQ-P, Cronbach's alphas were calculated in each of the three groups of individuals with AUD, nicotine dependence, and the problematic use of social media. To examine the concurrent validity of the DTQ-P, Pearson's correlation was performed to estimate the associations between the DTQ-P and other measures as well as inter-correlation between two subscales of the DTQ-P in each of the three groups. Linear hierarchical regression analyses were implemented to specify the predictive validity of the DTQ-P in each of the three groups by controlling for demographic and clinical characteristics, thought suppression (on the WBSI), negative affect (on the DASS-21), and impulsivity (on the BIS-15). In these model regressions to predict AUD, nicotine dependence and the problematic use of social media, demographic, and clinical characteristics (in the first step) thought suppression, negative affect, impulsivity (in the second step), and the two factors of the DTQ-P (in the third step) were entered.

To test the normality of data distribution, skewness and kurtosis indices were examined that an acceptable range is between -1/+1 and +1/-1 (Byrne, 2010; Kline, 2015). To perform regression models, the assumption of the lack of multicollinearity was checked through variance inflation factor (VIF) and tolerance index, so that VIF lower than 10 and tolerance index higher than 0.20 show the absence of multicollinearity. EFA, reliability, and Pearson's Product-Moment correlations were performed using SPSS-22 (IBM Corp., 2013).

**3. Results**

*3.1. Demographic and clinical characteristics*

Descriptive and clinical statistics of the groups with AUD, nicotine dependence, and problematic social media use are reported in Table 1. Skewness and kurtosis indices for all variables were between acceptable range (between -1/+1 and +1/-1; Byrne, 2010; Kline, 2015), showing the normality of data. The mean score of the AUDIT was 18.43 (range from 10 to 40 that was an acceptable range to detect hazardous alcohol use or AUD; Nadkarni et al., 2019). Also, the mean score of the FTND was 5.99 (range from 3 to 10), confirming individuals with nicotine dependence (scores ≥3; Heatherton et al., 1991).

Table 1: Descriptive statistics of three groups.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Characteristics | Group 1,Mean ±S.D or *n* (*%*) | Group 2,Mean ±S.D or *n* (*%*) | Group 3,Mean ±S.D or *n* (*%*) |  |  |
| Age, years | 34.81±11.22 | 33.66±11.75 | 31.66±10.17 |  |  |
| Gender |  |  |  |  |  |
| Male | 190 (63.3%) | 200 (66.7%) | 159 (53%) |  |  |
| Female | 110 (36.7%) | 100 (33.3%) | 141 (47%) |  |  |
| Education | 12.29±3.09 | 12.80±3.18 | 14.48±2.86 |  |  |
| Marital status |  |  |  |  |  |
| Single | 160 (53.3%) | 163 (54.3%) | 168 (56%) |  |  |
| Married | 102 (34%) | 113 (37.7%) | 121 (40.3%) |  |  |
| Divorced | 38 (12.7%) | 24 (8%) | 11 (3.7%) |  |  |
| Age of onset usage | 22.84±6.50 | 20.65±6.37 | 19.32±7.33 |  |  |
| Duration of use | 11.94±8.72 | 12.99±10.31 | 12.27±5.82 |  |  |
| With comorbidity  | 98 (33%) | 158 (52.7%) | Not assessed |  |  |
| MDD | 37 (12.3%) | 11 (3.7%) | Not assessed |  |  |
| BD | 14 (4.7%) | 3 (1%) | Not assessed |  |  |
| GAD | 9 (3%) | 9 (3%) | Not assessed |  |  |
| SUDs | 29 (9.7%, smoking) | 111 (37%, alcohol use) | Not assessed |  |  |
| OCD | 1 (0.3%) | 5 (1.7%) | Not assessed |  |  |
| MDD and SUDs | 2 (0.7%) | 15 (5%) | Not assessed |  |  |
| BD and SUDs | 7 (2.3%) | 4 (1.3%) | Not assessed |  |  |
|  |  |  |  | Skewness | Kurtosis |
| DTQ | 25.03±5.83 | 25.36±5.95 | 24.96±6.15 | Group 1=-0.16Group 2=0.07Group 3=0.18 | Group 1=-0.12Group 2=-0.28Group 3=-0.57 |
| BIS-15 | 34.56±6.88 | 34.56±6.83 | 34.92±5.11 | Group 1=-0.34Group 2=-0.45Group 3=-0.44 | Group 1=0.50Group 2=0.59Group 3=0.57 |
| WBSI | 51.7±9.11 | 49.47±9.89 | 48.04±9.80 | Group 1=-0.53Group 2=-0.44Group 3=-0.32 | Group 1=0.79Group 2=0.33Group 3=0.13 |
| DASS-21 | 34.18±12.43 | 30.71±13.25 | 31.70±10.03 | Group1=-0.31Group 2=-0.20Group 3=-0.21 | Group 1=-0.40Group 2=-0.49Group 3=0.25 |
| AUDIT | 18.43±8.36 | - | - | 0.19 | -0.26 |
| FTND  | - | 5.99±2.45 | - | -0.49 | -0.71 |
| PSMUS | - | - | 71.54±19.77 | -0.48 | -0.17 |

*Note.*

Group 1 = Alcohol Use Disorder; Group 2 = Nicotine dependence; Group 3 = Problematic social media use; DTQ = Desire Thinking Questionnaire; BIS-15 = Barratt Impulsiveness Scale-15; WBSI = [White Bear Suppression Inventory;](https://onlinelibrary.wiley.com/doi/abs/10.1002/per.478) DASS-21 = Depression, Anxiety and Stress Scale-21; AUDIT = Alcohol Use Disorders Identification Test; FTND = Fagerström Test of Nicotine Dependence; PSMUS = Problematic Social Media Use Scale; MDD = Major Depressive Disorder; BD = Bipolar Disorder; GAD = Generalized Anxiety Disorder; SUDs = Substance Use Disorders; OCD = Obsessive-Compulsive Disorder.

*3.2. The factors structure of the DTQ-P*

An EFA with principal component analysis using Oblimin with Kaiser normalization was performed on the first mixed group consisting of individuals with AUD (n=150) and nicotine dependence (n=150) (total=300; female=28.7%; aged 14-64 years; mean age=33.23 year). Sampling adequacy and factor analysis capability were confirmed through Kaiser- Meyer-Olkin Measure of Sampling Adequacy (KMO = 0.85) and Bartlett's Test of Sphericity (χ2 (45) = 1141.61, p < .001). The results showed a two-factor structure entitled 1- *Verbal Perseveration* and 2- *Imaginal Prefiguration* with eigenvalues equal to 4.2 and 1.7, respectively, was explored and the Scree test also was confirmed the presence of two factors (Fig. 1). In addition, 59.3% of the total variance was explained by these two factors. The rotated matrix is shown in Table 2 and all factor loadings for all items of two factors were significant and higher than 0.40 (factor loadings between 0.51 and 0.89).



 Fig. 1: Scree test

Table 2: Exploratory factor analysis (EFA) for 10 items of the DTQ on the first mixed group of individuals with alcohol use disorder and nicotine dependence (n=300) a

|  |  |  |  |
| --- | --- | --- | --- |
| Items | Factors |  | Extraction |
|  | Factor 1: Verbal Perseveration | Factor 2: Imaginal Prefiguration |  |
| Q1. If I did not practice the desired activity for a long time, I would think about it continuously. | **0.78** | 0.02 | 0.62 |
| Q2. When I begin to think about the desired activity I find it difficult to stop. | **0.85** | -0.14 | 0.66 |
| Q3. When I begin to think about the desired activity I continue until I manage to engage in it. | **0.89** | -0.11 | 0.73 |
| Q4. I repeat mentally to myself that I need to practice the desired activity. | **0.72** | 0.13 | 0.60 |
| Q5. My mind is focused on repeating what I desire till I manage to satisfy it. | **0.69** | 0.12 | 0.55 |
| Q6. I imagine myself doing the desired activity. | 0.13 | **0.57** | 0.47 |
| Q7. I imagine how I would feel like when engaging in the desired activity. | 0.29 | **0.51** | 0.45 |
| Q8. I anticipate the sensations I would feel practicing the desired activity.  | -0.10 | **0.79** | 0.58 |
| Q9. I begin to imagine the desired activity every time it comes to my mind. | 0.04 | **0.79** | 0.65 |
| Q10. I imagine myself involved in the desired activity as if it were a movie. | -0.07 | **0.82** | 0.62 |

*Note.*

a EFA with principal component analysis using Oblimin with Kaiser normalization.

DTQ = Desire Thinking Questionnaire.

The results of CFAs on the second mixed group (n=300; female=39%; aged 15-75 years; mean age=35.24 year) confirmed the two-factor structure of the DTQ-P with an acceptable model fit (χ2(34) =78.90, p<.001, CFI=0.94; GFI=0.98, TLI=0.93, SRMSR =0.050, RMSEA=0.067). Also, the same factor structure confirmed on the group with problematic social media use with a suitable fit (χ2(34) =76.10, p<.001, CFI=0.93; GFI=0.98, TLI=0.94, SRMSR =0.054, RMSEA=0.070). No modifications were made to the models. All factor loadings were significant and higher than 0.40 (see Table 3).

Table 3: Standardized factor loadings for 10 items of the DTQ based on CFA on the second mixed subgroup of individuals with alcohol use disorder and nicotine dependence (n=300) as well as group with problematic social media use (n=300).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | The second mixed group (n=300) |  | Problematic social media use group (n=300) |  |
| DTQ subscales | Items | Factor loadings | Z values | Factor loadings | Z values |
| Factor 1. Verbal Perseveration | Q1. | 0.68 | 14.34 | 0.67 | 14.88 |
|  | Q2. | 0.61 | 12.50 | 0.68 | 15.71 |
|  | Q3. | 0.76 | 18.45 | 0.75 | 19.16 |
|  | Q4. | 0.57 | 11.87 | 0.63 | 15.76 |
|  | Q5. | 0.54 | 11.08 | 0.57 | 15.23 |
| Factor 2. Imaginal Prefiguration | Q1. | 0.58 | 9.64 | 0.51 | 11.10 |
|  | Q2. | 0.60 | 10.73 | 0.50 | 12.05 |
|  | Q3 | 0.57 | 9.45 | 0.66 | 16.77 |
|  | Q4. | 0.68 | 14.85 | 0.76 | 21.85 |
|  | Q5. | 0.57 | 10.0 | 0.70 | 18.18 |

*Note.*

CFA = Confirmatory Factor Analysis; DTQ = Desire Thinking Questionnaire.

All factor loadings are higher than 0.40 and significant (*p*<.001).

*3.3. The reliability of the DTQ-P and its factors*

The internal consistency reliability using Cronbach's alphas for DTQ-P, VP, and IP were respectively 0.83, 0.83, and 0.77 in the group of individuals with AUD. Also, Cronbach's alphas for DTQ-P (α=0.85), VP (α=0.85), and IP (α=0.80) in the nicotine dependence group were good. In addition, Cronbach's alphas for the DTQ-P and its two subscales were confirmed in the problematic social media use group (DTQ-P=0.90, VP=0.86, and IP=0.88).

*3.4. The concurrent and predictive validity of the DTQ-P*

The results of Pearson Product-Moment correlations for each of three groups of individuals with AUD, nicotine dependence, and the problematic use of social media are shown in Table 4. The subscales of DTQ-P including verbal perseveration and imaginal prefiguration were positively and significantly correlated with measures evaluating negative affect (the DASS-21) impulsivity (the BIS-15), thought suppression (the WBSI), and AUD (the AUDIT), nicotine dependence (the FTND), and problematic social media use (the PSMUS) in the groups (p<.05 or .01) (see Table 4).

Table 4: Correlations among variables in the each of three groups.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Alcohol Use Disorder group |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 – DTQ-VP | - |  |  |  |  |  |
| 2 – DTQ – IP | 0.43\*\* | - |  |  |  |  |
| 3 – DASS-21 | 0.33\*\* | 0.18\*\* | - |  |  |  |
| 4 – BIS-15 | 0.14\* | 0.01 | 0.49\*\* | - |  |  |
| 5 – WBSI | 0.39\*\* | 0.31\*\* | 0.44\*\* | 0.18\*\* | - |  |
| 6 – AUDIT | 0.38\*\* | 0.48\*\* | 0.31\*\* | 0.28\*\* | 0.20\*\* | - |
| Nicotine dependence group |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 – DTQ-VP | - |  |  |  |  |  |
| 2 – DTQ – IP | 0.47\*\* | - |  |  |  |  |
| 3 – DASS-21 | 0.19\*\* | 0.14\* | - |  |  |  |
| 4 – BIS-15 | 0.11 | 0.06 | 0.57\*\* | - |  |  |
| 5 – WBSI | 0.26\*\* | 0.21\*\* | 0.38\*\* | 0.34\*\* | - |  |
| 6 – FTND | 0.47\*\* | 0.44\*\* | 0.43\*\* | 0.33\*\* | 0.23\*\* | - |
| Problematic social media use group |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 – DTQ-VP | - |  |  |  |  |  |
| 2 – DTQ – IP | 0.59\*\* | - |  |  |  |  |
| 3 – DASS-21  | 0.35\*\* | 0.22\*\* | - |  |  |  |
| 4 – BIS-15 | 0.14\* | 0.07 | 0.50\*\* | - |  |  |
| 5 - WBSI | 0.21\*\* | 0.20\*\* | 0.33\*\* | 0.30\*\* | - |  |
| 6 – PSMUS | 0.48\*\* | 0.44\* | 0.33\* | 0.40\*\* | 0.46\*\* | - |

*Note.*

DTQ - VP = Desire Thinking Questionnaire - Verbal Perseveration; DTQ-IP = Desire Thinking Questionnaire - Imaginal Prefiguration; BIS-15 = Barratt Impulsiveness Scale-15; WBSI = [White Bear Suppression Inventory;](https://onlinelibrary.wiley.com/doi/abs/10.1002/per.478) DASS-21 = Depression, Anxiety and Stress Scale-21; AUDIT = Alcohol Use Disorders Identification Test; FTND = Fagerström Test of Nicotine Dependence; PSMUS = Problematic Social Media Use Scale.

\* *p*<.05. \*\* *p*<.01.

The analyses of three linear hierarchical regression models performed on three groups (Alcohol Use Disorder, nicotine dependence, and problematic social media use) are presented in Table 5. In these regression models, demographic (age, gender, marital status, and education), and clinical (age onset of use, duration of use, and/or comorbidity) characteristics, negative affect (the DASS-21) impulsivity (the BIS-15), thought suppression (the WBSI) were controlled in the each of three regression analyses. These regression models explained 37%, 43%, and 38% of AUD (the AUDIT), nicotine dependence (the FTND), and problematic social media use (the PSMUS), respectively. *Verbal perseveration* and *imaginal prefiguration* (The DTQ-P subscales) together significantly predicted 18% and 17% of AUD and nicotine dependence, respectively, after controlling covariates. Also, *verbal perseveration* significantly explained 10% of problematic social media use beyond covariates (see Table 5 for more details).

Table 5: Regression analyses to predict alcohol use disorder, nicotine dependence, and problematic social media use based on the DTQ subscales (i.e., VP and IP).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Group 1: Predicting AUDIT |  | Group 2: Predicting FTND |  | Group 3: Predicting PSMUS |  |
| Steps | Adj R2 | R2 Change | Adj R2 | R2 Change | Adj R2 | R2 Change |
| 1- Demographic and clinical factors | 0.08 | 0.10\*\*\* | 0.11 | 0.13\*\*\* | 0.02 | 0.04\* |
| 2- DASS-21/BIS-15/WBSI | 0.16 | 0.09\*\*\* | 0.26 | 0.15\*\*\* | 0.29 | 0.26\*\*\* |
| 3- VP and IP | 0.37 | 0.18\*\*\* | 0.43 | 0.17\*\*\* | 0.38 | 0.10\*\*\* |
| Second step | *β* | *p* | *β* | *p* | *β* | *p* |
| Age  | 1.53 | 0.23 | 0.24 | 0.53 | -0.15 | 0.81 |
| Gender | -0.07 | 0.21 | -0.09 | 0.09 | 0.02 | 0.64 |
| Education | -0.02 | 0.27 | 0.04 | 0.50 | -0.04 | 0.49 |
| Marital status | 0.05 | 0.46 | 0.04 | 0.55 | -0.12 | 0.09 |
| Age onset of use | -0.96 | 0.19 | -0.19 | 0.39 | 0.05 | 0.92 |
| Duration of usage | -1.01 | 0.31 | 0.03 | 0.94 | 0.15 | 0.67 |
| Comorbidity | 0.12 | 0.03\* | 0.01 | 0.95 | - | - |
| DASS-21 | 0.16 | 0.02\* | 0.32 | <.001\*\*\* | 0.11 | 0.06 |
| BIS-15 | 0.19 | 0.002\*\* | 0.13 | 0.05\* | 0.22 | <.001\*\*\* |
| WBSI | 0.10 | 0.09 | 0.08 | 0.15 | 0.35 | <.001\*\*\* |
| Third step (final step) | *β* | *p* | *β* | *p* | *β* | *p* |
| Age  | 1.37 | 0.29 | 0.18 | 0.64 | -0.14 | 0.82 |
| Gender | -0.07 | 0.25 | 0.08 | 0.14 | -0.02 | 0.64 |
| Education | -0.02 | 0.71 | -0.03 | 0.60 | -0.04 | 0.52 |
| Marital status | 0.05 | 0.43 | -0.04 | 0.57 | -0.12 | 0.08 |
| Age onset of use | -0.88 | 0.24 | -0.15 | 0.49 | 0.05 | 0.92 |
| Duration of usage | -0.89 | 0.38 | 0.07 | 0.85 | 0.15 | 0.67 |
| Comorbidity | 0.08 | 0.19 | 0.01 | 0.95 | - | - |
| DASS-21 | 0.11 | 0.04\* | 0.24 | 0.002\*\* | 0.08 | 0.12 |
| BIS-15 | 0.14 | 0.03\* | 0.08 | 0.07 | 0.18 | 0.006\*\* |
| WBSI | 0.07 | 0.11 | 0.04 | 0.14 | 0.20 | 0.01\*\* |
| DTQ-VP | 0.28 | <.001\*\*\* | 0.30 | <.001\*\*\* | 0.30 | <.001\*\*\* |
| DTQ-IP | 0.35 | <.001\*\*\* | 0.26 | <.001\*\*\* | -0.02 | 0.93 |

Note.

Group 1 = Alcohol Use Disorder; Group 2 = Nicotine dependence; Group 3 = Problematic social media use; DTQ - VP = Desire Thinking Questionnaire - Verbal Perseveration; DTQ-IP = Desire Thinking Questionnaire - Imaginal Prefiguration; BIS-15 = Barratt Impulsiveness Scale-15; WBSI = [White Bear Suppression Inventory;](https://onlinelibrary.wiley.com/doi/abs/10.1002/per.478) DASS-21 = Depression, Anxiety and Stress Scale-21; AUDIT = Alcohol Use Disorders Identification Test; FTND = Fagerström Test of Nicotine Dependence; PSMUS = Problematic Social Media Use Scale.

\* *p*<.05. \*\* *p*<.01. \*\*\* *p*<.001.

**4. Discussion**

The current study sought to validate the DTQ-P in three groups of Iranian samples with AUD, nicotine dependence, and the problematic use of social media. As hypothesized, the DTQ-P replicated a two-factor structure called *Verbal Perseveration* and *Imaginal Prefiguration* in line with the original version of the DTQ (Caselli & Spada, 2011). Also, this finding is consistent with prior studies confirming the same factor structure of the DTQ in different cultures ([Aydın](https://www.sciencedirect.com/science/article/abs/pii/S0306460321003142?via%3Dihub" \l "!) et al., In Press; Chakroun-Baggioni et al., 2017; Brandtner & Brand, 2021; Dragan & Grajewski, 2021; Efrati et al., 2020; Markus et al., 2018; Solem et al., 2020). Furthermore, these findings confirm the role of desire thinking as an independent maladaptive coping strategy (e.g., Brandtner & Brand, 2021) in predicting addictive behaviors.

The present study demonstrated the reliability of the DTQ-P and its two subscales, by evaluating Cronbach's alpha for three groups of individuals with AUD, nicotine dependence, and problematic social media use, which were good (Cronbach's alpha >0.70). Previous studies have also reported good reliability for the DTQ and its subscales (Caselli & Spada, 2011; Chakroun-Baggioni et al., 2017; Dragan & Grajewski, 2021; Efrati et al., 2020; Markus et al., 2018; Solem et al., 2020).

In this study, the DTQ-P subscales had significant correlations with negative affect (depression, anxiety, and stress), thought suppression, and impulsivity in all three groups with AUD, nicotine dependence, and problematic social media use. In addition, and importantly, two subscales of the DTQ-P were moderately correlated with AUD, nicotine dependence, and problematic social media use (correlations between 0.30 and 0.49; Cohen, 1977). These results confirmed the DTQ-P’s concurrent validity. In line with these results, Solem and colleagues (2020) found that desired thinking measured by the DTQ was associated with negative affect and also strongly associated with addictive behaviors in individuals with hazardous alcohol use, nicotine dependence, and problematic social media use. The present study added new literature regarding the association of desire thinking with impulsivity and thought suppression. Although some evidence has found that individuals who try to suppress their thoughts to use some substances (e.g., nicotine) or some foods (e.g., chocolate) do not experience a high desire to use (Erskine et al., 2012), and can successfully suppress their thoughts to use (Miedl, Blechert, Meule, Richard, & Wilhelm, 2018), the present study showed the positive relationship between desire thinking and thought suppression. Furthermore, both thought suppression and desire thinking have been reported to play an important role in addictive behaviors (Nikčević et al., 2017). Also, desire thinking has been found to increase compulsive sexual behavior ([Efrati](https://akjournals.com/search?f_0=author&q_0=Yaniv+Efrati)et al., 2020). The findings of the present study suggest the possible role of desire thinking along with impulsivity and thought suppression in predicting addictive behaviors. Desire thinking may be conceptualized as a maladaptive form of coping to respond to emotional reactivity which contributes to increased craving in addictive behaviors (Brandtner & Brand, 2021; Caselli & Spada, 2010). In view of this, future studies may focus on evaluating the effects of thought suppression and impulsivity in the relationship between desire thinking and addictive behaviors to clarify these effects.

As expected, the current research showed the predictive role of desire thinking in severity of AUD, nicotine dependence, and problematic social media use, after controlling demographic and clinical characteristics as well as negative affect, impulsivity, and thought suppression (Efrati et al., 2021). Similarly, a study has found the role of desire thinking in predicting addictive behaviors (e.g., alcohol use, nicotine use, and social media use) adjusting for demographic characteristics and negative affect (Solem et al., 2020). The present study is also in line with previous studies (Albery & Spada, 2021; Caselli, Canfora, et al., 2015; Caselli, Ferla, et al., 2012; Caselli, Nikcevic, et al, 2012), suggesting the association of desire thinking with addictive behaviors.

*4.1. Implications*

The current study has some important implications. First, that the DTQ-P is a valid measure of desire thinking in individuals with various addictive behaviors in the Iranian community. Second, as previous studies have highlighted in Iranian populations (Izadpanah, Najafi, & Khosravani, 2021; Khosravani, Zandifar, et al., 2020; Najafi, Khosravani, Shahhosseini, & Afshari, 2018), desire thinking would appear to be a legitimate and culturally appropriate cognitive structure to target in the treatment of addictive behaviors relating to alcohol, cigarette, and social media use, above and beyond demographic and clinical characteristics associated with these behaviors. Third, in terms of treatment programs, Metacognitive Therapy (MCT; Wells, 2008) may be useful to target the interruption of desire thinking. MCT focuses on training attention and cognitive control (including the use of the Attention Training Technique (ATT) and Situational Attentional Refocusing (SAR); Wells, 2000), as well as recommending individuals to look at their thoughts, images, craving memories without any effort to control and modify them (including detached mindfulness; Wells, 2000). Furthermore, it tackles metacognitive beliefs which are linked to the activation of desire thinking. Recent research has shown MCT to be of value in the treatment of AUD (Caselli et al., 2018).

*4.2. Limitations and suggestions*

Regardless of the findings of this study, a number of limitations should be considered. The results of the present study relied on using self-report measures which are vulnerable to bias in responding. So, the use of visual tools to assess and understand desire thinking is recommended. The temporal stability of the DTQ-P has not been tested in the current research. Furthermore, the associations identified in the current study between desire thinking and addictive behaviors (AUD, nicotine dependence, and problematic social media use) were based on a cross-sectional design which cannot confirm causality. Accordingly, the study should be repeated in a longitudinal form to clarify the causal role of desire thinking in predicting addictive behaviors. The presence or absence of comorbidity in individuals with problematic social media use was not evaluated in the current study. This may affect the results in this group. Future studies should consider this limitation. Furthermore, the classification of individuals with problematic social media use in the current study was based on a theoretical framework. So, future studies will need to employ instruments and/or structured interviews to detect with the presence of problematic social media use, such as the Bergen Social Media Addiction Scale (BSMAS; Andreassen, Pallesen, & Griffiths, 2017) in which a score of 3 or above on all items (6 items) specifies dependency or problematic social media use (Andreassen, Torsheim, Brunborg, & Pallesen, 2012). Finally, the results cannot be generalized to non-clinical populations.

**5. Conclusions**

The present study confirmed the psychometric properties of the Persian version of the DTQ in Iranian samples with addictive behaviors. In addition, the reliability and validity of the DTQ-P have been found to be good in the current study. Importantly, the results of this study highlight that desire thinking plays a significant role in different addictive behaviors, including nicotine dependence as well as AUD and the problematic use of social media above and beyond both demographic characteristics and psychological variables.

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**Contributors**

The first and second authors (methodology, supervision, data curation, formal analysis, writing - original draft, review, and editing). The third author (data curation, formal analysis, clinical diagnosis). The fourth author (supervision, clinical diagnosis, writing - review and editing).

**Conflict of interest**

None declared.

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