

S. Amendola¹, V. Spensieri¹,
V. Guidetti², R. Cerutti¹

¹ Department of Dynamic and Clinical
Psychology, Faculty of Medicine and
Psychology, Sapienza University of Rome;

² Department of Human Neuroscience,
Faculty of Medicine and Dentistry,
Sapienza University of Rome

The relationship between difficulties in emotion regulation and dysfunctional technology use among adolescents

Summary

Objectives

Since two decades scientific research is studying excessive and dysfunctional new technologies use and its influences on people's lives, in terms of personal, relational, scholastic and work functioning impairment. The objectives of the present study are to investigate gender differences in problematic new technologies use as well as to examine the relationship between problematic new technologies use, emotional regulation and its specific dimensions.

Methods

280 Italian adolescents (51.1% males) aged 11 to 18 years (mean age = 13.31; SD = 2.33) were recruited from two Italian secondary public schools and involved in this study. Data were collected using the Internet Addiction Test, the Video Game Dependency Scale, the Brief Multicultural Version of the Test of Mobile-Phone Dependence and the Difficulties in Emotion Regulation Scale.

Results

Results indicate significant association between emotion dysregulation and problematic internet ($r = .504$; $p < .001$), videogame ($r = .372$; $p < .001$), mobile-phone ($r = .424$; $p < .001$) use. These results support hypothesis that adolescents with greater emotion dysregulation are more likely to experience problematic new technologies use. Additionally, stepwise multiple regression analysis pointed out that the lack of effective emotion regulation strategies is a common risk factor between the problematic new technologies use, but regression analysis highlighted specific risk factors for some of the investigated dependent behaviors.

Conclusions

Findings of this study highlight a link between problematic new technologies use, emotion dysregulation and its specific dimensions. The results are discussed considering scientific advances and the role of emotional dysregulation in determining problematic new technologies use in adolescence. Further research with larger sample sizes is needed to confirm our data.

Key words

Internet Gaming Disorder • Internet Addiction • Problematic Mobile-Phone Use • Emotion Regulation • Adolescence

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Correspondence

Rita Cerutti
Department of Dynamic and Clinical
Psychology, Sapienza University of Rome,
via degli Apuli 1, 00185 Rome
Tel. +39 06 4991 7936 • Fax +39 06 4991 7910
E-mail: rita.cerutti@uniroma1.it

Introduction

The term "addiction", was traditionally used to explain symptoms deriving from the use and abuse of substances. In the current literature, it

refers to dysfunctional behaviors and negative consequences associated to the repetition of typically socially accepted activities (e.g., gambling, internet use and videogames)¹. In recent years, scientific research has shown interest in the problematic use of or addiction to new technologies including Internet Addiction²⁻⁴, Internet Gaming Disorder⁵⁻⁷ and Mobile-Phone Addiction⁸⁻¹⁰. These behaviors have been conceptualized in different ways. On the one hand, they may be considered along an impulsive-compulsive spectrum (with some classified as impulse control disorders). On the other hand, which does not exclude the former, they may also be conceptualized as Behavioral Addictions^{11 12}.

In a recent review study, Grant and colleagues¹³ point out that behavioral addictions resemble substance addictions in diverse domains, including natural history, phenomenology, tolerance, co-morbidity, overlapping genetic contributions, neurobiological mechanisms and response to treatment. These findings concern pathological gambling exclusively and, only in part, extend to internet and videogame addictions, while there is not enough data to draw conclusions regarding other behavioral addictions.

Concerning neurobiological findings, recent research highlighted that problematic internet use is associated with structural or functional impairment in the regions of brain implicated in the process of reward, motivation, memory and cognitive control². Specifically, the orbitofrontal and the prefrontal cortex³ resulted involved in the development of internet addiction, suggesting that adolescence represents a specific risk phase due to the yet incomplete maturation of the development of these specific brain regions³.

The publication of the fifth version of the DSM 5 represents a fundamental innovation on this topic. Indeed, Pathological Gambling has been recategorized within the “Substance-Related and Addictive Disorders” section and renamed Gambling Disorder. With this change, gambling disorder has become the first recognized non substance behavioral addiction. Furthermore, Internet Gaming Disorder (IGD) is included in Section III, as a condition warranting more clinical research before it may be considered for inclusion as a formal disorder.

IGD is defined as the persistent and recurrent use of internet-based games, often with other players, that leads to clinically significant impairment or distress, as indicated by the presence of at least five criteria among those reported in the DSM-5, during the last 12 months⁵. However, the DSM-5 does not include an Internet Addiction Disorder diagnosis and no shared diagnostic criteria for this condition are available. Data on the prevalence of internet addiction is limited by methodological difficulties concerning both the diagnosis and the heterogeneity of diagnostic tools, making it difficult to

compare prevalence rates among different countries¹⁴. These concerns also regard the study of IGD⁷ and mobile-phone addiction¹⁴⁻¹⁶.

Another important aspect to keep in mind is related to the complexity of technologies their diverse uses and applications. The latest generation of mobile phones allows easy accessibility and usability of internet and videogames. Griffiths¹⁷ distinguishes between addiction “to” the internet and “on” the internet, to clarify how some individuals may be Internet addicted but not necessarily addicted to the internet per se, since they use it only as a medium to satisfy other addictions. Similarly, Billieux¹⁸ considers dysfunctional use of mobile phones that implies involvement in specific online activities (e.g., videogames, gambling and other addictive behaviors). In other words, a videogamer who uses the internet or mobile-phone primarily to play could be addicted to videogames but may not be addicted to the internet per se (similar to pathological gamblers who use the internet or mobile-phones only to bet). The distinction between these different behaviors should be considered. The risk is to confuse the different modalities of technology usage (internet, videogame, mobile-phone).

Addiction and emotion (dys)regulation

Difficulties in emotional regulation, in particular the regulation of negative and painful emotions, plays an important role in increasing the risk of developing or maintaining an addiction^{4 19-22}. Emotion regulation refers to how an individual sustains, intensifies, or inhibits ones emotions, according to ones purposes²³. Some studies highlight the relationships between emotion regulation and addiction including internet addiction⁴. In particular, faced with the inability to tolerate intense and unpleasant emotional states, individuals resort to substances and/or behaviors in order to experience temporary relief. There are still very few studies that have investigated the relationship between emotional dysregulation and addictions to new technologies in adolescence, for example, problematic videogame and internet usage²⁴. Research has suggested that internet and technology use can be a way to escape and get away from reality as well to cope with stress, depression, loneliness and worry^{4 26}. Indeed, motivations reported more frequently by problematic gamers include the use of videogames to relieve tension and escape from reality²⁷.

The apparent benefits of addictive behavior (e.g. changes in mood and subjective experience, relaxation and pleasure, coping strategy social anxiety, fear, tension and painful emotions) reinforce the behavior, representing a temporary solution or coping strategy to managing developmental tasks. However, the dysfunctional and disorganizing nature of the addiction has been shown to have an impact on adolescent’s psychophysical health.

In light of the above, the present study adds to the existing knowledge on the link between emotion regulation and technology use and is based on the conceptualization of emotion regulation as proposed by Gratz and Roemer ²⁸. In particular, the following dimensions have been included to define the concept: a) awareness and understanding of emotions; b) acceptance of emotions; c) the ability to control impulsive behaviors and behave in accordance with desired goals when experiencing negative emotions; and d) the ability to use strategies to regulate emotions appropriate to the situation and in a flexible way, in order to modulate the emotional responses as desired, so as to achieve individual goals and situational requests.

Objectives

The current study aimed to explore the relationships between difficulties in emotion regulation and adolescents' problematic internet use (PIU), problematic videogame use (PVU) and problematic mobile-phone use (PMPU). This study's objectives include the following:

- to evaluate the prevalence of PIU, PVU, PMPU, gender and age groups differences;
- to analyze the relationship between problematic technology use (internet, videogame and mobile-phone) and emotion dysregulation, exploring in particular potential associations with the emotion dysregulation dimensions;
- finally, the predictive effect of the emotion dysregulation dimensions (Nonacceptance, Goals, Impulse, Strategies, Awareness and Clarity) on problematic technology use (including PIU, PVU and PMPU) will be investigated through stepwise multiple regression analysis. The aim was to examine which specific dimensions of emotion dysregulation better predict problematic technology use. The stepwise multiple regression was employed in order to identify the independent variables that have stronger associations with the dependent variable. This procedure involves analysis at each step to analyze the specific contribution of the predictor variable entered previously in the equation in order to understand the contribution of the previous variables when the new independent variable has been added.

Materials and methods

Subjects

This study was conducted on a sample of 280 Italian students (M = 143, F = 137) aged 11-18 (M = 13.31, SD = 2.33) attending two secondary schools in central Italy. A written informed consent was obtained from the parents before inclusion in the study. Collective admin-

istration of the self-report questionnaires took place during school time in the classrooms. Anonymity of participants was ensured. This study was approved by the Ethics Committee of the Department of Dynamic and Clinical Psychology, Faculty of Medicine and Psychology, Sapienza University of Rome (Italy).

Measures

All participants in the research completed the questionnaires described below:

- the *Internet Addiction Test (IAT) (Young)* ^{4 29} is a 20 item self-report questionnaire assessing the level of psychopathological risk associated with the internet, examining the degree of concern and compulsiveness, as well as the impact on the individual's life. Participants responded on a Likert scale ranging from 1 (*never*) to 5 (*always*). A higher total score reflects a high level of PIU. Based on the IAT total score, Young ³⁰ distinguishes the following internet users: a score between 0 and 30 points is considered below the average and does not indicate any problem related to the use of the internet; a score between 31 and 49 points suggest an average use of the Internet, the individual can sometimes surf the web a little too long, without losing control of the situation; a score between 50 and 79 points is above the average score that implies occasional problems related to use, a condition at risk for addiction development; finally, a score between 80 and 100 points indicates that internet use is intense causing significant problems and is suggestive of an Internet Addiction (IA). The psychometric evaluation of the IAT Italian version demonstrated good internal consistency (Cronbach's α values range from .83 to .86) and convergent validity ³¹. In the present study, the scale showed good internal consistency (Cronbach's α of .85);
- the *Video Game Dependency Scale (CSAS)* ⁷ is a self-report questionnaire including 18 items evaluating PVU, both online and offline. This instrument covers all nine DSM-5 criteria for the IGD diagnosis and reflects a first estimate of the risk of developing the condition. Students were instructed to respond based on their gaming behavior within the last 12 months and rated each item on a four-point scale from 1 (*strongly disagree*) to 4 (*strongly agree*). The CSAS demonstrated very good reliability in Rehbein et al.⁷ (Cronbach's α = 0.93). In the present study, the scale showed a very good internal consistency (Cronbach's α of .93). For research purposes, the CSAS total score was used as a dimensional indicator of the degree of PVU;
- the *Brief Multicultural Version of the Test of Mobile Phone Dependence (TMD brief)* ³² is a self-report questionnaire consisting of 12 items that investigate

problems related to PMPU. The first three items are answered on a scale ranging from 0 (*never*) to 4 (*frequently*). The nine remaining items use a scale ranging from 0 (*completely disagree*) to 4 (*completely agree*). This instrument was adapted from a previous instrument (TMD)¹⁰ initially developed according to the DSM-IV-TR criteria for dependence disorder. The authors³² reported that the questionnaire exhibits good reliability (Cronbach's $\alpha = 0.88$). They outline four dimensions: Abstinence; Abuse and Interference with other activities; Tolerance; and Difficulty of control: These are representative of the addictive process. In the present study, the scale demonstrated good internal consistency (Cronbach's α of .87);

- the *Difficulties in Emotion Regulation Scale* (DERS) 28 is a 36 item self-report measure developed to assess clinically relevant difficulties in emotion regulation. Items are scored on six subscales: Non acceptance of Emotional Responses (Non acceptance, 6 items); Difficulties Engaging in Goal-Directed Behavior (Goals, 5 items); Impulse Control Difficulties (Impulse, 6 items); Lack of Emotional Awareness (Awareness, 6 items); Limited Access to Emotion Regulation Strategies (Strategies, 8 items); and Lack of Emotional Clarity (Clarity, 5 items). Participants respond on a Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). High scores reflect greater difficulties in emotion regulation. The DERS and its subscales have strong psychometric properties²². In the Italian context, the DERS has been shown to be a valid and reliable tool (Cronbach's $\alpha = .90$)³³. In the present study, the scale showed good internal consistency (Cronbach's α of .87) as well as all six subscales (Cronbach's α from .66, Awareness, to .80, Strategies).

Statistical analysis

Data were analyzed using the Statistical Package for Social Science (SPSS) 25.0 for Windows. The sample ($n = 280$) was divided in 3 subgroups based on age: group 1: aged 11-12 years ($n = 138$); group 2: aged 13-15 years ($n = 77$); and group 3: aged 16-18 years ($n = 65$). Descriptive statistics were used to evaluate sample characteristics (frequency, means and standard deviations). Three zero-order correlations between the variables were initially calculated in order to analyze the relationships between the variables of this study. Subsequently, analysis of univariate variance (ANOVAs) were used to investigate the main differences according to gender and the three age groups. Stepwise multiple linear regression analysis was conducted in order to determine whether there were any predictive effects of the emotion regulation dimensions on PIU, PVU and PMPU.

Results

The total sample's ($n = 280$) mean score on the IAT was 42.09 (SD = 11.32). No statistically significant differences emerged between males and females ($F(1,279) = 2.42$; $p = .35$).

On the basis of the cut off set by Young³⁰, 15.4% ($n = 43$) of the participants did not report any problems related to the internet use with a total score below the average on the IAT (from 0 to 30); 58.8% ($n = 165$) of participants reported a total score range (from 31 to 49) that suggests an average use of the internet indicating that the individual can sometimes surf the web a little too long, without losing control of the situation; 25.7% ($n = 72$) of participants obtains a score above the average (from 50 to 79) that implies occasional problems related to internet use, a condition at risk for addiction development. No participant obtained a test score between 80 and 100 points indicating significant problems and an internet addiction.

The total sample's ($n = 280$) mean score on the CSAS was 27.17 (SD = 10.14). Statistically significant differences in relation to gender emerged ($F(1,279) = 39.59$; $p < .001$) indicating that males ($M = 30.71$, SD = 11.01) consistently scored higher than females ($M = 23.47$, SD = 7.57) on PVU, both online and offline.

As outlined by Rehbein and colleagues⁷, the item scores that are based on the DSM-5 criteria were calculated. Approximately three percent ($n = 9$, aged 11-13) of participants appeared to meet the diagnostic criteria for IGD, including eight males and one female.

Finally, the total sample's ($n = 280$) mean score on the TMD brief was 19.89 (SD = 10.54). No statistically significant differences emerged between males and females ($F(1,279) = 3.02$; $p = .08$).

Significant positive correlations between PIU and PVU ($r = .520$; $p < .001$), between PIU and PMPU ($r = .688$; $p < .001$), as well as between PVU and PMPU ($r = .397$; $p < .001$) were found. Significant positive correlations between emotion dysregulation and PIU ($r = .504$; $p < .001$), PVU ($r = .372$; $p < .001$) and PMPU ($r = .424$; $p < .001$) also emerged (Tab. I).

Additionally, stepwise multiple regression analyses showed that the "Strategies" factor of the DERS appears to be the best predictor of PIU, PVU and PMPU (Tabs. II-IV). Regarding PVU, "Strategies", male gender and "Non acceptance" explained 29% of the variance in CSAS scores. With respect to PIU, "Strategies" and "Goal" explained 25% of the variance in IAT scores. Finally, in terms of PMPU, "Strategies" explained 18% of the variance in TMD brief scores.

Furthermore, findings highlighted statistically significant differences between the three subgroups (group 1: aged 11-12; group 2: aged 13-15; and group 3: aged 16-18) in IAT, CSAS and DERS scores (Tab. V).

TABLE I. Pearson correlation among psychological test scores.

	CSAS	IAT	TMDbrief
DERS	0.372***	0.504***	0.424***
NonAcceptance	0.373***	0.411***	0.334***
Goal	0.217***	0.344***	0.305***
Impulse	0.276***	0.346***	0.319***
Awareness	-0.034	-0.004	-0.025
Strategies	0.409***	0.489***	0.429***
Clarity	0.093	0.261***	0.182***

Note. CSAS: Video Game Dependency Scale; IAT: Internet Addiction Test; TMDbrief: Test of Mobile Phone Dependence Brief Version; DERS: Difficulties in Emotion Regulation Scale; * $p < .05$; ** $p < .01$; *** $p < .001$.

Group 2 obtained a higher mean score than the other two age groups on both the IAT and the DERS. Group 1 demonstrated a higher mean score than the other two groups on the CSAS. No statistically significant differences emerged between the groups on the TMD brief. Regarding the DERS subscales, the limited access to emotion regulation strategies ("Strategies") was significantly different between groups: group 2 reported a higher mean score than the other two groups.

Discussion and conclusions

Excessive and problematic use of the internet^{16 14 25}, videogames^{24 7} and mobile-phones¹⁸, can have a negative impact on the psychophysical and social-relational well-being of the individual. In accordance with Young³⁰, no research participant met the diagnostic criteria for Internet Addiction, as measured by the IAT. These results are in contrast to with other studies carried out in Europe. In particular, findings from a Greek study² revealed a 6.2% prevalence rate of IA in adolescents aged 14 to 18 years. Conversely, our results are in line with other studies carried out in Italy among adolescent non-clinical populations which have reported a low prevalence rate ranging from 0.79%³⁴ to 1.2%¹⁶ for IA. Similarly, a recent study³⁵ on a sample of Italian adults, showed that no participant scored between 80 and 100 on the IAT (indicating IA).

In our sample, 25.7% ($n = 70$) of participants received a score between 50 and 79, with occasional problems related to internet use, reflecting a risk condition for the development of IA³⁰. This finding is in accordance with other Italian studies in which the prevalence of those at risk of developing IA has ranged from 5%³⁴ to 49%¹⁶. On the one hand, the increase of subjects "at risk" could refer to "a new normality" considering PIU a temporary

TABLE II. Stepwise multiple regression analysis for risk factors predicting CSAS total scores in study participants.

Independent Variables	Dependent Variable: CSAS			
	Beta	R2	R2 adjusted	F
Strategies	0.27***			
Genere	-0.33***			
NonAcceptance	0.17*	0.30	0.29	37.24***

Note. CSAS: Video Game Dependency Scale; * $p < .05$; ** $p < .01$; *** $p < .001$.

TABLE III. Stepwise multiple regression analysis for risk factors predicting IAT total scores in study participants.

Independent Variables	Dependent Variable: IAT			
	Beta	R2	R2 adjusted	F
Strategies	0.42***			
Goal	0.14*	0.25	0.25	45.25***

Note. IAT: Internet Addiction Test; * $p < .05$; ** $p < .01$; *** $p < .001$.

TABLE IV. Stepwise multiple regression analysis for risk factors predicting TMDbrief total scores in study participants.

Independent Variable	Dependent Variable: TMDbrief			
	Beta	R2	R2 adjusted	F
Strategies	0.43***	0.18	0.18	60.45 ***

Note. TMDbrief: Test of Mobile Phone Dependence Brief Version; * $p < .05$; ** $p < .01$; *** $p < .001$.

TABLE V. Analysis of variance (ANOVA) comparing the three age groups.

Variables	Group 1 (11-12 years), mean (\pm SD)	Group 2 (13-15 years), mean (\pm SD)	Group 3 (16-18 years), mean (\pm SD)	F	P-value
CSAS	29.36 (\pm 10.60)	27.74 (\pm 10.37)	26.99 (\pm 10.05)	16.90	0.000
IAT	41.46 (\pm 10.95)	47.22 (\pm 11.49)	42.03 (\pm 11.37)	15.05	0.000
TMDbrief	18.87 (\pm 11.31)	21.82 (\pm 10.83)	19.54 (\pm 8.03)	1.88	0.154
DERS	85.80 (\pm 18.98)	89.30 (\pm 18.42)	85.59 (\pm 18.79)	3.58	0.029
Nonacceptance	12.17 (\pm 4.88)	13.23 (\pm 4.99)	12.25 (\pm 4.76)	2.89	0.057
Goal	14.56 (\pm 4.69)	14.96 (\pm 4.71)	14.54 (\pm 4.73)	.73	0.481
Impulse	13.77 (\pm 5.22)	14.40 (\pm 4.83)	13.72 (\pm 5)	1.75	0.176
Awareness	17.27 (\pm 4.70)	17.04 (\pm 4.39)	17.10 (\pm 4.64)	.21	0.814
Strategies	17.14 (\pm 6.45)	17.93 (\pm 6.22)	16.87 (\pm 6.19)	4.07	0.018
Clarity	10.89 (\pm 4.26)	11.74 (\pm 4.11)	11.11 (\pm 4.29)	1.09	0.337

Note. CSAS: Video Game Dependency Scale; IAT: Internet Addiction Test; TMDbrief: Test of Mobile Phone Dependence Brief Version; DERS: Difficulties in Emotion Regulation Scale.

phenomenon connected to the specific adolescent period of life and to the fact that it is necessary to adapt to the new online environment. Vice versa, on the other hand, it could indicate an expansion of problems related to internet use. In line with other studies on adolescent populations¹⁶, our findings showed no statistically significant differences between males and females with respect to PIU and PMPU.

Approximately 3.2% ($n = 9$) of the this sample demonstrated PVU that is in agreement with a previous study in which the same tool was used to investigate PVU basing on the diagnostic criteria of the DSM-5⁷. We observed that males were more at risk of developing IGD than females. Additionally, a higher PVU score characterized younger adolescents (aged 11-12). The results of the present study could be explained by referring to adolescence as a crucial period of life during which impulsivity and sensation-seeking play an important role in exposing adolescents to risky behaviors. Adolescence is characterized by a greater vulnerability to emotional dysregulation and to psychopathological risk due to different factors, including the non-homogeneous development of the cerebral, behavioral and cognitive systems, together with emerging emotional, intellectual and behavioral abilities, and the need to manage the different evolutionary tasks of this phase of life³⁶.

In accordance with the existing literature⁸, the results of the present study demonstrate that the IAT, CSAS and TMD brief scores are positively and significantly correlated, underlining the strong associations between PIU, PVU and PMPU. The positive associations reported among problematic technology use may be due to one or more risk factors shared by the addictive behaviors investigated^{8,18}. It is worth noting that difficulties in emo-

tion regulation are associated with various forms of addiction. Specifically, emotion dysregulation is a critical factor for a variety of psychiatric and emotional disorders²².

Similarly, findings of the present study confirm that emotion dysregulation is associated with the problematic use of new technologies^{24,25}. In particular, PIU, PVU and PMPU correlated with emotional dysregulation dimensions, namely, non acceptance of emotional responses ("Nonacceptance"), difficulties engaging in goal-directed behavior ("Goals"), impulse control difficulties ("Impulse") when negative emotions are experienced and limited access to emotion regulation strategies ("Strategies"). The lack of emotional clarity ("Clarity") correlated with PIU and PMPU but not with PVU. This finding is in contrast with a recent study by Estévez and colleagues¹, who observed that the lack of understanding of the nature of emotional responses predicts PVU in a sample of Spanish adolescents. Furthermore, the lack of emotional awareness ("Awareness") was not associated with the problematic use of the new technologies investigated. Weinberg & Klonsky²² obtained the same result with clinical variables theoretically associated with emotional dysregulation (such as depression, anxiety, suicidal ideation etc.). According to the authors, this result may be linked to the potential problematic nature of the "Awareness" subscale, in particular, the lack of validity or to the inappropriate and unclear language for an adolescent population. In Estévez and colleagues' (i.e., study¹ study, this scale predicted drug abuse but not the problematic use of technology (internet and videogames).

In our study, the limited access to effective emotion regulation strategies is central in predicting the problem-

atic use of the technologies explored (internet, video-games, mobile-phones). This DERS dimension together with non-acceptance of emotional responses (“Non acceptance”) predicts PVU, while together with difficulties engaging in goal-directed behaviour (“Goals”), predicts PIU. In line with the findings observed by Kuss and colleagues²⁷ and Young⁴, it is possible that adolescents with PIU, PVU and PMPU obtain relief from negative emotional states through a compulsive-impulsive behavior related to the use of technologies.

In sum, the results of this study add new knowledge to the literature and are in line with hypothesis regarding the existence of specific risk factors linked to different technological addictions, as well as shared risk factors¹⁸.

It should be noted that this study is not exempt from limitations. First of all, the statistical analysis carried out does not allow conclusions to be drawn regarding any cause-effect directionality between the variables investigated; only longitudinal research would allow for the

investigation of the causal relationship between the observed associations. Second, only self-report questionnaires were used. Third, the measures employed in this study did not evaluate information such as hours of use, favorite content and applications, motivations and purposes. The investigation of these additional aspects is needed to increase the clinical and theoretical validity of these results. Finally, the sample size influences the generalizability of the present findings.

This study demonstrates that difficulties in emotion regulation and, in particular, the “Strategies” dimension, appear to be associated with the problematic use of new technologies (i.e., internet, videogames, mobile-phones). Further studies, especially longitudinal ones, are needed to expand and better understand the various aspects related to the new technologies while additionally adopting a multidisciplinary perspective.

Conflict of Interest

The authors have no conflict of interests.

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