

ORIGINAL ARTICLE

# Associations between Online Addiction, Attachment Style, Emotion Regulation, Depression and Anxiety in General Population: Testing the Proposed Diagnostic Criteria for Internet Addiction

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## ABSTRACT

The focus of this study was twofold. The first aim of the study was to investigate psychometric properties of the Turkish version of the Chen Internet Addiction Scale (CIAS). Second, we explored the relations between Internet Addiction, Attachment Style, Emotion Regulation, Depression and Anxiety among college students. A total of 754 college students participated in the study. The CIAS, Young Internet Addiction Test (YIAT), Experiences in Close Relationship-Revised (ECR-R), Difficulties in Emotional Regulation Scale (DERS), Center for Epidemiological Studies Depression Scale (CES-D), Beck Anxiety Inventory (BAI), and WHO Disability Assessment Schedule 2.0 (WHODAS 2.0) were administered in the study. The CIAS was subjected to confirmatory factor analysis. The associations between Internet addiction, attachment styles, difficulty in emotion regulation, anxiety and depression were evaluated using one-way analysis of variance and logistic regression analysis. The signal detection analysis showed that a cut value of 64 for the CIAS, with diagnostic accuracy of 97.1% and a cut value of 40 for the YIAT, with diagnostic accuracy of 86.9% were evaluated to be best diagnostic cutoff points. Considering univariate relationships between variables of interest, fearful and preoccupied attachment were significantly associated with pathological Internet use. Logistic regression analyses demonstrated that being male, difficulties in emotional regulation, anxiety and depression statistically significantly contributed to the risk for development of Internet addiction. Internet addiction as indexed by the CIAS cutoff is a highly debilitating mental disorder.

**Keywords:** Behavioral addiction, affect regulation, addictive behaviours, diagnostic accuracy, assessment, confirmatory factor analysis, psychopathology

## INTRODUCTION

Over the last two decades, the research on Internet use

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disorders and its antecedents has grown significantly (Cash, Rae, Steel, & Winkler, 2012; Kuss & Lopez-Fernandez, 2016; Pontes, Kuss, & Griffiths, 2015; Spada, 2014; Suissa, 2015). In the recent revision of the Diagnostic and Statistical Manual (DSM-5), Internet gaming disorder has been included as a clinically important condition that needs more research (American Psychiatric Association, 2013). Nevertheless, potential online addictions such as gambling, pornography, cybersex, social networking, shopping seem to have comparable detrimental effects, suggesting that limiting a

diagnosis to online gaming would result in missing out many cases of individuals experiencing severe impairment due to online addiction (Lopez-Fernandez, 2015).

The scope of the conceptualization of Internet use disorders varies substantially and includes symptoms derived from pathological gambling or substance-related addiction. Griffiths' addiction components (2005) include salience, mood modification, tolerance, withdrawal, conflict, and relapse. Tao et al. (2010) put forward eight dimensions of Internet addiction disorder as preoccupation, withdrawal, tolerance, difficulty to control, denial of harmful outcomes, impairment in social functioning, mood alterations and concealment. In the DSM-5 nine symptoms of preoccupation, withdrawal, tolerance, loss of control, continued use, neglect of alternative activities, escapism and mood modification were suggested and stipulated five or more symptoms over a 12-month period were stipulated to meet Internet Gaming Disorder (APA, 2013). In extensive reviews, scholars have identified different assessment instruments relevant to Internet addiction and concluded that three principal diagnostic assessment approaches include Young's Internet Addiction Diagnostic Questionnaire (YIADQ) (K. S. Young, 1998) and Internet Addiction Test (IAT) (K. Young, 1998), Chen Internet Addiction Scale (CIAS) (Chen, Weng, Su, Wu, & Yang, 2003), with miscellaneous cutoff values for classification (Aboujaoude, 2010; Kuss, Griffiths, Karila, & Billieux, 2014). As mentioned, demarcation points utilized for classification of Internet use disorders differ substantially and the issue conveys difficulties establishing a gold standard for a reliable diagnosis and identifying more firmly the underlying etiological factors (M. D. Griffiths et al., 2016; Kuss et al., 2014; Kuss & Lopez-Fernandez, 2016).

In an attempt to develop diagnostic criteria for Internet addiction, Ko, Yen, Chen, Chen, and Yen (2005) proposed 13 candidate criteria including preoccupation, craving, tolerance, withdrawal, Internet use longer than intended, losing control over Internet use, excessive time spent online, excessive effort spent on activities, and continued overuse despite physical and psychological problems, accompanied by functional impairment in work or school, social relationships and violations of

school or community rules over a three months time. Presence of six or more symptoms in B criteria alongside functional impairment in at least one domain was stipulated for a principal diagnosis of Internet addiction. The Diagnostic Criteria of Internet Addiction (DC-IA) was empirically tested on the basis of a systematic psychiatric interview and showed an excellent diagnostic accuracy, with high specificity (97.1%) and sensitivity (87.5%). In further studies, the DC-IA was utilized to detect optimal cutoff for the CIAS. The CIAS yields total scores ranging from 26 to 104, and a cutoff value of 64 was demonstrated to have excellent diagnostic accuracy and specificity (87.6% and 92.6%) based on the results of systematic diagnostic interviews relying on the DC-IA (Ko, Yen, Yen, et al., 2005). In a replication study, a two stage diagnostic approach using the DC-IA and the CIAS with an optimal cutoff 64 was attested to be discriminative for Internet addiction among college students (Ko, Yen, Chen, Yang, et al., 2009).

There has been ample evidence that emotion regulation process causally involve in psychopathological conditions including addictions (Schreiber, Grant, & Odlaug, 2012). Despite the complexity of the construct, some conceptualizations concerning emotion regulation include identification and expressive control of emotional experiences, modulation of aroused states, and directing behaviours in socially acceptable ways (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gratz & Roemer, 2004; Linehan, 2014). More recent models of Internet use disorders has postulated that the underlying etiological factors pertaining to specific behavioral addiction can be best understood as outcomes of interactions of biopsychological predisposing factors with affective, cognitive and executive functioning mediated via coping capacity, attentional and cognitive biases (Brand, Young, & Laier, 2014; Brand, Young, Laier, Wolfling, & Potenza, 2016; G. H. Dong & Potenza, 2014). Co-occurrence and significant linkages of attention deficit and hyperactivity disorder traits, anxiety, social phobia, various psychosomatic health complaints and depression with Internet addiction disorders seems to be norm rather than exception (Cho, Sung, Shin, Lim, & Shin, 2013; Gamez-Guadix, 2014; D. A. Gentile et al., 2011; Ko et al.,

2014; Ko, Yen, Chen, Yeh, & Yen, 2009; Siddiqui, Qureshi, & Alghamdi, 2018) that the significant associations between mental health and addictive Internet use disorders appear to be bi-directional (Anderson, Steen, & Stavropoulos, 2017; Ciarrochi et al., 2016; G. Dong, Lu, Zhou, & Zhao, 2011; Gamez-Guadix, Orue, Smith, & Calvete, 2013; van den Eijnden, Meerkerk, Vermulst, Spijkerman, & Engels, 2008). High comorbidity of psychiatric disorders which is indicative of greater difficulties in emotion regulation may contribute to a more complicated manifestation of symptoms, more treatment difficulties and poor prognosis of addictive disorders (Benaiges, Prat, & Adan, 2010). Moreover, addictive behaviours may be regarded as counterproductive strategies to gain relief in response to negative emotional states (Al-Gamal, Alzayyat, & Ahmad, 2016; Boysan et al., 2017; Brand, Laier, & Young, 2014; Cheng, Sun, & Mak, 2015; Chou et al., 2015; Hormes, Kearns, & Timko, 2014; Kardefelt-Winther, 2017; Kuss, 2013; Li et al., 2016; Zhou, Li, Li, Wang, & Zhao, 2017) and an ability to executively differentiate, understand and regulate emotions has been suggested to be central in managing addictive behaviours (Brand, Young, et al., 2014; Kun & Demetrovics, 2010).

The emerging evidence concerning the significant relations between online addictive behaviours and emotion regulation was that pathological Internet use appears to serve as a form of mood regulation strategy that leads to severe impairment in mood regulation (Billieux & Van der Linden, 2012). Internal and external emotion dysregulation were found to be significantly associated with addicted behaviors in terms of pathological Internet and smart phone use amongst high school student (Yildiz, 2017); while difficulties expressing emotions was a significant antecedent of addictive Internet use among college students (Oktan, 2011). In comparison to normal controls matched for age, gender and education, individuals with gaming disorder were more likely to use maladaptive emotion regulation strategies in terms of lower cognitive reappraisal and higher expressive suppression, and revealed greater depression, anxiety and hostility (Yen et al., 2018). Using the Affective Neuroscience Personality Scales, a self-

report measure of primary emotions, fear and sadness were demonstrated to be robust antecedents of different aspects of problematic Internet use in a community dwelling sample (Montag, Sindermann, Becker, & Panksepp, 2016). Spada and Marino (2017) tested a structural model and indicated that meta-cognitions and emotional regulation impacted separately on problematic Internet use among 380 youngsters, aged 13 to 20. In a more recent surveillance of problematic Internet use, Akbari (2017) identified that college students who had lower distress tolerance were more likely to escape through mobile devices or computers to gain relief. Difficulties in emotion regulation had indirect impact on problematic Internet use via meta-cognitions and distress tolerance.

Attachment is a strong emotional bond within people originates from early experiences with parents, including warm, intimate and stable relationship between parent and infant (Bowlby, 1988). Brennan, Clark, and Shaver (1998) suggested a two dimensional construct of adult attachment, i.e., attachment anxiety and attachment avoidance. Attachment anxiety refers to the fear or anxiety of being abandoned and attachment avoidance is marked by discomfort of intimacy and reliance. Based on these two principal aspects of attachment, four dimensional model of attachment styles includes secure attachment characterized by low levels of anxiety and avoidance, avoidant marked by high levels of avoidance, preoccupied with high levels of attachment anxiety and fearful characterized by high levels of both attachment anxiety and avoidance (Bartholomew & Horowitz, 1991). From the view of stress diathesis perspective, insecure attachment is associated with difficulties in emotion regulation which cannot be regarded as psychopathology *per se* rather seems to be a robust vulnerability for development of psychological disorders (Boysan & Çam, 2016). With respect to the relations between attachment and addiction, Flores (2004) posited that addictive behaviours can be regarded as a counterproductive strategy in dealing with emotion regulation problems emerged from attachment insecurities.

There has been a growing research interest on associations between online addictive behaviours and

attachment styles. Attachment insecurities seem to exert influence on online interpersonal behavioral patterns that insecurely attached individuals have less likely expand their social networks and social ties (Jenkins-Guarnieri, Wright, & Hudiburgh, 2012; Lee, 2013), are concerned about their perceived images (J. H. Lin, 2015, 2016) and reveal less interest in social networks (Liu, Shi, Liu, & Sheng, 2013; Oldmeadow, Quinn, & Kowert, 2013). Nevertheless, attachment insecurities particularly attachment anxiety were significantly associated with fear of missing in online relations that predicted more frequent social media use (Blackwell, Leaman, Trampusch, Osborne, & Liss, 2017). On the other hand, Internet addicts has consistently been found to have a tendency towards insecure attachment (M. P. Lin, Ko, & Wu, 2011; Monacis, de Palo, Griffiths, & Sinatra, 2017a, 2017b; Schimmenti, Guglielmucci, Barbasio, & Granieri, 2012; Severino & Craparo, 2013) that preoccupied and dismissive attachment styles were reported to be significant correlates of online addictive behaviours (Odaci & Cikrikci, 2014; Savci & Aysan, 2016). An interaction of avoidant and anxious attachment with psychopathology in terms of depression and phobia contributed to undue Internet use in which depression moderated the relations between attachment avoidance and addictive behaviours, leading to future alcohol dependency (Shin, Kim, & Jang, 2011). The emerging evidence has consistently pointed out that both paternal and maternal attachment insecurities were significant antecedents of development and persistence of online addictive behaviours (Kim & Kim, 2015; Lei & Wu, 2007). Family environment plays a central role in protection against and an increased risk for development of addictions that marital conflict was indicated to have a significant influence on decreased paternal and maternal attachment as well as peer attachment that lead development of behavioral addiction (Yang, Zhu, Chen, Song, & Wang, 2016). In a study conducted among 310 high school students, Schimmenti, Passanisi, Gervasi, Manzella, and Fama (2014) found that adolescents addicted to Internet use were more likely to report childhood physical and sexual traumatic experiences, as well as greater scores on three types of attachment

insecurities in terms of need for approval, preoccupation with relationships and avoidant attachment compared to non-addicted individuals. However, once the shared variances were controlled for the predictor variables of interest, preoccupation with relationship coupled with early traumatic experiences were still contributing to the risk for addictive behaviours.

In this study it was aimed to study several aspects pathological Internet use. First, establishing a reliable diagnostic criteria for online addictive behaviours is critical to firmly understand the underlying etiological factors and develop more effective interventions. To this end, we assessed diagnostic accuracy of the cut point on the CAIS originally proposed by Ko et al. (2005; 2005; 2009) concurrent with functional impairment as indexed by WHODAS 2.0 (Üstün, Kostanjsek, Chatterji, & Rehm, 2010). Second, using signal detection analysis, the optimal cut value of the YIAT corresponding to the demarcation point on the CAIS was explored. Third, the predictive values of attachment styles and difficulties in emotion regulation along with anxiety and depression on pathological Internet use were investigated.

## METHOD

### Participants and Procedure

Participants were seven hundred fifty-four college students, aged from 17 to 50. Participants' average age was  $20.82 \pm 3.31$  years. Almost half of the sample were female ( $n=416$ , 55.2%). Volunteers reported average  $3.4 \pm 2.8$  hours daily Internet use. Socio-demographic characteristics of the sample are presented in Table 1.

In order to obtain the Turkish version of the CIAS, a standard translation protocol was adopted. All 26 items were underwent a preliminary English to Turkish translation by two scholars. After comparing the translated versions of the Turkish CIAS, a final Turkish form of the questionnaire was achieved by matching both translated versions.

The study was undertaken at Batman University among undergraduates enrolled in various programs. The scope, purposes, and procedure of the current investigation were announced in the classes. Volunteers

**Table 1. Descriptive statistics for the demographic characteristics of the sample (N=754)**

Age		(Mean, SD)	20.82	3.31
Daily Internet use (hours)		(Mean, SD)	3.38	2.76
Gender	Male	(n, %)	338	44.83
	Female	(n, %)	416	55.17
Income	Low	(n, %)	106	14.06
	Average	(n, %)	615	81.56
	Upper	(n, %)	33	4.38
Attachment style	Secure	(n, %)	144	19.10
	Avoidant	(n, %)	187	24.80
	Preoccupied	(n, %)	145	19.23
	Fearful	(n, %)	278	36.87
Pathological Internet use	CIAS $\geq$ 64			
	WHODAS 2.0 $\geq$ 17	(n, %)	66	8.75
Pathological Internet use	YIAT $\geq$ 40	(n, %)	150	19.89

Note. 754 college students, aged from 17 to 50 years, participated in the study. YIAT = Young Internet Addiction Test; CIAS = Chen Internet Addiction Scale; WHODAS 2.0 = WHO Disability Assessment Schedule 2.0 Short Form - Self-Assessment

participated in the study after their courses. Volunteers provided written informed consent and then completed a set of battery of questionnaires. Respondents were not compensated for their participation. The approval for the procedures of the study was granted by Van Yüzüncü Yıl University Institutional Ethical Board of Social and Human Units.

### Psychometric Instruments

**Chen Internet Addiction Scale (CIAS):** The 26-item self-report questionnaire was designed to assess Internet addiction in general population (Chen et al., 2003). Respondents are asked to rate each question on a Likert type 4-point scale, ranging from 1 to 4. The CIAS yields five sub-scales of Compulsive use, Withdrawal, Tolerance, Interpersonal and Health Problems and Time Management Difficulties. The initial validation study reported excellent internal reliability coefficients for the scale and subscales, ranging from 0.79 to 0.93.

**Young Internet Addiction Test (YIAT):** The YIAT, a 20-item self-administered scale, was designed to assess problematic Internet use (K. Young, 1998; K. S. Young, 1998). Each item is rated on a Likert type scale, ranging from 0 to 5. A total score is obtained by averaging the

summed scores of the items. The Turkish version of the scale had a Cronbach's alpha of  $\alpha = 0.93$  (Boysan et al., 2017).

### Experiences in Close Relationship-Revised

**(ECR-R):** The ECR-R is developed to screen aspects of adult attachment styles (Fraleigh, Waller, & Brennan, 2000). The scale consists of 36 self-report questions, scored on a 7-point scale. The instrument yields scores on two dimensions, each was comprised of 18 items, including attachment anxiety and attachment avoidance. The Turkish version of the scale revealed good internal consistency with a Cronbach's  $\alpha = 0.90$  for attachment avoidance and  $\alpha = 0.86$  for attachment anxiety (Selcuk, Gunaydin, Sumer, & Uysal, 2005).

### Difficulties in Emotional Regulation Scale (DERS):

The DERS (Gratz & Roemer, 2004) is a 36 item self-report instrument designed to assess difficulties in emotion regulation. Each item is rated on a 5-point scale, ranging from 1 to 5. The instrument yields six sub-scales: non-acceptance of emotional responses, difficulties engaging in goal directed behaviour, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity. Turkish version of the DERS had promising psychometric

properties with a internal reliability coefficient of  $\alpha = 0.94$  (Ruganci & Gencoz, 2010).

**Center for Epidemiological Studies Depression Scale (CES-D):** The CES-D (Radloff, 1977) is a 20-item self-administered questionnaire developed to assess severity of depressive symptomatology. Items are rated on a 4-point Likert-type scale, ranging from 0 to 3. Items 4, 8, 12, and 16 are reversed scored. Scores on the 20 items are summed to yield a total depressive severity score. The Turkish version of the CES-D was shown to have high convergent validity and internal reliability (Lehmann et al., 2011).

**Beck Anxiety Inventory (BAI):** The BAI (Beck, Brown, Epstein, & Steer, 1988) is a 21-item self-report questionnaire designed to assess presence and severity of physiological anxiety symptoms. Respondents are asked to rate each item on a 4-point scale, ranging from 0 (*Not at all*) to 3 (*Severely*). The Turkish version was demonstrated to have good psychometric properties (Ulusoy, Sahin, & Erkmén, 1998).

**WHO Disability Assessment Schedule 2.0 – 12 Item Self-Report (WHODAS 2.0 – SR):** WHODAS 2.0 was developed to assess activity limitations and participant restrictions in the prior month (Rehm et al., 1999). The scale assesses functional impairment in six life domains: 1) communication, 2) self-care, 3) mobility, 4) interpersonal relations, 5) work and household roles and 6) community roles. There are 36 and 12 item versions that we used 12-item self report version of the WHODAS 2.0. Given the population norms for item response theory based scoring of the WHODAS 2.0 short version (Üstün et al., 2010), a score of 17 corresponding to the 90<sup>th</sup> percentile was utilized to demarcate pathological Internet use related disability in the current study.

### Data Analysis

Initially, we begin with obtaining descriptive statistics for socio-demographic characteristics of the sample. Descriptive item statistics were computed for the psychometric instruments utilized in the current study.

Using confirmatory structural equation modeling, we tested whether original factor structure of the CIAS fit to the data collected in the present study. One-way analysis of variance analysis was run to explore differences in scale scores across attachment styles. To make comparisons between the overlapping features of the constructs measured by Chen Internet Addiction Scale and Young Internet Addiction Test, we adhered to signal detection analysis approach and detected an optimal cutoff value for the Young Internet Addiction Test. Lastly, we run two logistic regression models in which Internet addicts scored pathological levels on the Chen Internet Addiction Scale ( $\geq 64$ ) plus WHODAS 2.0 ( $\geq 17$ ) and on the Young Internet Addiction Test ( $\geq 40$ ) were dependent variable in each logistic model. Difficulties in emotional regulation, functional impairment, depression, anxiety, attachment anxiety and avoidance were regressed on the dependent variable in each logistic regression analysis while adjusting for socio-demographic characteristics.

## RESULTS

### Dimensionality and factorial validity of the Chen Internet Addiction Scale

CFA was performed on the 26 items of the Turkish version of CIAS using maximum likelihood estimation method with robust standard errors on the overall sample ( $N=754$ ) to evaluate two competing models (a general 1-factor model vs original 5-factor latent structure).

The results derived from the CFA when testing the one general factor solution showed poor overall fit:  $S-B \chi^2 (299) = 1161.121$   $p < 0.001$ ;  $RMSEA = 0.06$ ;  $SRMR = 0.05$ ;  $CFI = 0.85$ . On the other hand, the results of the CFA performed on the initial validation study 5-factor latent structure yielded acceptable model fit according to the guideline proposed by Hu and Bentler (1999):  $S-B \chi^2 (289) = 883.464$   $p < 0.001$ ;  $RMSEA = 0.05$ ;  $SRMR = 0.05$ ;  $CFI = 0.90$ .

### Descriptive statistics for the psychometric measures

Means, standard deviations and item statistics for the psychometric instruments are presented in Table 2. The

Table 2. Descriptive statistics for the psychometric instruments

	$\alpha$	Intra r	Rjt	Inter-item r	Mean	SD	Item mean (range)	Item SD	Scores Range (range)
Chen Internet Addiction Scale	0.94	0.98	0.51-0.68	0.16-0.60	43.75	14.67	1.30-2.14	0.67-1.03	26-104
Compulsive Use	0.80	0.97	0.54-0.62	0.40-0.53	8.30	3.42	1.55-1.76	0.82-1.03	5-20
Withdrawal	0.81	0.96	0.56-0.66	0.37-0.54	9.24	3.52	1.68-2.00	0.83-0.99	5-20
Tolerance	0.76	0.97	0.45-0.63	0.33-0.53	7.20	2.74	1.35-2.14	0.68-1.01	4-16
Interpersonal and health problems	0.84	0.96	0.53-0.66	0.32-0.60	11.29	4.30	1.50-1.82	0.79-0.95	7-28
Time management difficulties	0.77	0.97	0.39-0.65	0.25-0.57	7.72	3.00	1.30-2.00	0.67-0.95	5-20
Young Internet Addiction Test	0.93	-	0.41-0.75	0.23-0.67	24.60	17.33	0.71-1.79	1.10-1.53	0-100
Difficulties in Emotion Regulation Scale Global	0.91	-	-0.27-0.69	-0.30-0.67	86.98	21.97	1.70-3.29	1.06-1.36	36-180
Non-acceptance of Emotional Responses	0.83	-	0.52-0.67	0.36-0.64	12.64	5.40	1.70-2.68	1.06-1.33	6-30
Difficulties engaging in goal directed behaviour	0.76	-	0.21-0.65	0.13-0.57	14.83	4.51	2.67-3.29	1.24-1.31	5-25
Impulse control difficulties	0.82	-	0.31-0.71	0.17-0.67	14.11	5.37	2.02-2.90	1.14-1.32	6-30
Lack of emotional awareness	0.65	-	0.09-0.57	-0.02-0.62-	16.09	4.46	2.15-3.18	1.11-1.33	6-30
Limited access to emotion regulation strategies	0.86	-	0.27-0.70	0.15-0.64	17.57	6.91	1.97-2.61	1.16-1.36	8-40
Lack of emotional clarity	0.77	-	0.46-0.59	0.21-0.59	11.75	4.25	1.97-2.67	1.12-1.24	5-25
Beck Anxiety Inventory	0.92	-	0.46-0.73	0.16-0.67	13.34	11.64	0.23-1.16	0.62-1.03	0-63
Center for Epidemiological Studies Depression Scale	0.88	-	0.17-0.70	-0.28-0.61	20.90	11.79	0.58-1.62	0.96-1.20	0-60
WHO Disability Assessment Schedule 2.0	0.88	0.97	0.31-0.74	0.15-0.87	17.10	9.32	1.08-1.60	1.06-1.38	0-48
Experiences in Close Relationships Scale-Revised									
Attachment Anxiety	0.84	-	0.05-0.63	-0.11-0.56	66.32	20.11	2.60-5.80	1.84-2.29	18-126
Attachment Avoidance	0.78	-	0.02-0.58	-0.13-0.67	67.21	17.98	2.90-4.56	1.99-2.40	18-126

NOTE. N = 754; Intra r = test re-test intra-correlation coefficients between two applications with 10-day interval;  $\alpha$ = internal consistency; Rjt= corrected item-total correlation coefficients (range); Inter-item r = Spearman inter-item correlation coefficients (range); SD= standard deviation

**Table 3. Pearson product-moment correlation coefficients between the CIAS and YAIT scores**

	1	2	3	4	5	6	7
1. Chen Internet Addiction Scale	1.00	0.89 **	0.84 **	0.86 **	0.89 **	0.84 **	0.85 **
2. Compulsive Use		1.00	0.71 **	0.72 **	0.72 **	0.67 **	0.76 **
3. Withdrawal			1.00	0.69 **	0.61 **	0.60 **	0.68 **
4. Tolerance				1.00	0.70 **	0.67 **	0.74 **
5. Interpersonal and health problems					1.00	0.72 **	0.76 **
6. Time management difficulties						1.00	0.75 **
7. Young Internet Addiction Test							1.00

NOTE: \*\*:  $p < 0.01$ ; CIAS= Chen Internet Addiction Test; YIAT=Young Internet Addiction Test

total and five subscales of the Turkish form of the CIAS revealed excellent internal reliability, with Cronbach's alphas ranging from 0.76 to 0.94. The same was true for the temporal stability of the scale, with re-test intra-correlations ranging from 0.96 to 0.98. The item discrimination indexes in terms of corrected item-total correlation coefficients were greater than  $\geq 0.50$  indicative of excellent item reliability and validity. Overall, the Turkish version of the CIAS showed sound and promising psychometric features.

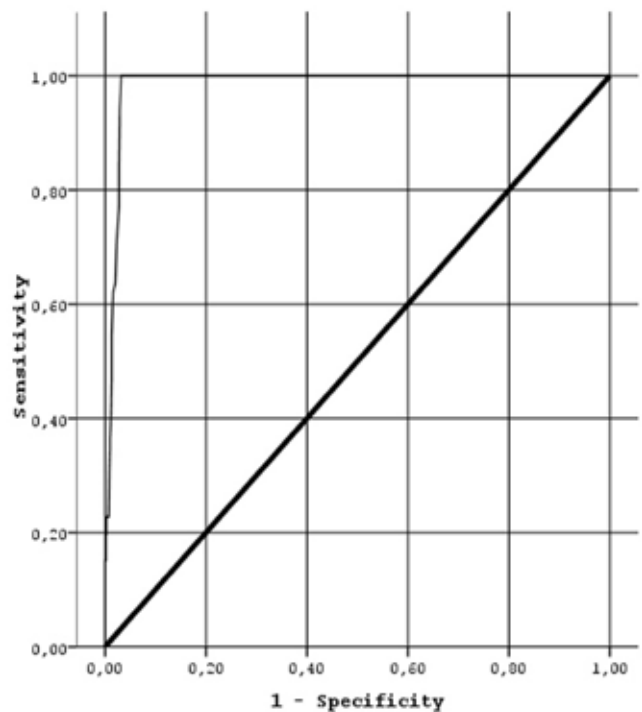
### Pearson correlations

We run Pearson product-moment correlation coefficient to evaluate the shared variance between total and sub-scales scores of the CIAS and YIAT. The correlation analyses showed that YIAT total scores strongly correlated with total and sub-scales scores of the CIAS, ranging from 0.68 to 0.85. Findings are presented in Table 3.

### Signal detection analysis

We used the cut values of the CIAS ( $\geq 64$ ) plus the WHODAS 2.0 ( $\geq 17$ ) as the gold standard for a principal diagnosis of Internet addiction. We detected 66 individuals were Internet addicts. The first receiver operating characteristic analysis assessed the ability of the CIAS total score *per se* to precisely identify 66 individuals with Internet addiction from a sample of 754 college students. The area under the curve (AUC) was very close to 1.00 (AUC=0.985,  $p < 0.001$ , Asymptotic 95% Confidence Interval = 0.978 - 0.993), which is indicative of excellent diagnostic efficiency of the cut-off value (See Figure 1). The cut score simultaneously optimizing both

sensitivity and specificity was derived for CIAS total scores. Not surprisingly, as can be seen in Table 6, the cut score on the CIAS  $\geq 64$  simultaneously optimized both sensitivity (100%) and specificity (96.8%), with an excellent diagnostic accuracy (97.1%). This result can be interpreted in a way that the initial proposed cut-off for the CIAS total score by Ko et al. (2005; 2005; 2009), well captures functional impairment related to pathological Internet use and can be reliably used in screening community samples.



**Figure 1. Receiver operating characteristic analysis curve for the CIAS total score in a sample of college students. The break point of the line closest to the left upper corner denotes the point that simultaneously optimizes specificity and sensitivity of the CIAS.**



The second receiver operating characteristic analysis assessed the ability of YIAT total score to correctly identify 66 individuals with Internet addiction from the same sample. The analysis revealed a strong signal

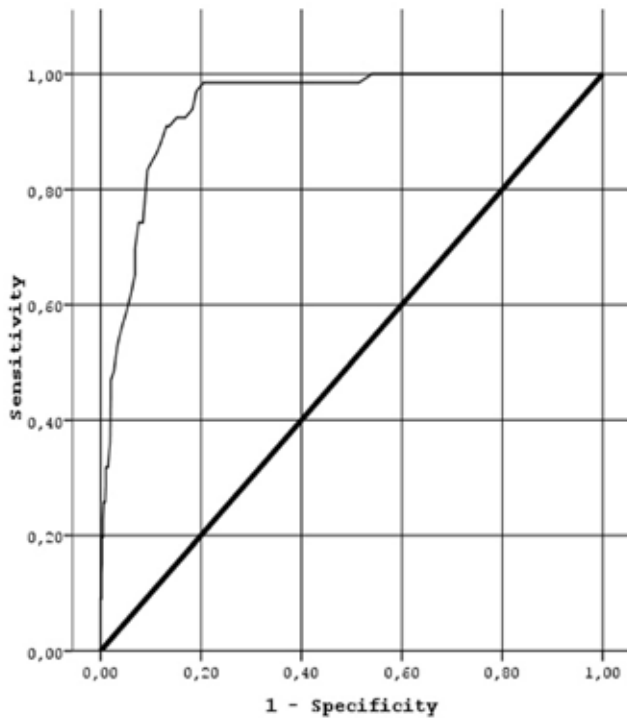


Figure 2. Receiver operating characteristic analysis curve for the YIAT total score in a sample of college students. The break point of the line closest to the left upper corner denotes the point that simultaneously optimizes specificity and sensitivity of the YIAT.

detecting curve for the YIAT total score (AUC=0.943,  $p < 0.001$ , Asymptotic 95% Confidence Interval = 0.922 - 0.965). (See Figure 2). The cut score optimizing both sensitivity and specificity were derived for values of the YIAT total score. When sensitivity and specificity were both optimized (cut score=40), 60 of 66 Internet addicts (90.90%) and 598 of 688 non-addicts (86.9%) were correctly detected. Overall, 87.3% of the sample was correctly classified using cut score of the YIAT total score. Sensitivity, specificity and optimal cut values for the CAIS and the YIAT are presented in Table 4.

### ANOVAs across attachment styles

We performed nineteen one-way analysis of variance models to investigate the mean differences in scores on Internet addiction as measured by the CIAS and YIAT, emotional dysregulation as indexed by the subscales of the DERS, anxiety and depression as rated on the BAI and CES-D and functional impairment as measured by the WHODAS 2.0 self-report across attachment styles. All ANOVA models indicated significant F values that post-hoc analyses were performed using Bonferroni multiple comparison test.

ANOVA models comparing subscales of the CIAS and IAT total scores across attachment styles showed that people with preoccupied and fearful attach styles were at greater risk for Internet addiction relative to secure and

Table 4. Sensitivity and specificity for the CIAS and YIAT total scores according to the gold standard based on the CIAS ( $\geq 64$ ) plus WHODAS 2.0 ( $\geq 17$ ) cutoffs

CIAS total	Sensitivity	Specificity	YIAT Total	Sensitivity	Specificity
57.50	1.000	0.911	33.50	0.985	0.795
58.50	1.000	0.924	34.50	0.970	0.810
59.50	1.000	0.932	35.50	0.939	0.817
60.50	1.000	0.940	36.50	0.924	0.831
61.50	1.000	0.946	37.50	0.924	0.849
62.50	1.000	0.959	38.50	0.909	0.863
<b>*63.50</b>	<b>1.000</b>	<b>0.968</b>	<b>*39.50</b>	<b>0.909</b>	<b>0.869</b>
64.50	0.939	0.971	40.50	0.879	0.881
65.50	0.833	0.972	41.50	0.864	0.888
66.50	0.773	0.972	42.50	0.833	0.907
67.50	0.712	0.977	43.50	0.742	0.916
68.50	0.636	0.980	44.50	0.742	0.920
69.50	0.621	0.984	45.50	0.742	0.924

Note. \*indicated optimal cutoff values for the CIAS and YIAT total scores. CIAS= Chen Internet Addiction Test; YIAT=Young Internet Addiction Test; WHODAS 2.0 = WHO Disability Assessment Schedule 2.0 Short Form – Self Assessment

**Table 5. One-way analysis of variance of scale scores across attachment styles**

	Attachment Styles												Post Hoc <sup>†</sup>
	Secure n=144		Avoidant n=187		Preoccupied n=145		Fearful n=278		F(3, 750)	P	$\eta^2$		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD					
Chen Internet Addiction Scale	39.90	11.67	41.13	13.58	46.03	14.97	46.33	15.90	<b>9.647</b>	<b>&lt;0.001</b>	<b>0.037</b>	S=A<P=F	
Compulsive Use	7.48	2.96	7.73	3.19	8.83	3.53	8.82	3.59	<b>8.039</b>	<b>&lt;0.001</b>	<b>0.031</b>	S=A<P=F	
Withdrawal	8.36	3.08	8.67	3.48	9.90	3.56	9.74	3.59	<b>8.426</b>	<b>&lt;0.001</b>	<b>0.033</b>	S=A<P=F	
Tolerance	6.60	2.32	6.72	2.65	7.71	2.83	7.58	2.86	<b>7.943</b>	<b>&lt;0.001</b>	<b>0.031</b>	S=A<P=F	
Interpersonal and health problems	10.33	3.63	10.73	3.95	11.46	4.30	12.08	4.71	<b>6.789</b>	<b>&lt;0.001</b>	<b>0.026</b>	S=A<P=F	
Time management difficulties	7.13	2.35	7.28	2.75	8.14	3.04	8.10	3.34	<b>5.760</b>	<b>0.001</b>	<b>0.023</b>	S=A<P=F	
Young Internet Addiction Test	20.15	15.76	20.87	16.91	27.09	17.06	28.12	17.60	<b>11.321</b>	<b>&lt;0.001</b>	<b>0.043</b>	S=A<P=F	
Difficulties in Emotion Regulation Scale Global	74.87	19.08	81.45	19.85	89.30	22.76	95.76	20.34	<b>38.969</b>	<b>&lt;0.001</b>	<b>0.135</b>	S<A<P<F	
Non-acceptance of Emotional Responses	10.36	4.35	11.26	4.75	12.92	5.72	14.59	5.42	<b>27.468</b>	<b>&lt;0.001</b>	<b>0.099</b>	S=A<P<F	
Difficulties engaging in goal directed behaviour	13.04	4.53	13.71	4.08	15.57	4.80	16.13	4.14	<b>22.057</b>	<b>&lt;0.001</b>	<b>0.081</b>	S=A<P=F	
Impulse control difficulties	12.17	5.03	12.44	4.58	14.94	5.52	15.80	5.32	<b>24.802</b>	<b>&lt;0.001</b>	<b>0.090</b>	S=A<P=F	
Lack of emotional awareness	15.11	4.15	17.07	4.60	15.54	4.65	16.22	4.29	<b>6.255</b>	<b>&lt;0.001</b>	<b>0.024</b>	S=P=F<A	
Limited access to emotion regulation strategies	14.53	5.84	15.45	6.10	18.68	7.39	19.98	6.67	<b>30.968</b>	<b>&lt;0.001</b>	<b>0.110</b>	S=A<P=F	
Lack of emotional clarity	9.65	3.28	11.52	4.23	11.65	4.13	13.05	4.31	<b>22.297</b>	<b>&lt;0.001</b>	<b>0.082</b>	S<A=P<F	
Beck Anxiety Inventory	8.67	8.44	11.04	10.36	14.20	12.83	16.87	12.09	<b>20.417</b>	<b>&lt;0.001</b>	<b>0.076</b>	S<A<P<F	
Center for Epidemiological Studies Depression Scale	15.33	10.13	18.02	9.58	22.21	12.59	25.03	11.88	<b>29.368</b>	<b>&lt;0.001</b>	<b>0.105</b>	S<A<P<F	
WHO Disability Assessment Schedule 2.0	14.19	9.46	16.74	9.81	17.69	8.89	18.55	8.80	<b>7.378</b>	<b>&lt;0.001</b>	<b>0.029</b>	S<A=P<F	
Attachment Anxiety	46.63	9.73	49.28	9.83	82.69	15.14	79.44	12.47	<b>457.152</b>	<b>&lt;0.001</b>	<b>0.646</b>	S=A<P<F	
Attachment Avoidance	45.78	10.80	79.79	10.66	52.26	8.65	77.65	11.46	<b>466.444</b>	<b>&lt;0.001</b>	<b>0.651</b>	S<P<A=F	

Note. Statistically significant statistics are boldfaced. <sup>†</sup>Post hoc analyses were conducted using Bonferroni multiple group comparison test.

**Table 6. Logistic regression analyses on pathological Internet use**

	CIAS $\geq$ 64 plus WHODAS.20 $\geq$ 17			YIAT $\geq$ 40		
	P	Odds Ratio	95% CI	P	Odds Ratio	95% CI
Age	0.971	0.998	0.909-1.097	<b>0.027</b>	<b>0.916</b>	<b>0.848-0.990</b>
Gender	<b>&lt;0.001</b>	<b>0.175</b>	<b>0.088-0.345</b>	<b>&lt;0.001</b>	<b>0.361</b>	<b>0.233-0.560</b>
Income	0.092	1.853	0.904-3.799	0.550	1.157	0.716-1.870
Non-acceptance of Emotional Responses	0.123	0.952	0.893-1.014	0.706	1.009	0.965-1.054
Difficulties engaging in goal directed behaviour	0.135	1.072	0.978-1.175	<b>0.031</b>	<b>1.068</b>	<b>1.006-1.133</b>
Impulse control difficulties	0.726	0.986	0.910-1.068	0.361	0.975	0.923-1.030
Lack of emotional awareness	0.964	0.998	0.924-1.079	0.597	0.986	0.936-1.038
Limited access to emotion regulation strategies	0.725	1.013	0.945-1.085	0.971	0.999	0.953-1.047
Lack of emotional clarity	<b>&lt;0.001</b>	<b>1.228</b>	<b>1.118-1.349</b>	<b>&lt;0.001</b>	<b>1.154</b>	<b>1.084-1.228</b>
Beck Anxiety Inventory	<b>0.017</b>	<b>1.034</b>	<b>1.006-1.062</b>	<b>0.001</b>	<b>1.034</b>	<b>1.014-1.054</b>
Center for Epidemiological Studies Depression Scale	<b>0.004</b>	<b>1.053</b>	<b>1.017-1.091</b>	0.059	1.023	0.999-1.048
Attachment Anxiety	0.216	1.010	0.994-1.027	0.787	1.002	0.990-1.013
Attachment Avoidance	0.384	1.009	0.989-1.028	0.446	1.005	0.992-1.017

Note. Statistically significant statistics are boldfaced. Gender: 0=Male; 1=Female; Income: 0=Low, 1=Average, 2=Upper. CIAS= Chen Internet Addiction Test; YIAT=Internet Addiction Test

avoidant individuals. In comparison to preoccupied and fearful attachment, secure individuals in general reported better emotional regulation capacity as well as avoidant type. Fearful respondents were at greater risk for development of depression and anxiety, following by preoccupied individuals. The same was true for functional impairment as measured by the WHODAS 2.0 scores. Findings are presented in Table 5.

### Logistic regression analysis

To explore the risk factors for pathological Internet use, we run two logistic regression analyses in which individuals who reported 64 or higher scores on the CIAS plus 17 or higher on the WHODAS 2.0 and individuals who scored 40 or higher on the YIAT were binary dependent variables. In the regression models, socio-demographic variables in terms of age, gender and income, six sub-scales of the DERS, two dimensions of the ECR-R, depression as indexed by the CES-D and anxiety as measured by the BAI were sequentially regressed on dependent variables.

In the first regression analysis, we found that being male (OR= 0.175,  $p < 0.001$  95% CI = 0.088-0.345), lack of emotional clarity (OR= 1.228,  $p < 0.001$  95% CI = 1.118-1.349), anxiety (OR= 1.034,  $p = 0.017$  95% CI = 1.006-1.062), and depression (OR= 1.053,  $p = 0.004$  95% CI =

1.017-1.091) significantly contributed to the unique variance of pathological Internet use.

In the second regression model in which YIAT cut value was utilized to identify Internet addicts, we found that younger age (OR= 0.916,  $p = 0.027$  95% CI = 0.848-0.990), being male (OR= 0.361,  $p < 0.001$  95% CI = 0.233-0.560), Difficulties engaging in goal directed behaviour (OR= 1.068,  $p = 0.031$  95% CI = 1.006-1.133), lack of emotional clarity (OR= 1.154,  $p < 0.001$  95% CI = 1.084-1.228), and anxiety (OR= 1.034,  $p = 0.001$  95% CI = 1.014-1.054) were significant predictors of pathological Internet use. Results are presented in Table 6.

## DISCUSSION

Expanding on the Ko et al.'s work (2005; 2005; 2009), we tested the diagnostic efficiency of the cutoff on the CIAS ( $\geq 64$ ) through using an assessment procedure involving the WHODAS 2.0 to determine functional impairment in regard to unduly Internet use along with the CIAS total scores. We also determined the optimal demarcation point on the YIAT scores for the Internet use disorders relying on the cutoff on the CIAS ( $\geq 64$ ) plus WHODAS 2.0 ( $\geq 17$ ). Based on the data recruited from a relatively large sample of college students we detected 66 individuals were Internet addicts (8.75%). The

prevalence rate observed in the current sample was consistent with the previous reports (D. Gentile, 2009; Grusser, Thalemann, & Griffiths, 2007; Salguero & Moran, 2002), indicating that online addiction is not rare in normal community population. Signal detection analysis attested to the optimal cutoff point originally proposed by Ko et al. (2005; 2005; 2009) for the Turkish version of the CIAS and indicated excellent diagnostic efficiency that 97.1% of participants were correctly classified predicated on their online addiction status. Moreover, a cutoff point of 40 or higher than 40 on the YIAT was observed as optimal detection point correctly differentiate participants with pathological online addictive behaviours from healthy participants. Using the cutoff point of the YIAT  $\geq 40$ , 87.3% of the respondents were correctly classified. Our results confirmed and expanded the previous findings in the literature (Aboujaoude, 2010; Ko, Yen, Yen, et al., 2005; Ko, Yen, Chen, et al., 2005; Ko, Yen, Chen, Yang, et al., 2009; Kuss et al., 2014).

The emerging evidence relevant to the process of problematic Internet use suggests that such behaviours could be best understood on along a continuum ranging from normal use to pathological levels certain with severe impairment in functionality which can be conceptualized as a maladaptive self-regulatory strategy (Billieux & Van der Linden, 2012; LaRose, Lin, & Eastin, 2003; Spada, Langston, Nikcevic, & Moneta, 2008; Tokunaga, 2015; Yu, Kim, & Hay, 2013). High comorbid psychiatric conditions are typical in Internet use disorders rather than exception (Cho et al., 2013; Gamez-Guadix, 2014; D. A. Gentile et al., 2011; Ko et al., 2014; Ko, Yen, Chen, Yeh, et al., 2009) in which co-occurrence of online addictive behaviours and psychological problems seems to reciprocally related to each other (Anderson et al., 2017; Ciarrochi et al., 2016; G. Dong et al., 2011; Gamez-Guadix et al., 2013; van den Eijnden et al., 2008) that can be interpreted in a way emotion dysregulation interplays between internalizing and aberrant online behaviors to be regarded as externalizing behaviours. Even though this high comorbidity calls the concept of Internet addiction into question whether it is really a clinical entity or a behavioral problem secondary to other clinical conditions

On the other hand, emerging evidence indicates that difficulties in emotion regulation causally involves in development and maintenance of online behavioral problems (Billieux & Van der Linden, 2012; Oktan, 2011; Yen et al., 2018; Yildiz, 2017). Several lines of research has consistently attested to the critical role of emotion regulation capacity on difficulties managing online behaviors underpinned by various vulnerability factors such as personality, perceived parental behaviors, meta-cognitions and distress tolerance (Akbari, 2017; Montag et al., 2016; Spada & Marino, 2017; Yu et al., 2013). Our results were in consonant with the accumulated evidence that emotion regulation incapacity in terms of Difficulties engaging in goal directed behaviour and Lack of emotional clarity were significant antecedents of Internet addiction. Moreover, participants high in depressive and anxious symptomatology were at greater risk for over-engagement in online addictive behaviours.

Interpersonal nature of emotion regulation and significant relations to early childhood experiences lying under the development of attachment capacity have long been recognized and well-documented (Cozolino, 2013; Schore, 2016; Siegel, 2012). In keeping with the view of interpersonal regulation of emotions, attachment insecurities were found to be tied to the excessive online behavioral engagement (M. P. Lin et al., 2011; Monacis et al., 2017a, 2017b; Schimmenti et al., 2012; Severino & Craparo, 2013) putatively mediate by affective symptomatology (Shin et al., 2011) and highly associated with negative experiences in family environment (Kim & Kim, 2015; Lei & Wu, 2007), particularly adverse childhood experiences (Schimmenti et al., 2014). Our results were partially in line with attachment studies of online behavioral addiction that participants with preoccupied and fearful attachment style were more likely to exhibit undue engagement in online use resulting in functional impairment. Although these findings overlapped in part with the previous studies (Odaci & Cikrikci, 2014; Savci & Aysan, 2016), our data pointed out that a tendency to interpersonal avoidance seems to protect against Internet use disorders. Given the research findings concerned with the relations between attachment insecurities and social network use (Jenkins-Guarnieri et

al., 2012; Lee, 2013), avoidant people may less likely use maladaptive online regulation strategies. On the other hand, the associations of attachment avoidance and anxiety with excessive Internet use were no longer significant once their shared variance with emotional dysregulation, affective symptoms and demographic variables.

Several important limitations of this study should be highlighted. First, our data sampled only college students and participants were not randomly selected that the study group is not representative of young adults. Also cohort studies with different age groups should be conducted to firmly confirm our results. Second, the research design of the study was cross sectional. Longitudinal design studies are needed to obtain more reliable relations including precise causality between the variables of interest. Third, from the view of social cognitive models of media use, due to the widespread use of online media it is difficult to distinguish between pathological and unduly use of Internet and long times spent online may not always necessarily be the case pathological (LaRose, 2010; LaRose & Eastin, 2004; LaRose et al., 2003; Tokunaga, 2017; Tokunaga & Rains, 2010). Finally, pathological Internet use has been found to be related to a number of factors such as identity status (Morsunbul, 2014), family factors (Ko et al., 2015; Park, Kim, & Cho, 2008; Yen, Yen, Chen, Chen, & Ko, 2007), social support (Durkee et al., 2012). Moreover, the robust relations between physical activity and emotional well-being have been documented (Irandoust & Taheri, 2017; Taheri & Irandoust, 2018) that sedentary behaviours seem to be an integral part of maladaptive unduly Internet use (Vandelanotte, Sugiyama, Gardiner, & Owen, 2009). Therefore, comprehensive investigations capturing the lifestyle of Internet addicts will provide more fruitful

information about the etiology of the disorder.

The term 'Internet addiction' still sparks hot debates about whether it is a clinical entity, a behavioral problem secondary to other disorders or a subtype of a supreme disorder which may be better understood in the scope of an umbrella conceptualization of a 'general behavioral addiction' factor (Shaffer, Hall, & Vander Bilt, 2000; Starcevic, 2010, 2013). The confirmation of the cutpoint of the CIAS by means of adding the WHODAS 2.0 to assessment procedure to more profoundly assess the functional impairment with respect to pathological Internet use supported the notion that unduly online behaviours convey pathological aspects and can be clinically discriminated by using the proposed procedure utilized in the current study. Besides, the proposed assessment procedure could also be beneficial to determine prevalence rates and risky populations as to online addiction disorders in community dwelling and clinical samples, to more profoundly understand the underpinning mechanisms of the disorder and to evaluate the course and prognosis of online behavioral addictions. This study also add to our understanding that attachment insecurities and difficulties in emotion regulation as well as internalizing symptoms in terms of anxiety and depression which are robust correlates of attachment and emotion regulation seems to causally involve in development and perseverance of online addiction disorders.

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