

Coloma-Carmona, A. et al.:Development and validation of the Trading Disorder Scale for assessing problematic trading behaviors

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Supplementary materials

Table S1

Descriptive characteristics and variable distributions for the full sample (N=403)

Variables	Non-winsorized data			Winsorized data ^{††}	
	Mean (SD) or % (n)	Range (min-max)	Outliers % (n) ^{††}	Mean (SD)	Range (min-max)
Demographic variables					
Mean (SD) age, in years	38.44 (12.09)	18-64	0 (0)	NA	NA
% (n) Male sex	65.3 (263)				
% (n) Marital status					
Single	50.6 (204)				
Married	40.2 (162)				
Divorced	4.2 (17)				
Widowed	0.7 (3)				
Other	4.2 (17)				
% (n) Education level					
None	0.2 (1)				
Primary	3 (12)				
High School	36 (145)				
University studies	60.8 (245)				
% (n) Employment status					
Student	9.4 (38)				
Employed	76.4 (308)				
Unemployed/domestic work	10.9 (44)				
Retired	3.2 (13)				
% (n) Income					
<1000€	13.6 (55)				
1000–1999€	43.2 (174)				
≥2000€	23.8 (96)				
Don't know/Prefer not to disclose	19.4 (78)				
Trading involvement					
Disordered trading					
% (n) Met ≥5 criteria	11.4 (46)				
Mean (SD) Total severity score	1.4 (2.5)	0-13	1.2 (5)	1.3 (2.4)	0-9
Mean (SD) No. of financial assets traded	1.6 (1.1)	1-8	0.7 (3)	1.6 (1)	1-5
% (n) Past-year frequency of trading [†]					
Less than once a month	53.1 (214)				
Monthly	31.8 (128)				
Weekly	11.9 (48)				
Daily	3.2 (13)				
Mean (SD) Mean trade size, in euros [†]	3,111.7 (8,075)	1-75,000	2 (8)	2,675.5 (5,580.8)	1-26,000
% (n) Shortest preferred time frame for trading [†]					
Seconds	25.6 (81)				
Hours	20.8 (66)				

Days	17.7 (56)				
Weeks-months	36 (114)				
% (n) Frequency of daily market monitoring					
Never or not daily	54.1 (218)				
1-3 times per day	37.5 (151)				
Every hour	6.5 (26)				
Every few minutes	2 (8)				
Mean (SD) Hours per day studying trading markets	1.8 (3.3)	0-24	2.2 (9)	1.7 (2.5)	0-12
Gambling behaviors and psychological correlates					
% (n) Past-year gambling participation					
Mean (SD) Problem gambling (PGSI) severity	2.1 (4.3)	0-27	1.2 (5)	1.9 (3.8)	0-15
% (n) Problem gambling (PGSI ≥ 5)					
Mean (SD) Impulsivity (UPPS-P)					
Total score	42.6 (8.4)	20-68	0 (0)	NA	NA
Negative urgency	9.6 (2.8)	4-16	0 (0)	NA	NA
Lack of premeditation	6.9 (2.2)	4-16	0.2 (1)	6.9 (2.1)	4-14
Lack of perseverance	7.2 (2.2)	4-16	0 (0)	NA	NA
Sensation seeking	9.6 (2.7)	4-14	0 (0)	NA	NA
Positive urgency	9.3 (2.5)	4-16	0 (0)	NA	NA
% (n) Substance use					
Alcohol	87.3 (352)				
Tobacco	27.3 (110)				
Cannabis	12.9 (52)				
Cocaine	4.5 (18)				
Hallucinogens	3.7 (15)				

Note: Missing data for the preferred time frame (n=86) resulted in a smaller sample size than 403 for this variable.

^aWinsorized data

[†]Trading frequency is based on the financial asset in which participants engaged most frequently. Mean trade size refers to the average amount of money invested per trade across all assets. The preferred time frame reflects the shortest duration participants held positions in financial assets.

^{††}Winsorized data were obtained by replacing outliers (absolute z-score of 3.29) with the nearest non-outlier value within the sample distribution.

Table S2

Summary of model fit indices for Exploratory Factor Analysis (EFA)

	No. Parameters	Chi-Square test	df	CFI	TLI	RMSEA (90% CI)	Model comparisons
1-factor	13	95.100**	65	0.982	0.978	0.049 (0.025-0.070)	
2-factor	25	72.247*	53	0.988	0.983	0.044 (0.010-0.067)	22.990* (1-factor against 2-factor)
3-factor	36	53.009	42	0.993	0.987	0.037 (0.000-0.065)	19.956 (2-factor against 3-factor)

* $p < .05$, ** $p < .01$

Table S3*Standardized factor loadings of the EFA (n = 191) and CFA (n=212)*

	EFA			CFA
	One-factor	Two-factors [†]		One-factor
Items of the <i>Trading Disorder Scale</i>	F1	F1	F2	F1
Item 1. Mind occupied with investment and/or trading activities	0.778	0.817	0.527	0.701
Item 2. Need to invest/trade with increasing amounts of money	0.706	0.646	0.646	0.894
Item 3. Need to invest/trade with increasing amounts of time	0.787	0.857	0.437	0.821
Item 4. Restlessness when cutting down (withdrawal)	0.826	0.898	0.475	0.830
Item 5. Disrupted sleep pattern	0.811	0.731	0.755	0.931
Item 6. Unsuccessful efforts to control or stop trading/investing	0.872	0.831	0.752	0.897
Item 7. Loss of interest in previous hobbies	0.757	0.755	0.589	0.911
Item 8. Trading/investing to cope negative emotions	0.955	0.806	0.929	0.745
Item 9. Chasing losses	0.837	0.877	0.550	0.817
Item 10. Lie about trading/investing	0.889	0.845	0.770	0.704
Item 11. Jeopardized or lost a significant relationship/job/career	0.887	0.783	0.832	0.916
Item 12. Rely on others for money	0.876	0.588	0.945	0.972
Item 13. Suicidal behavior (ideation, plans or acts)	0.872	0.577	0.955	0.902

[†]Correlation between both factors was 0.618**

Table S4*Summary of model fit statistics for latent class solutions of the Trading Disorder Scale*

No. of classes	Log- likelihood	AIC	BIC	SABIC	BLRT Bootstrapped LRT <i>p</i> -value (k-1 vs. k)	Vuong-Lo- Mendell-Rubin LRT <i>p</i> -value (k-1 vs. k)	Adjusted Lo- Mendell-Rubin LRT <i>p</i> -value (k-1 vs. k)	Entropy
1	-1688.225	3402.450	3454.436	3413.186	NA	NA	NA	NA
2	-1259.343	2572.686	2680.657	2594.983	<.001	<.001	<.001	.933
3	-1200.593	2483.186	2647.143	2517.045	<.001	.011	.011	.864
4	-1179.330	2468.659	2688.601	2514.080	<.001	.209	.214	.840

Abbreviations: *AIC* Akaike's information criterion, *BIC* Bayesian information criterion, *SABIC* sample size adjusted BIC, *NA* not applicable.

The optimal class solution is highlighted in bold.

Table S5

Comparisons of trading-related, gambling-related and psychological correlates with winsorized univariate outliers ($z\text{-score} \pm 3.29$)

	Latent classes			TDS categories					
Variables	Non-disordered trading (<i>n</i> = 291)	At-risk trading (<i>n</i> = 71)	Disordered trading (<i>n</i> = 41)	Statistic (p)	ES	Non-disordered trading (score<5) (<i>n</i> = 357)	Disordered trading (score ≥5) (<i>n</i> = 46)	Statistic (p)	ES
Trading involvement									
Disordered trading									
Mean (SD) Total severity score	0.1 (0.4) ^a	2.7 (1.1) ^b	7.3 (1.5) ^c	325.253 (<0.001)**	0.90	0.6 (1)	7.2 (1.5)	-12.746 (<0.001)**	0.64
Mean (SD) No. of financial assets traded	1.4 (0.7) ^a	1.9 (1.1) ^b	2.5 (1.4) ^c	42.945 (<0.001)**	0.15	1.5 (0.8)	2.5 (1.4)	-5.830 (<0.001)**	0.29
Mean (SD) Mean trade size, in euros [†]	2,402.1 (5,153.4) ^a	3,791.2 (6,829.4) ^b	2,683.7 (6,007.9) ^a	14.968 (<0.001)**	0.01	2,700.6 (5,626.2)	2,480.6 (5,269.5)	-0.163 (0.871)	0.01
Mean (SD) Hours per day studying trading markets	1.2 (1.9) ^a	2.6 (3.3) ^b	3.2 (2.8) ^c	60.062 (<0.001)**	0.10	1.5 (2.9)	3.2 (3.1)	-5.442 (<0.001)**	0.27
Gambling behaviors and psychological correlates									
Mean (SD) Problem gambling (PGSI) severity	0.9 (2.4) ^a	1.9 (3.4) ^b	8.5 (5.1) ^c	72.200 (<0.001)**	0.38	1.1 (2.6)	7.8 (5.5)	-7.508 (<0.001)**	0.37
Mean (SD) Impulsivity (UPPS-P)									
Lack of premeditation	6.7 (2.1) ^a	7 (2.2) ^a	8.3 (2) ^b	20.489 (<0.001)**	0.05	6.7 (2.1)	8.2 (2.2)	-4.268 (<0.001)**	0.21

Note: TDS categories are based on the number of disordered trading symptoms met. Endorsing ≥ 5 symptoms was considered as disordered trading (Guglielmo et al. 2016). Effect sizes (ES) are reported for all tests: η^2 for the Kruskal-Wallis H test (latent class comparisons) and Rosenthal's r for the Mann-Whitney U test (TDS categories comparisons) in continuous variables, and ϕ /Cramér's V for χ^2 tests in categorical variables. In post-hoc comparisons, significant differences are indicated with different superscript letters. Large effect sizes are shown in bold.

[†]Mean trade size refers to the average amount of money invested per trade across all assets.

* $p < 0.05$, ** $p < 0.01$

Table S6

Pearson's r and Spearman's ρ correlations between the Trading Disorder Scale (TDS) total scores and measures related to both trading behaviors and disordered gambling, after winsorizing outliers

	TDS total scores
PGSI total score	$r=0.585^{**}$
Past-year frequency of trading	$\rho=0.356^{**}$
Number of assets traded	$r=0.425^*$
Hours spent daily studying markets	$r=0.305^{**}$
Frequency daily market monitoring	$\rho=0.463^{**}$
Shortest preferred time frame	$\rho=-0.010$
Mean trade size	$r=0.030$

* $p<0.05$, ** $p<0.01$