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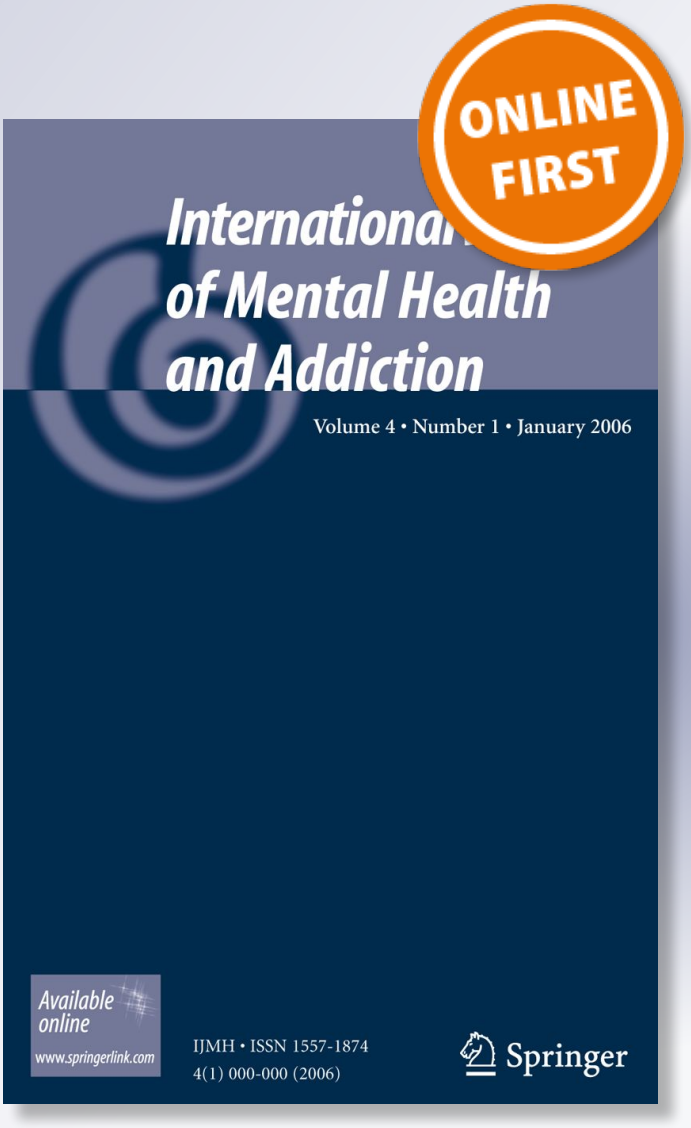

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The Association Between Internet User Characteristics and Dimensions of Internet Addiction Among Greek Adolescents

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Abstract This study examined how internet users' psychological characteristics, amount of internet use and demographic factors contribute to particular dimensions of internet addiction. The sample consisted of 384 adolescents, ranging in age from 15 to 18 years. Participants were asked to complete the Internet Addiction Test (IAT), measures of Locus of Control, Depression, Loneliness, Self-esteem, and Social Anxiety as well as an inventory that included demographic factors and questions about the amount of Internet use. Results revealed significant associations between variables and different sets of predictors across the four dimensions of Internet use behaviour identified in the study. However, locus of control, depression, and amount of internet use were significant predictors of all internet addiction dimensions. Recommendations are provided on how researchers can strengthen the field of research concerning how internet addiction is manifested and which adolescent internet users are more susceptible to different manifestations of addiction.

Keywords Adolescents · Internet addiction · User characteristics · Amount of internet use

Since the mid-1990s, there have been frequent reports of individuals whose use of the internet is problematic. Problem Internet use is being considered as more of an impulse-control disorder than an addiction and appears to have many features of impulse control disorders, particularly the criteria outlined for pathological gambling (Young 1999). Internet addiction merits classification as a new or emerging psychiatric disorder in its own right and refers to an individual's inability to control their Internet use, which in turn leads to feelings of distress and functional impairment of

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daily activities (Shapira et al. 2003). The addictive use of the internet is a new phenomenon which many practitioners are unaware of and subsequently unprepared to treat (Young 1996). Although there has been no official psychiatric diagnosis which designates preoccupation as an addiction to internet, some professionals propose this phenomenon as an "internet addiction disorder" (Yang 2001).

Many studies have discussed the factors related to the internet addictive behavior. Psychopathology factors such as depression and anxiety (Selfhout et al. 2009), personality factors like self-esteem (Kim and Davis 2009), the amount of internet use and gender (Fung 2002) were related to the internet addictive behavior. It should be noted that most of them have also been linked to addiction in other contexts (Kim and Haridakis 2009).

In relation to gender, a common finding is that there are significantly more males who are addicted to the internet than females (Brenner 1997; Chen et al. 2007; Ko et al. 2006; Leung 2004). Differences in internet use were also found according to age, gender, and socioeconomic status (Mesch 2001; Shaw and Gant 2002).

As regards the amount of time spent online, results of studies in samples of individuals who described themselves as internet addicts reported that this varied greatly from 8.5 h per week to 21.2 h per week (Yang and Tung 2007). It was also suggested that the higher the amount of time spent online, the greater the extent of symptoms of internet addiction (Leung 2004; Widyanto and McMurran 2004).

Regarding users' psychological characteristics, research findings have revealed associations between depression, locus of control, loneliness, social anxiety and self-esteem with internet addiction. For depression, several cross-sectional survey studies have found that internet use was associated with more symptoms of depression in adolescents, derived from low self-esteem, fear of rejection, and the desire to be acknowledged (Selfhout et al. 2009; Sun et al. 2005). Regarding locus of control (the individual's belief about the extent to which he/she is in control of his/her life), Chak and Leung (2004) found that greater dependent use of the internet was negatively linked to internal locus of control. On the other hand, externality was found to be positively related to internet addiction (Iskender and Akin 2010). Whang et al. (2003) reported that internet addiction group had higher degree of loneliness and depressed mood compared with the non-addicts group, while other findings indicated that loneliness, depression, and computer self-efficacy were significant factors of problematic internet use (Ceyhan and Ceyhan 2008; Leung 2002).

Moreover, a group of studies suggested that the higher one's level of shyness, the greater the likelihood to be addicted to the internet (Chak and Leung 2004; Liu and Kuo 2007; Yuen and Lavin 2004). Internet addiction was also associated with poor mental health and low self-esteem in adolescents (Armstrong et al. 2000; Yen et al. 2009). These findings are consistent with the view that one of the reasons people may become addicted to media use is to overcome relationship problems and bolster their self-esteem (Peele 1985).

Integrating all the previous research about the effects of users psychological and demographic characteristics and the amount of use on addiction, the main aims of this study were the following: a) to investigate gender, age and socioeconomic status differences in components of internet addiction, b) to examine the relationship between dimensions of internet addiction and psychological factors prevalent in other addictive behaviors (locus of control, depressive symptomatology, loneliness, self-esteem and interaction anxiousness), c) to investigate how internet users' psychological characteristics, amount of internet use and demographic factors contribute to particular dimensions of internet addiction.

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Method

Sample

The participants were 384 students (209 girls and 175 boys), drawn from the first and second grade classrooms of two secondary schools in an urban area of Northern Greece (mean age= 16.27 years, SD=0.64). General internet use behavior was measured by asking participants how many hours they spent using the internet in a typical week.

Measures

Internet Addiction The Greek version (Siomos et al. 2009) of the Internet Addiction Test (IAT) (Young 1996) was employed. IAT is a self-reported questionnaire which consists of 20 questions, evaluated on a 5-point Likert scale (from 1 "not at all" to 5 "always"). Factor analysis (maximum likelihood; varimax rotation) performed on the IAT identified four dimensions accounted for 50.09 % of the variance: a) excessive use (7 items, Cronbach alpha=.766, e.g. "How often do you find yourself saying "Just a few more minutes" when online?"), b) neglect of social life (5 items, Cronbach alpha=.691, e.g. "How often do you prefer excitement of the internet to intimacy with your partner?"), c) intrusion (neglect of needs or activities) (5 items, Cronbach alpha=.725, e.g. "How often do you lose sleep due to late night log-ins?"), d) escaping reality (3 items, Cronbach alpha=.649, e.g. "How often do others in your life complain to you about the amount of time you spend online?"). Cronbach alpha for the whole questionnaire was .876.

Locus of Control Locus of control was measured by the Greek version (Mellon et al. 2009) of the Brown Locus of Control Scale (BLOCS) (Brown 1990), a modification of the Levenson LOCS (Levenson 1974). Factor analysis (maximum likelihood; varimax rotation) identified three dimensions accounted for 32.10 % of the variance: a) internality (8 items, Cronbach alpha=.603, e.g. "Whether or not I get to be a leader depends mostly on my ability"), b) powerful others (8 items, Cronbach alpha=.627, e.g. "My life is chiefly controlled by powerful others"), c) chance (8 items, Cronbach alpha=.607, e.g. "It's chiefly a matter of fate whether or not I have a few friends or many friends"). Cronbach alpha for the whole questionnaire was .656.

Depression The level of depressive symptoms was evaluated by the Adolescent Depression Rating Scale (ADRS) (Revah-Levy et al. 2007), a 10-item self-reported questionnaire which measures depression as a complex emotional state. Items included: "I have no energy for work/school", and "I feel downhearted and discouraged". The modality of response was true/false for each item. Lower scores indicated higher level of depressive symptoms.

Loneliness Levels of loneliness were assessed by the UCLA Loneliness Scale (version 3) (Russell 1996), a 20-item unidimensional measure of loneliness. For each statement respondents were asked to indicate how often they feel the way described on four-point scale. Items included: "How often do you feel that you lack companionship?" and "How often do you feel that you are no longer close to anyone?".

Self-Esteem The 10-item Rosenberg's Self-Esteem Scale (Rosenberg 1965) was used to measure participants' self-esteem. Items included: "I am able to do things as well as more other people" and "All in all, I am inclined to feel that I am a failure". Agreement with the

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statements was indicated on the following scale: strongly agree, agree, disagree and strongly disagree.

Social Anxiety The 15-item Interaction Anxiousness Scale (IAS) (Leary 1983) was used to assess social anxiety via interaction with others. For each item, respondents were asked to indicate the "degree to which the statement is characteristic or true of you" on a five-point scale. Items included: "I usually feel uncomfortable when I am in a group of people I don't know" and "I often feel nervous when talking to an attractive member of the opposite sex".

The last four instruments were translated into Greek and retranslated into English by a native speaker of English. Differences between the original version and the retranslation were discussed in order to improve the quality of the Greek translations. Regarding the internal consistencies of the ADRS, UCLA, Self-esteem Scale, and IAS, Cronbach's alphas were .748, .868, .796 and .782 respectively.

Results

T-tests were applied to investigate gender and age differences and analyses of variance to examine socioeconomic status differences in all IAT dimensions. Mean scores and standard deviations are presented in Table 1. No significant gender differences were found on 'Excessive use', 'Neglect of social life' and 'Escaping reality'. Boys scored higher than girls on 'Intrusion' [$t(382)=2.694$, $p<.01$]. Younger children scored significantly higher on 'Excessive use' [$t(381)=2.023$, $p<.05$] and 'Escaping reality' [$t(381)=3.437$, $p<.01$]. No significant difference was found between the three socioeconomic status groups on 'Excessive use', 'Intrusion' and 'Escaping reality'. Children with high socioeconomic status scored significantly lower than children with low socioeconomic status on 'Neglect of social life' [$F(2,381)=3.554$, $p<.05$].

No statistically significant gender, age or socioeconomic difference was found on IAT total score, although boys and children from A Grade and low socioeconomic class tended to score higher [M=41.92(12.27) vs. M=39.75(13.25), M=41.91(13.24) vs. M=39.44(12.30) and M=44.89(14.64) vs. M=40.05(12.73) and M=39.53(12.90) respectively, $p<.05$ in all cases].

Adolescents who used internet more than 20 h per week were found to score significantly higher on IAT [M=51.54(12.70), F(2,381), $p=.000$] than those who used it 11–20 h [M=45.13(10.91)] or up to 10 h [M=51.54(12.70)].

Associations between IAT dimensions and all the other measures of the study are presented in Table 2. Higher scores on all IAT subscales and overall Internet Addiction

Table 1 Mean scores (SD) for gender, school grade, and Socio-economic status in the four IAT subscales

IAT	Gender		School Grade		Socioeconomic status		
	Male $N=175$	Female $N=209$	A $N=202$	B $N=182$	High $N=38$	Middle $N=328$	Low $N=18$
Excessive use	2.44 (.77)	2.36 (.87)	2.48 (.88)	2.30* (.76)	2.35 (.88)	2.40 (.83)	2.48 (.87)
Neglect of social life	1.56 (.59)	1.55 (.63)	1.60 (.66)	1.15 (.56)	1.42 (.54)	1.55 (.61)	1.89* (.77)
Intrusion	2.17 (.82)	1.94** (.83)	2.02 (.82)	2.07 (.88)	2.02 (.99)	2.03 (.80)	2.34 (1.02)
Escaping reality	2.05 (.93)	1.93 (.91)	2.13 (.97)	1.81** (.84)	1.96 (.95)	1.98 (.91)	2.11 (1.17)

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

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Table 2 Correlations between scores on BLOCS, ADRS, UCLA L.S., Self-esteem, IAS and IAT dimensions

	Excessive use	Neglect of social life	Intrusion	Escaping reality	Total IAT
Total BLOCS	-.17**	-.30**	-.20**	-.19**	-.26*
Internality	.05	-.05	-.01	-.05	-.00
Powerful others	-.16**	-.24**	-.16**	-.13*	-.21*
Chance	-.21**	-.28**	-.21**	-.19**	-.28*
ADRS	.18*	.33**	.29**	.20**	.30*
UCLA L.S.	.08	.29**	.11*	.06	.16*
RSES	-.09	-.33**	-.18**	-.09	-.20*
IAS	.06	.20**	-.01	.02	.07

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

were associated with lower scores on BLOCS, and higher scores on its 'Powerful Others' and 'Chance' dimensions and higher scores on ADRS. Higher scores on 'Neglect of social life', 'Intrusion' and overall Internet Addiction were associated with higher scores on 'Loneliness Scale' and lower scores on RSES. Higher scores on 'Neglect of social life' were associated with higher scores on IAS. Thus, the results show that adolescents who tend to score higher on overall IAT and its subscales may be characterized by certain psychological constructs examined in this study.

In order to determine the relative contribution of these constructs, amount of internet use and demographic characteristics on each of the IAT dimensions and overall internet addiction, five hierarchical regression analyses were performed. Final results of these analyses are summarized in Table 3.

The hierarchical multiple regression equation with all the variables entered accounted 39 % of the variance for 'Excessive use' [R=.53, F(9,374)=16.32, $p<.001$). Variables

Table 3 Summary of the Final Results of Hierarchical Regression Analyses

Final β

Variables	Excessive use	Neglect of social life	Intrusion	Escaping reality	Total IAT
Step 1 (Psychological factors)					
Locus of control	-.15**	-.15**	-.16**	-.19**	-.19**
Depression	.11*	.18**	.21**	.17**	.19**
Loneliness	-.01	.08	.04	.04	.11*
Self-esteem	.04	-.05	-.13*	-.01	-.02
Social anxiety	.06	.12*	.07	.01	.01
Step 2					
Amount of internet use	. 48**	. 18**	.38**	.20**	.43**
Step 3 (Demographic characteristics)					
Gender	.00	-.00	-.11*	-.02	-.03
Grade	-.09*	-.11*	-.03	-.17**	-.09*
Socioeconomic status	-.11*	-.04	-.02	-.01	-.02

All βs are final βs on the last step of regression

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

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entered on Step 1 (Locus of control, Depression, Loneliness, Self-esteem and Social Anxiety) accounted for 28 % of the variance (R^2=.28, p<.001) in 'Excessive use'. Entering amount of Internet use on Step 2 accounted for an additional 6 % of the variance (ΔR^2=.06, p<.001), and entering demographic characteristics (gender, age and socioeconomic status) on Step 3 explained additional 5 % of the variance (ΔR^2=.05, p<.001). Specifically, locus of control, age (school grade) and socioeconomic status were significant negative predictors, while depression and amount of Internet use were significant positive predictors.

Meanwhile, the multiple regression equation accounted for 57 % of the variance in 'Neglect of social life' [R=.46, F(9,374)=11.45, p<.001). Psychological factors entered in Step 1 accounted for 21 % of the variance (R^2=.21, p<.001). Entering amount of Internet use on Step 2 accounted for an additional 18 % of the variance (ΔR^2=.18, p<.001) and entering demographic characteristics on Step 3 explained additional 17 % of the variance (ΔR^2=.17, p<.001). Locus of control and school grade were significant negative predictors of 'neglect of social life', while depression, social anxiety and amount of use were significant positive predictors.

The hierarchical multiple regression equation explained 52 % of explained variance of 'Intrusion' [R=.53, F(9,374)=15.77, p<.001]. Psychological factors entered in Step 1 accounted for 27 % of the variance (R^2=.27, p<.001). Entering amount of Internet use on Step 2 accounted for an additional 13 % of the variance (ΔR^2=.13, p<.001) and entering demographic characteristics on Step 3 explained additional 12 % of the variance (ΔR^2=.12, p<.001). Locus of control, self-esteem and gender were significant negative predictors, while depression and amount of use were significant positive predictors of 'Intrusion'.

The multiple regression equation accounted for 31 % of the variance in 'Escaping reality' [R=.38, F(9,374)=7.06, p<.001). Psychological factors on Step 1 accounted for 14 % of the variance (R^2=.14, p<.001), amount of time entered on Step 2 for an additional 10 % (ΔR^2=.10, p<.001), and demographic characteristics entered on Step 3 an additional 7 % (ΔR^2=.07, p<.001). Locus of control and school grade were significant negative predictors. Depression and amount of Internet use were significant positive contributors to escaping reality.

Finally, hierarchical multiple regression equation explained 57 % of explained variance of total IAT score [R=.56, F(9,374)=19.36, p<.001]. Psychological factors entered in Step 1 accounted for 31 % of the variance (R^2=.31, p<.001). Entering amount of Internet use on Step 2 accounted for an additional 14 % of the variance (ΔR^2=.14, p<.001) and entering demographic characteristics on Step 3 explained additional 12 % of the variance (ΔR^2=.12, p<.001). Among psychological factors, locus of control was a significant negative predictor, while depression and loneliness were significant positive predictors of Internet addiction. Amount of time was also a significant positive predictor, while school grade was a significant negative predictor.

Discussion

In our study, addictive tendencies did not vary significantly with gender. In contrast, other studies have indicated that males are at greater risk of internet addiction than females (Jang et al. 2008; Ko et al. 2006; Lam et al. 2009). The fact that boys scored higher than girls on 'Intrusion', may reflect their tendency to use the Internet longer period than they intend and their inability to correct their problematic Internet use. This finding is consistent with other findings, which support that boys' problematic internet use is linked with neglect of activities in their everyday lives (Choi et al. 2009) and may be attributed to different

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preference and styles in Internet activities between male and female adolescents (Ko et al. 2007). Socioeconomic status differences found in "neglect of social life" may also reflect differences in Internet activities between adolescents with different socioeconomic status.

Younger children's scores on "Excessive use" and 'Escaping reality" were significantly higher than older children's scores. Excessive Internet use by younger adolescents has been reported in many studies (Jang et al. 2008; Mesch 2001), while our result regarding the use of internet as a means of escaping reality may reflect a progression in Internet addiction moving from the milder to the intense level, since it has been argued that escaping reality, seems to be a more intense manifestation of possible Internet addiction than other dimensions (Kim and Haridakis 2009). However, we can't reach a definitive conclusion about this, since no consensus has been reached on the dimensions or stages of Internet addiction in previous research.

Results regarding differences on IAT scores between adolescents who used internet more than 20 h per week and those who used it fewer hours are in accordance with findings of prior research which also linked the amount of use with Internet addiction (Ko et al. 2006; Leung 2004; Widyanto and McMurran 2004).

The associations observed between all dimensions of internet addiction and locus of control are also consonant with other research findings which suggest that individuals who believe that they have control over their lives are less likely to be addicted to the Internet (Chak and Leung 2004; Iskender and Akin 2010).

Depressive symptoms were also found to be associated with all dimensions of internet addiction. Previous studies indicate that people may develop a new lifestyle through Internet activities, which may cause a worsening in their actual social relationships (Selfhout et al. 2009; Sun et al. 2005). In other words, depressive feelings of people relying on the Internet for social support might remain or even worsen toward their real-life interpersonal relationships, increasing their risk of becoming Internet addicted. This assumption is supported by the association found between loneliness and total IAT score as well as its "Neglect of social life" and "Intrusion" dimensions. This result is consistent with the findings of previous studies (Levent 2010; Morahan-Martin and Schumacher 2003). In contrast, Amichai-Hamburger and Ben-Artzi (2003) indicated that the internet use can be reducing the loneliness among the users. However, reliance on the Internet to alleviate loneliness may lead to problematic Internet use (Kim and Haridakis 2009).

Self-esteem was also associated total IAT score as well as its "Neglect of social life" and "Intrusion" dimensions. One possible explanation could be that individuals may use the internet as a way of escaping self-esteem problems (Armstrong et al. 2000). However, social anxiousness which is also associated with low self-esteem was not found to be linked with internet addiction as a whole. The fact that it was only associated with "Neglect of social life" indicates that the Internet may provide a means of escape from uncomfortable everyday offline interactions for extremely social anxious people and leads them to an unhealthy preference for online communication activities over their offline activities. However, it should be noted, that in this study social anxiety was only assessed via interaction with others, while fear of negative evaluation by others – assessed by 'social phobia scales' and linked with externality and vulnerability to poor psychological health (see, Shepherd and Edelmann 2009) - was not taken into account.

Finally, the results of our regression analyses indicate that different dimensions of internet addiction can be predicted by a combination of different users' characteristics. However, locus of control, depression, and amount of internet use were significant predictors of all internet addiction dimensions. This may suggest that externally controlled and depressive heavy users of the Internet may be particularly prone to developing an addiction to the

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Internet. In other words, individuals with high depression and external locus of control might not believe that they can control and moderate their Internet-use behaviors. The loss of control and the disruptive effects it may have on the user and his/her relationship with others may be a major distinguishing characteristic between mere heavy use and addiction.

Moreover, the addiction symptoms may only be the tip of the iceberg and thus the underlying causes resulting in the manifestations of these behaviours may be a result of other psychological dysfunctions. Many studies indicate a possible underlying psychopathology in internet addicts, long before they became addicted to the internet (Chen et al. 2007; Yen et al. 2009). However, clarification based on clear epidemiological studies is needed.

Among psychological characteristics social anxiety was a positive predictor of 'Neglect of social life', self-esteem a negative predictor of 'Intrusion' and loneliness a positive predictor of total IAT score. Regarding demographic characteristics, gender was found to be a significant predictor of 'Intrusion', socioeconomic status of 'Excessive use' and school grade of all dimensions of Internet addiction except 'Intrusion'. These results suggest that apart from the amount of internet use, locus of control and depression, which were found to predict addiction tendencies in many settings (Kim and Haridakis 2009), specific aspects of addictive behavior or tendencies toward it can be predicted by different users' characteristics. Therefore, intervention strategies should use a multimodal approach that considers individual as well as environmental factors.

Several limitations should be considered in this study: first, we used a questionnaire method rather than a direct, in-depth interview. Second, the diagnosis of Internet addiction needs to be refined to improve the reliability and validity. Third, most importantly, as a cross-sectional study, our results do not clearly indicate causal relations between Internet addiction and adolescents' characteristics. This appears to be a subject that warrants further in-depth study. Future research should also be directed toward identifying with greater specificity exactly what background characteristics of Internet users and other factors such as motives for using the Internet, users' needs, personality traits, etc. explain how addiction is manifested and which users are more susceptible to different manifestations of addiction.

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