

# Development and Verification of Problematic Cryptocurrency Trading Scale

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## ABSTRACT

**Aim:** Cryptocurrency trading is similar to problematic gambling behavior, with its high-risk factors and its methods of use. In this sense, it can become addictive. The aim of this study is to develop a valid and reliable scale to measure Problematic Cryptocurrency Trading among individuals who trade cryptocurrency.

**Method:** First, the theoretical framework of the study was discussed to lay a basis for the motives of this study. Then, with the help of the DSM-5 diagnostic criteria and internet addiction scales, a 16-item scale was designed. The study was carried out on 2 different sample groups. The results were reported under the titles Study 1 and Study 2. The sample size of Study 1 was 1314. The data were collected through TrueFeedBack BlackStar, a survey platform that provides survey participation by awarding its participants with cryptocurrency. For this data set, item analyses, the *t*-test, reliability analysis, and the explanatory factor analysis were performed for 27% of the lower and upper groups. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity to determine the suitability for the factor analysis, the principal component analysis for factorization, and the promax method for factor rotations were used. The SPSS Statistics 22 software package was used for the analyses. The sample size of Study 2 was 353. The data were collected from people known to be trading cryptocurrencies. The confirmatory factor analysis was performed for the model, the factor structure of which was determined in Study 1. For the goodness of fit of the model, root mean square error of approximation (RMSEA), incremental fit index (IFI), goodness of fit index (GFI), and chi-Square Test ( $\chi^2$ ) goodness of fit criteria were used. The Amos 23 software package was used for the data analysis.

**Results:** As a result of the exploratory factor analysis, a two-factor structure was obtained. For the total scores of the scale, Cronbach's alpha reliability value was found to be 0.913, and for the sub-factors, Cronbach's alpha values were found to be 0.897 and 0.866. The factor loadings of items varied between 0.786 and 0.597 for the first sub-factor and between 0.869 and 0.683 for the second sub-factor. The confirmatory factor analysis confirmed the two-factor structure of the scale, and the goodness of fit criteria were found to be at acceptable levels.

**Conclusion:** It was determined that the Problematic Cryptocurrency Trading Scale is a valid and reliable scale.

## ARTICLE HISTORY

Received: May 10, 2021

Accepted: July 28, 2021

**KEYWORDS:** Behavioral addiction, bitcoin, gambling addiction, problematic cryptocurrency trading, reliability, validity

## INTRODUCTION

The developing technology and changing human needs have led to certain changes in the money markets. Cryptocurrencies have attracted great interest in the last 10 years due to their increasing use and features, despite their recent emergence. Cryptocurrency refers to a digital currency or virtual currency designed to be faster, cheaper, and more reliable than an ordinary central authority, especially governments that issue money in a country. Cryptocurrency does not need a central bank or a regulatory authority to regulate its production and verify the flow of funds. It uses cryptographic techniques to

maintain the workflow. Cryptocurrency is an alphanumeric currency.<sup>1-3</sup> Unlike cash, cryptocurrencies provide users with an anonymous user identity that prevents asset disclosure, giving them the chance to store and transfer their assets. At the basis of cryptocurrency lies blockchain technology. Blockchain technology is a technology that provides data integrity; however, without a digital key, user identity and currency value cannot be accessed.<sup>4</sup> Blockchain technology, which can be described as a type of distributed ledger technology,<sup>5</sup> draws the cryptocurrency mechanism away from the central mechanism controlled

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**Cite this article as:** Menteş N, Yolbaş İ, Bulut M. Development and verification of problematic cryptocurrency trading scale. *Psychiatr Clin Psychopharmacol.* 2021;31(3):310-318.



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by the state. Thus, cryptocurrency technology, which is based on the blockchain, provides the necessary security through private or public keys and facilitates the money transaction and transfer process. This system ensures that the fees charged in the usual financial system are bypassed and the transfer process is carried out with a minimum transaction fee.<sup>1,6,7</sup> The first cryptocurrency created was Bitcoin, introduced by Nakamoto.<sup>8</sup> Bitcoin has attracted great attention since its release.<sup>9</sup> Bitcoin and other cryptocurrencies have reached more than 50 million active investors and are traded on more than 100 exchanges worldwide.<sup>3</sup> It is estimated that the supply of bitcoins, which was limited to 21 million when it went into circulation, will reach 21 million in 2140.<sup>10</sup> The increasing interest in Bitcoin has also brought some problems to light. There are sudden fluctuations in price. The price of the Bitcoin increased by 122% and 1360% respectively in 2016 and 2017.<sup>11</sup> Despite the high volatility of the crypto markets,<sup>12</sup> users often consider cryptos as an investment rather than money.<sup>13</sup> From this aspect, crypto trading is like the trading of high-risk stocks. Such stocks are highly volatile, preferred by those with a high-risk tolerance, and they are transferred frequently.<sup>12</sup> There are 3 pleasures that attract people to stock trading: spending time, the desire for high returns, and thrill-seeking, the last 2 of which qualify as gambling motives.<sup>14,15</sup> There are studies in the literature suggesting that stock trading and investing indicate behaviors that follow problematic gambling behavior.<sup>12,14,16,17</sup> Mills and Nower reported in their 2019 study that according to the data of the previous year, more than half of the regular gamblers trade cryptocurrencies, crypto trading is linked to high-risk stock trading, and crypto trading is associated with gambling disorder, depression, and anxiety.<sup>12</sup> Cryptocurrency trading is an industry that requires constant monitoring, in which great profits and losses are experienced and the risks are high. Prices increase and decrease suddenly, creating an expectation of high returns. It is also very likely that more money is invested in order to compensate for the losses. Cryptocurrency production and transactions are carried out online.<sup>18</sup> Spending excessive time on the internet and the inability to control the use of the internet can be generally described as internet addiction.<sup>19-21</sup> In other words, it can be said that an individual's spending excessive time on the internet is the strongest symptom and factor in considering internet use as addiction.<sup>22</sup> The fact that cryptocurrency trade requires complex transactions, the use of computers for the transactions, and has the possibility of making a great deal of money in a short span of time, will have some negative effects on users. To begin with, since the transactions are made through a digital signature, the continuous use of a computer is required. It seems quite possible that the time that will be spent on the internet will affect the professional life of individuals. In addition, other experiences (gaming, gambling, luck- and skill-based gambling, online gambling,

etc.) show that the extra time spent on the internet and the desire to win can lead to the risk of addiction. The high quantum of winnings, compensating the loss when losing, and the fact that it requires skill when carrying out transactions,<sup>23</sup> resembles the stock market on the one hand, and on the other, the gambling games that depend on luck and skill. As a matter of fact, in 2018, Griffiths<sup>24</sup> proposed his idea that addiction to cryptocurrency trading is a sub-type of online day-trading addiction<sup>25</sup> and/or a stock-trading addiction.<sup>26</sup> Cryptocurrency trading can be associated with excessive trading, stock market addiction, and pathological gambling addiction in general. The aim of this study is to develop a valid and reliable scale that measures problematic cryptocurrency trading, on the basis of gambling and internet addictions which are associated with cryptocurrency trading.

### Scale Design and Ethical Compliance

For the validity and reliability study of the Problematic Cryptocurrency Trading Scale, the feasibility of the study was first investigated by conducting a literature review. The study was planned considering the criteria summarized in the first section. The ethical approval for the study was obtained from the Dicle University Social Sciences and Humanities Ethics Committee (Dated 12.02.2021 and numbered 22836). In addition, in the introduction part of the survey form which the participants were to fill out online, a consent form confirming the participants' voluntary participation in the study was added. Two separate data collection methods were chosen for the study. The prepared survey was conducted online via Google Forms. Based on the fact that the study subject is associated with gambling and internet addiction, the scale questions were developed through modifications of the DSM-5 diagnostic criteria for gambling disorder<sup>27</sup> and internet addiction scales. With the aid of Young's Internet Addiction Scale<sup>28</sup> and the South Oaks Gambling Screen,<sup>29</sup> the 19-item scale questions were prepared. Based expert opinion (M.B., M.C.K., M.G, İ.Y.), 3 questions were removed from the survey. The measurement was performed with a 5-point Likert scale. The participants' levels of participation were determined as 1 - Never, 2 - Rarely, 3 - Sometimes, 4 - Frequently, and 5 - Always.

## STUDY 1

### Sample

Data were collected through TrueFeedBack BlackStar, a survey platform that provides cryptocurrency and reward distribution to its participants using blockchain technology. With this method, 1569 survey data were collected. People who were included in this data set but stated that they did not trade cryptocurrency were excluded from the study. The incomplete surveys were also excluded from the data set. After excluding these

data, the remaining 1314 survey data were analyzed. Associating the number of observations with the number of items in order to support the factor analysis, some authors suggest that the sample size should be 5, 10, or 15 times the number of items; however, there are also authors who argue that the sample size of 300 and above is adequate.<sup>30</sup> There were 16 items in our study. The sample size was adequate for the data set.

### Measurement Tools and Process

The following statistical analyses were performed for Study 1.

- Exploratory factor analysis to determine the factor structures of the items
- Item discrimination, inter-item, and item-total correlations
- Comparison of the means of 27% upper group and 27% lower group for item validity
- Reliability analysis for internal consistency

The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity to determine the suitability for the factor analysis, the principal axis analysis for factorization, and the promax method for factor rotations were used. The cut-off point was determined as 0.30. The items with a difference of less than 0.20 between the factor loadings and those included in more than 1 factor simultaneously were excluded from the study.<sup>31</sup>

For the item analysis, the item-total score correlation and item discrimination were evaluated. The item-total score correlation coefficient was checked. It was decided to exclude items with an item-total score correlation coefficient below 0.40. In addition, the independent samples *t*-test was performed on 27% of the upper and lower groups for the item discrimination. For the analysis, the total scores of the items were ranked in descending order and the highest 27% and lowest 27% groups were determined. The number of participants in the highest 27% group was 355 and the number of participants in the lowest 27% group was 355. It was decided to exclude the items with no significant difference.

The reliability of the scale was evaluated with Cronbach's alpha coefficient. The SPSS Statistics 22 software package was used for analysis in the study.

### Findings

In this section, the findings obtained for Study 1 are given. The general characteristics of the 1341 survey data are summarized in Table 1

It was determined that 82.3% of the participants were male, 7.7% were female, 48.8% were married, 47.7% had never been married, and 3.8% were divorced or widowed. Regarding educational background, 56.1% of the participants had a university degree, 29.4%

**Table 1.** Demographic Information

Property	Demographic Categories	N (%) or Mean $\pm$ SD
Age (years)		1314 (30.42) $\pm$ 9.298
Gender	Male	1081 (82.3)
	Female	233 (7.7)
Marital status	Divorced	35 (2.7)
	Widowed	15 (1.1)
	Married	641 (48.8)
	Never Married	623 (47.7)
Highest level of education	Ignorant	5 (0.4)
	Elementary education	102 (7.8)
	High school	386 (29.4)
	University	737 (56.1)
	Master's or Ph.D.	84 (6.4)
Income	Less than 3000	542 (41.25)
	3000-6000	517 (39.35)
	6000-9000	153 (11.64)
	9000-12000	49 (3.73)
	12 000 or above	53 (4.03)

were high school graduates, 7.8% elementary school graduates, and 6.4% had a postgraduate degree. The mean age of the participants was 30.42  $\pm$  9.298. The incomes of the participants were found as: 42.25% with less than 3000 TL, 39.35% with 3000-6000 TL, 11.4% with 6000-9000 TL, 3.7% with 9000-12 000 TL, and 4.03% with 12 000 TL and above.

To determine the suitability for the factor analysis, the results of the KMO test and Bartlett's test of sphericity were evaluated. As a result of the exploratory factor analysis performed on the first version of the scale, the KMO test result was found to be 0.946 and the Bartlett's test of sphericity result was found to be significant ( $\chi^2 = 11833.611$   $P = .000$ ). As a result of the analysis, a two-factor structure was suggested, and 53.882% of the total variance was explained. The first factor explains 46.373% of the total variance and the second factor explains 7.509% of the total variance. When the results of the analysis after factor rotation are examined, it is seen that the factor loading values of all items are greater than 0.40. The 0.40 factor load on the primary factor is probably the most used ideal value for "good" factor loads.<sup>31</sup> As a result of the analysis, cross-loading was found in question S14. Since the cross-loaded items do not separate well between the factors, they are removed one by one and the factor analysis was repeated.<sup>32</sup> The results of the repeated analysis after these 3 items were removed: the KMO test result was 0.938 and the Bartlett's test of sphericity result was found to be significant ( $\chi^2 = 10702.489$   $P = .000$ ). The rate of total variance explained increased to 53.564%. The rate of the explained total variance of the first factor was

Table 2. Pattern Matrix

	Component	
	1	2
Q1 How often do you stay on the internet to trade in cryptocurrency for longer than you planned?	0.834	
Q9 How often do you find yourself saying “just a few more minutes” when trading cryptocurrency?	0.810	
Q2 How often do you neglect family matters to make time for trading cryptocurrency?	0.765	
Q6 How often do you get sleep-deprived due to the time you spend trading cryptocurrency?	0.738	
Q3 How often is there a change in your social activities (sports, hobbies, and sex life) due to the time you spend on trading cryptocurrency?	0.731	
Q12 How often do you tend to trade cryptocurrency again in order to compensate for your loss, even though you have suffered great losses from trading cryptocurrency?	0.621	
Q10 How often do you feel pessimistic, nervous, depressed when not trading cryptocurrency, and experience that these complaints disappear when you trade cryptocurrency?	0.571	
Q7 How often do you fantasize about cryptocurrency (mining or earning coins) when not trading cryptocurrency?	0.563	
Q4 How often do you keep it a secret and get defensive when someone asks about cryptocurrency trading?	0.557	
Q5 If someone bothers you while trading cryptocurrency, how often do you snap at them, yell at them and display angry behavior?	0.473	
Q8 How often do you try to reduce the time you spend trading cryptocurrency?	0.414	
Q16 How often did you trade cryptocurrency with money that did not belong to you, without informing the owner?		0.920
Q15 How often did you take a loan from a bank or borrow money from a loan shark to buy cryptocurrency?		0.910
Q13 How often do you borrow (or consider borrowing) money from family or friends to buy cryptocurrency?		0.742
Q11 How often do you pretend to have made a profit from cryptocurrency even though you have not?		0.554

45.547%, while the rate of the explained variance of the second factor was 8.017%. The results showing the ideal factor loadings obtained as a result of the rotation are presented in Table 2.

For the two-factor structure formed as a result of the exploratory factor analysis, the scale questions Q1, Q9, Q2, Q6, Q3, Q12, Q10, Q7, Q4, Q5 and Q8 were collected in the first factor; and the questions Q16, Q15, Q13, Q11 were collected in the second factor. The factor loadings of the items in the first factor were between 0.414 and 0.834, and the factor loading of the items in the second factor were between 0.554 and 0.920. The sub-dimensions were named considering the DSM-5 diagnostic criteria. The first factor was termed “Withdrawal and Tolerance,” and the second factor was termed “Money-seeking Behavior and Denial.” After the exploratory factor analysis, item analysis and reliability results for the scale were given.

The correlation results of the item total scores before the factor analysis and the independent samples *t*-test results applied to 27% of the lower and upper groups are shown in Table 3.

In the table, the item-total correlation scores of all items in the scale before factor analysis and the independent samples *t*-test results for 27% of the groups have been given together. The item-total correlation score is between 0.550 and 0.740 (Table 3). The item-total correlation score of all items is more than 0.40. In addition, a significant difference was found between the groups as a result of the

independent samples *t*-test for 27% of the lower and upper groups for item discrimination. A significant difference between groups was considered a measure of internal consistency.<sup>32</sup> In this case, no item was excluded from the scale as a result of item analysis.

#### Statistics of the Items in the Scale and Reliability of the Factors

The Cronbach’s alpha reliability results for the general factor structure and the two-factor subscale, and the item statistics for the scale are shown in Table 4.

The Cronbach’s alpha reliability value for the general factor structure was found to be 0.922. The Cronbach’s alpha reliability value was calculated as 0.907 for the “Withdrawal and Tolerance” sub-factors, and as 0.866 for the “Money-Seeking Behavior and Denial” sub-factors. Both sub-factors have high reliability values. The item-total correlation scores ranged between 0.528 and 0.763 (Table 4). These values were also at the ideal level. A Cronbach’s alpha value between 0.81 and 1.00 shows that the developed scale is highly reliable.<sup>33</sup> In this case, it can be said that the scale has high reliability.

## STUDY 2

### Sample

For Study 2, people who were known to trade cryptocurrencies were contacted, and the questionnaire

**Table 3.** Item-Total Score Correlation and t-Test Results Before Factor Analysis

	Corrected Item-Total Correlation	Mean		Mean Difference	Std. Error Difference	t-Score
		27% Upper	27% Lower			
Q1	0.550	3.4338	1.6056	1.82817	0.07225	25.304'
Q2	0.680	3.0648	1.1155	1.94930	0.05969	32.656'
Q3	0.699	2.9324	1.0732	1.85915	0.05853	31.766'
Q4	0.597	3.0761	1.1408	1.93521	0.06615	29.255'
Q5	0.673	2.6592	1.0366	1.62254	0.06156	26.356'
Q6	0.714	3.1465	1.0958	2.05070	0.05636	36.388'
Q7	0.576	3.4028	1.4507	1.95211	0.06894	28.316'
Q8	0.553	2.8958	1.1831	1.71268	0.06182	27.705'
Q9	0.732	3.4423	1.1099	2.33239	0.05413	43.085'
Q10	0.740	2.8676	1.0282	1.83944	0.05574	32.998'
Q11	0.651	2.7099	1.0620	1.64789	0.06626	24.870'
Q12	0.643	3.3408	1.1352	2.20563	0.06303	34.993'
Q13	0.655	2.4423	1.0254	1.41690	0.06677	21.219'
Q14	0.740	3.1014	1.0676	2.03380	0.05882	34.579'
Q15	0.600	2.2817	1.0254	1.25634	0.07084	17.736'
Q16	0.572	2.0704	1.0198	1.05065	0.07046	14.912'

was introduced through social media channels. Cryptocurrency traders were asked to respond to the questionnaire. With this method, 353 participants were reached. The sample size was adequate for the data set. Another assumption of confirmatory factor analysis is that each factor has at least 2 items. This assumption is also provided for the factor structure obtained as a result of the exploratory factor analysis.

#### Measurement Tools and Process

The confirmatory factor analysis method was used to test the construct validity of the scale. For the goodness of fit, root mean square error of approximation (RMSEA), comparative fit index (CFI), goodness of fit index (GFI) and,  $\chi^2/df$  goodness of fit (presented as CMIN/DF), were used. For the goodness of CMIN/DF fit, the value  $\chi^2/df \leq 3$  indicates good fit, and the value  $\chi^2/df \leq 53$  indicates

**Table 4.** Statistics of the Items in the Scale and Reliability of the Factors

Factor Name	Mean $\pm$ SD	Cronbach's $\alpha$	Questions	Corrected Item-Total Correlation	Mean	SD	%95CI	
							Lower Bound	Upper Bound
General factor structure	28.83 $\pm$ 11.23	0.922						
Withdrawal and tolerance	22.73 $\pm$ 8.91	0.907	Q1	0.608	2.52	1.187	2.45	2.58
			Q9	0.754	2.23	1.182	2.16	2.29
			Q2	0.702	1.95	1.086	1.89	2.01
			Q6	0.727	2.02	1.102	1.96	2.07
			Q3	0.714	1.83	1.038	1.77	1.89
			Q12	0.639	2.18	1.252	2.11	2.24
			Q10	0.707	1.80	1.021	1.74	1.85
			Q7	0.571	2.40	1.210	2.33	2.46
			Q4	0.598	2.03	1.190	1.97	2.10
			Q5	0.640	1.71	.994	1.65	1.76
Money seeking behavior and denial	6.10 $\pm$ 3.23	0.866	Q16	0.751	1.38	.872	1.33	1.42
			Q15	0.763	1.46	.937	1.41	1.52
			Q13	0.734	1.54	.963	1.49	1.60
			Q11	0.631	1.72	1.052	1.66	1.78



**Table 5.** Some Descriptive Statistics for the Study 2 Sample

Questions	Mean	SD	95% CI	
			Lower Bound	Upper Bound
Q1	3.309	1.3005	3.173	3.445
Q9	2.856	1.4038	2.709	3.002
Q2	2.221	1.2187	2.093	2.349
Q6	2.943	1.2824	2.809	3.078
Q3	2.445	1.3496	2.303	2.586
Q12	3.105	1.4333	2.955	3.255
Q10	2.091	1.2421	1.961	2.221
Q7	2.788	1.3787	2.643	2.932
Q4	2.221	1.3129	2.084	2.358
Q5	1.912	1.518	1.783	2.041
Q8	2.368	1.1776	2.245	2.492
Q16	1.258	0.7897	1.175	1.340
Q15	1.450	1.016	1.344	1.557
Q13	1.541	1.0602	1.430	1.652
Q11	1.810	1.1360	1.691	1.929

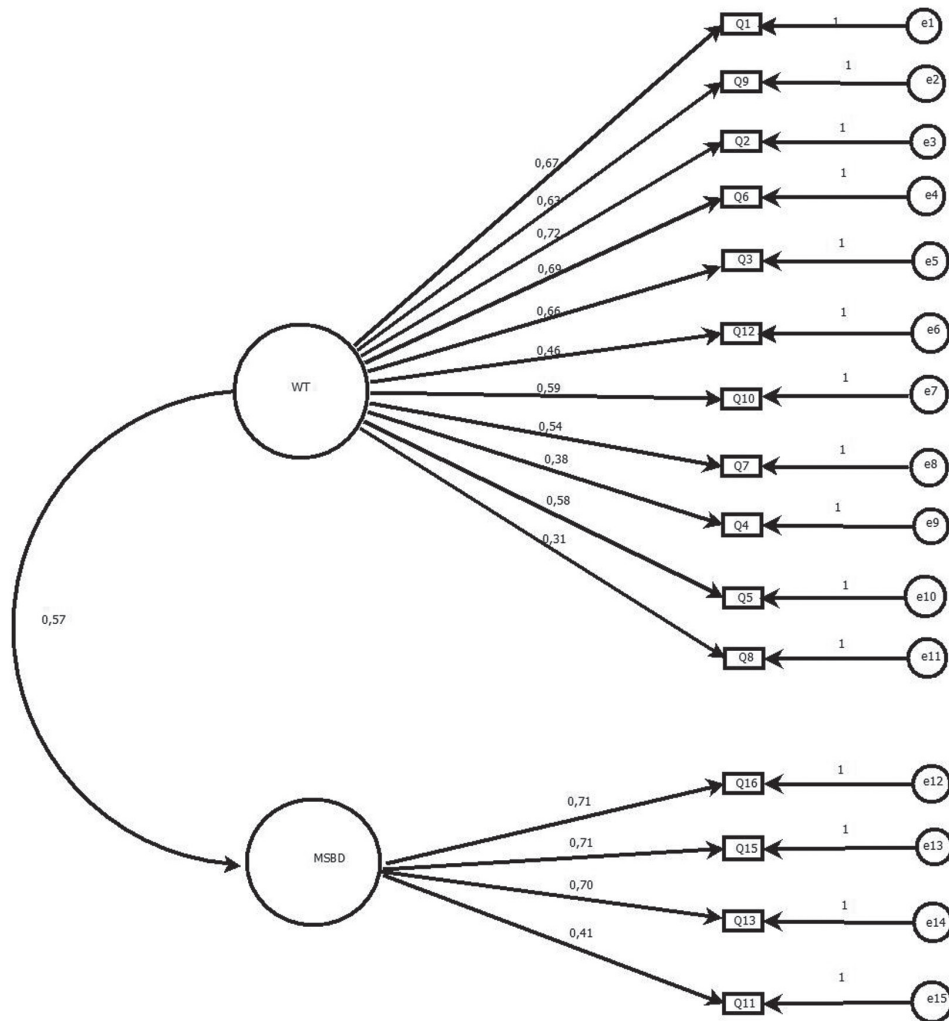
acceptable fit. Values of  $0.90 \leq GFI$ ,  $0.95 \leq CFI$ , and  $0 < RMSEA \leq 0.05$  were used as criteria for indicating a good fit. Values of  $0.85 \leq GFI$ ,  $0.90 \leq CFI$ , and  $0.05 < RMSEA \leq 0.08$  were used as criteria for indicating acceptable goodness of fit. The criteria of fit were compiled from the SPSS - AMOS23 Applied Statistical Analyses Book.<sup>34</sup> The Amos 23 software package was used for the analyses in the study.

**Findings**

Some descriptive statistics for the sample in Study 2 are summarized in Table 5.

With the exploratory factor analysis, it was determined that the scale has a two-factor structure; and the factors included in each sub-dimension were specified. The suitability of the obtained model was tested with the help of the confirmatory factor analysis. For this, the model obtained in study 1 was tried to be verified by using the sample of Study 2.

The path diagram regarding the model for the confirmatory factor analysis is shown in Figure 1.



**Figure 1.** The Path diagram regarding the model for the confirmatory factor analysis.

The item correlations range between 0.40 and 0.72. Regarding the model fit,  $\chi^2/df$  goodness of fit (presented as CMIN/DF), RMSEA, CFI, and GFI will be used for interpretation. For the model, it was determined that good model fit was achieved according to the CMIN/DF (2.750), GFI (0.915) fit criteria, and acceptable fit was achieved within the CFI (0.895) and RMSEA (0.071) fit criteria. Based on these results, it was determined that a good fit or an acceptable fit was achieved for all criteria. Therefore, the model proposed for the two-factor structure obtained by the exploratory factor analysis was determined to be suitable, as a result of the confirmatory factor analysis.

## DISCUSSION

Although addiction was generally associated with addictive chemical substances such as alcohol, drugs, and nicotine when it was first conceptually defined, in parallel with the increase in studies examining the brain, it has been recently determined that some behaviors (gambling, etc.) cause chemical dependency.<sup>23</sup> It has been thought that excessiveness in some behavioral habits such as gambling, internet, video games, shopping, eating, and so on, may also represent addiction.<sup>35,36</sup> However, it is not correct to define every continuous and excessive behavior as an addiction. Evaluating behavioral addictions based on scientific criteria would be a more correct approach. Diagnostic criteria such as salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse are the criteria used in the detection of behavioral addictions.<sup>37</sup> Gambling disorder, which was first defined as a psychiatric disorder in DSM-III, was defined as a non-substance-related disorder under the main category of substance-related and addictive disorders in DSM-5.<sup>38</sup> Cryptocurrency production and trading must be monitored carefully. Its prices can increase and decrease suddenly, and it also works with a system in which trading requires complex transactions carried out online. Cryptocurrency trading is an activity that includes serious risks. It contains sufficient reasons that require the individual to stay on the internet for a long time. Studies report that people who excessively trade cryptocurrency display mild addiction symptoms<sup>39</sup> such as muscle rigidity, background anxiety, checking the Bitcoin and Altcoin prices multiple times throughout the day, and thinking about trading while engaging in other activities; there are also studies which report that the financial risks are the cause of the addiction.<sup>40</sup> The aim of this study is to develop a valid and reliable scale that measures problematic cryptocurrency trading. In accordance with this purpose, a preliminary scale consisting of 19 questions was prepared based on the diagnostic criteria for gambling addiction and internet addiction scales. The prepared scale questions were reduced to 16 according to an expert's opinion, and the data were collected through the survey

consisting of these scale questions for 2 separate sample groups. With the Study 1 sample, the items were analyzed, the item-total correlations were examined, and the item total correlation scores were found to be adequate and statistically significant. Our sample set was arranged to compare the group averages of the 27% of the upper and lower groups, the scores obtained from the scale items were ranked in ascending order, and the independent samples *t*-test was performed on the data of the 27% of the upper and lower groups. Consequently, a significant difference was determined between the groups. Therefore, it can be stated that the items in the problematic cryptocurrency trading scale are highly discriminating. Exploratory factor analysis was performed to determine the factor structure of the scale. Taking an expert's opinion into consideration, 1 item (Q14) was removed from the scale due to cross-loading. As a result of the exploratory factor analysis, the scale items formed a two-factor structure. For the sub-factors, naming for sub-dimensions has been made taking the included items and the DSM-5 criteria into consideration.

The first sub-factor was termed "Withdrawal and Tolerance," the second sub-factor was termed "Money Seeking Behavior and Denial." For the final version of the scale: the Cronbach's alpha value for the general scale reliability was 0.922, the Cronbach's alpha value for the Withdrawal and Tolerance sub-factor was 0.907, and the Cronbach's alpha value for the Money Seeking Behavior and Denial sub-factor was found to be 0.866. The highest score to be obtained from the scale is 75 and the lowest score is 15. No cut-off point has been determined for the scale. A high overall score on the scale indicates the risk of problematic cryptocurrency trading. The validity of the two-factor Problematic Cryptocurrency Trading Scale developed was proved by the confirmatory factor analysis. When the goodness of fit criteria in the confirmatory factor analysis were considered, it was determined that the designed model was of an acceptable structure. The confirmatory factor analysis revealed that problematic cryptocurrency trading can be detected with these 4 diagnostic criteria: withdrawal, tolerance, engaging in illegal activities to find money, and lying. There are surveys in the literature that measure addictions such as gambling, gaming, internet, stock market, and excessive trading. However, a scale measuring problematic cryptocurrency trading has not yet been developed. While problematic cryptocurrency trading is similar to gambling, stock market, excessive trading and internet addictions, it also differs from these habits due to some of its features. For example, the stock market is carried out in accordance with the law and under the control of a legal authority, but most of the cryptocurrencies still do not have a legal basis. Although cryptocurrency trading contains excitement and high risks just like gambling, it does not work entirely based on luck. Certain estimates can be made by tracking

and making specific analyses. Its production, the trading, storage and transfer between accounts are internet based. Considering these features, developing an independent scale that measures problematic cryptocurrency trading is a more correct approach. With this study, a valid and reliable scale has been developed for problematic cryptocurrency trading.

**Ethics Committee Approval:** Ethical committee approval was received from the Social and Human Sciences Ethics Committee of Dicle University (2021-02-12).

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

**Peer Review:** Externally peer-reviewed.

**Author Contributions:** Concept - N.M., İ.Y., M.B.; Design - N.M., İ.Y., M.B.; Supervision - N.M., İ.Y., M.B.; Resource - N.M., İ.Y., M.B.; Materials - N.M., İ.Y., M.B.; Data Collection and/or Processing - N.M., İ.Y.; Analysis and/or Interpretation - N.M., M.B.; Literature Search -N.M., İ.Y., M.B.; Writing - N.M.; Critical Reviews - M.B.

**Acknowledgments:** We would like to thank Assoc. Dr. Cemal Kaya and Assoc. Dr. Mehmet Güneş for their contributions.

**Conflict of Interest:** The authors have no conflicts of interest to declare.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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