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ABSTRACT

OBJECTIVE: In the last decade, using social network sites (SNSs) has grown and become an integral part of daily routine for adolescents. As known, ADHD is a major public health problem for all addiction types, including the Internet and SNSs addiction. Our aim was to examine the effect of ADHD, impulsivity types, using motivations, internalizing and externalizing symptoms on Facebook (FB) overuse and FB addiction among adolescents.
METHODS: Participants were recruited from ADHD and non-ADHD adolescents who were applied to the child and adolescent psychiatry and have an active FB account. We used FB Use and Motivations Form, the Barratt Impulsiveness Scale (BIS), Bergen FB Addiction Scale (BFAS) and Conners-Wells' Adolescent Self-Report Scale-Long form (CASS:L).
RESULTS: Our results indicated that ADHD adolescents have more fake FB accounts, have their own accounts for longer time, are using FB for more motivation types and FB overuse is more frequent than in non-ADHD counterparts. According to the degree of FB use, we have shown that adolescents with FB overuse behaviour have more externalizing symptoms and have higher CASS:L and Barrat impulsivity scores than others. Risk factors for FB overuse are: having a fake FB account and having higher ADHD index scores; risk factors for FB addiction are: higher attentional impulsivity, higher conduct problems scores and higher ADHD index scores.
CONCLUSIONS: The results of this study have improved our understanding about the risk factors of a new behavioural addiction type among adolescents.

Introduction

In the last decade, using social network sites (SNSs) has grown and became an integral part of daily routine for many people all around the world. Although SNSs were developed for adults, adolescents have fully embraced these sites and, as a result of exponentially growing smart/mobile phone usage, 73% of adolescents have their own SNSs posts [1,2]. Many adolescents begin and end their day by checking their SNSs pages. According to Papacharissi and Mendelson, online media serve as functional alternatives to interpersonal and mediated communication; so SNSs users may lose control and enhance addictive behaviours [3].

SNSs addiction has been defined as a failure to regulate usage, which leads to negative personal outcomes, including neglect of personal life, mental preoccupation, escapism, mood-modifying experiences, tolerance and concealing addictive behaviour [4]. While it is true that all SNSs serve a similar purpose – chatting, sharing experiences and ideas, tracking and updating information about popular events etc., the specific features of each one are varied; so Facebook (FB) or Twitter

addict may differ from Whats App or MySpace addict [5] and researchers argue that the need to separate out results from specific sites is crucial to understanding the development of SNSs addiction [6]. As known, FB is the most popular SNS in the world [6,7], and social scientists have recently begun to examine aspects of its use and potential use to become addictive for both adults and adolescents [8,9].

Several studies aimed to clarify the relationship between motivations for FB use and FB addiction. There are many motivations for using FB, like seeking friendship, get to know people better, make plans, relationship maintenance, escapism and passing time [6,10,11]. In a review that examined 24 studies, it was shown that most popular motivations for using FB were relationship maintenance, passing time, entertainment, companionship, escapism, avoiding loneliness and gratifying interpersonal needs [6], and addicts were more inclined to use it for motivations mentioned above [12]. Other studies measuring independent risk factors for addiction revealed that it is associated with being male, [13], being a heavy user [14,15], relationship dissatisfaction [16], depression

[14,15] and anxiety [15]. In addition, recent studies have shown ADHD is the most frequent comorbid disorder with Internet addiction (also in FB addiction), and the severity of ADHD is associated with the severity of Internet addiction [17,18].

Studies have shown that the prevalence of FB addiction among adolescents is ranging from 4% to 43.2% [13,19–23]. But to our knowledge, there is not any study about the prevalence and effects of ADHD symptoms, impulsivity symptoms and comorbid psychiatric disorders on FB overuse among adolescents. In order to address this lack of research, the present study aims to compare the frequency of FB overuse and addiction between adolescents with ADHD and non-ADHD subjects. On the basis of literature, we assumed that FB overuse and FB addiction would be related to ADHD and ADHD-related symptoms, impulsivity types, comorbidities and FB using motivations among adolescents.

The following hypotheses were posed:

H1: FB overuse and FB addiction are higher in adolescents with ADHD than non-ADHD.

H2: Scores of ADHD-related symptoms, impulsivity types and internalizing–externalizing symptoms are higher in FB overuse group than normal use group.

H3: FB using motivations are different between ADHD–non-ADHD and FB overuse–normal use groups.

H4: In FB overuse group, there are statistically significant relationships between ADHD-related symptoms, impulsivity types, comorbidities and FB addiction symptom scores.

H5: ADHD symptoms, impulsivity types and motivation types are the variables that effect the FB addiction.

Material and method

The research protocol for this study was approved by the Research Ethics Board of Ufuk University School of Medicine. Participants were recruited from adolescents who were applied to the child and adolescent psychiatry between January 2015 and December 2015 and have an active FB account. Participants were enrolled in the study after the aim and the procedure of the study were explained and written informed consent was obtained.

ADHD group was composed of adolescents both newly diagnosed with ADHD or were diagnosed before but did not get a regular ADHD treatment for a long time and applied to child and adolescent psychiatry for medication. The Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime version (KSADS-PL) were applied by child and adolescent psychiatrists to all adolescents with ADHD. Then, Demographic Information and

Facebook Use and Motivations Form, the Barratt Impulsiveness Scale, Bergen Facebook Addiction Scale (BFAS) and the Conners-Wells' Adolescent Self-Report Scale-Long form (CASS:L) were filled out by these adolescents. This group consisted of 187 adolescents who were aged 13–19 years ($M = 14.9$, SD = 1.7), and 50.8% of the sample were males. Maternal education was 5–15 years ($M = 8.1$, SD = 4.8) and paternal education was 8–15 years ($M = 8.9$, SD = 4.1). The majority of families were in medium socioeconomic status (96%) in this group.

Non-ADHD group was composed of adolescents who were applied to our child and adolescent psychiatry policlinics for the first time and have not get any psychiatric treatment before. KSADS-PL were applied to all adolescents in this group too, and adolescents who have ADHD symptoms or any other psychiatric diagnosis according to KSADS-PL were excluded from the group. But the adolescents who have subclinic psychiatric symptoms had been included. Adolescents in this group also filled out Demographic Information and Facebook Use and Motivations Form, the Barratt Impulsiveness Scale, BFAS and the CASS:L form (). There were 102 adolescents in this group those who were aged 13–19 years ($M = 14.9$, SD = 1.4) and 49% of the participants were male. Maternal education was 5–15 years ($M = 7.8$, SD = 4.1) and paternal education was 8–15 years ($M = 9.2$, SD = 3.9).

Adolescents with a diagnosis of a neurological/physical disorder or mental retardation, who did not want to participate and who did not have an active FB account were excluded.

Measurements

Demographic information and FB use and motivations form

This form consisted of questions that were prepared by the authors to obtain information about demographic characteristics (age, school, parental age and education, monthly income, marital status of parents), history of FB use and motivations of using FB of the participants.

Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime version

The KSADS-PL was originally developed by Kaufman [24] and the validity and reliability study of Turkish version was conducted by Gökler [25]. It is a semistructured instrument that aims to diagnose psychiatric disorders in children.

The Barratt Impulsiveness Scale, Version 11

It is a widely used measure of impulsiveness [26,27]. It includes 30 items that are scored to yield six first-order factors (attention, motor, self-control, cognitive complexity, perseverance, and cognitive instability

impulsiveness) and three second-order factors (attentional, motor, and nonplanning impulsiveness). The validity and reliability study of Turkish version was conducted by Gulec [28].

Bergen Facebook Addiction Scale

BFAS is a self-report questionnaire that was developed in 2011 by Andearrsen [29]. This scale includes 18 items, 3 for each of the 6 core features of addiction: salience, mood modification, tolerance, withdrawal, conflict, and relapse. Salience items are: "Spent a lot of time thinking about FB or planned use of FB?" "Thought about how you could free more time to spend on FB?" Thought a lot about what has happened on FB recently?; Tolerance items are: "Spent more time on FB than initially intended?" "Felt an urge to use FB more and more?"; "Felt that you had to use FB more and more in order to getthe same pleasure from it?"; Mood modification items are: "Used FB in order to forget about personal problems?" "Used FB to reduce feelings of guilt, anxiety, helplessness, and depression?" "Used FB in order to reduce restlessness?". Relapse items are: "Experienced that others have told you to reduce your use of FBbut not listened to them?" "Tried to cut down on the use of FB without success?" "Decided to use FB less frequently, but not managed to do so?"; Withdrawal items are: "Become restless or troubled if you have been prohibited from using FB?" "Become irritable if you have been prohibited from using FB?" "Felt bad if you, for different reasons, could not log on to FB for some time?"; and Conflict items are: "Used FB so much that it has had a negative impact on your job/studies?" "Given less priority to hobbies, leisure activities, and exercise because of FB?" "Ignored your partner, family members, or friends because of FB?"

Each item is scored on a 5-point scale using anchors of 1: very rarely to 5: very often. Higher scores indicate greater FB addiction. According to the polythetic scoring method, we determined the cutoff score for FB overuse as 42 points (e.g. scoring 3 or above on at least four of the six items). In addition, adolescents who have scored 12 or more items as 4 (often) or 5 (very often) were grouped as FB addicted.

The validity and reliability study of Turkish version was conducted by Akin [30].The results of confirmatory factor analysis demonstrated that the 18 items loaded on six factors (salience, mood modification, tolerance, withdrawal, conflict, and relapse) and the six-dimensional model was well fit ($\chi^2 = 291.88$, df = 118, $p = .0000$, RMSEA = .061, CFI = .95, GFI = .92, IFI = .95, and SRMR = .040). The internal consistency reliability coefficients of the scale were .74, .81, .85, .76, .90, .80, for six subscales, respectively, and .93

for overall scale. In our sample, the Cronbach alpha value of 18 items was .91.

Conners-Wells' Adolescent Self-Report Scale-Long form

The CASS:L form is a standard instrument for the assessment of attention deficit/hyperactivity disorder and related behavioural problems in adolescents. It has 87 items and 8 subscales named Family Problems, Conduct Problems, Anger-Control Problems, Emotional Problems, Cognitive Problems, Hyperactive-Impulsive, DSM-IV Symptoms, and ADHD Index. The validity and reliability study of Turkish version was conducted by Kaner et al. [31].

Statistical analysis

We used independent sample t test and Mann–Whitney U test to compare scale scores between the groups. We compared the rate of FB overuse, FB addiction, and FB motivation rates of groups with Chi-square, Fisher's exact tests. In order to investigate the association between FB overuse–FB addiction and sociodemographic variables, comorbidity and scale scores, we used univariate logistic regression analysis. We included variables which had unadjusted p values <.01 in univariate analysis in backward multivariate logistic regression analysis. Hosmer–Lemeshow goodness-of-fit statistics were used to assess fit. A 5% type-1 error level was used to infer statistical significance. A p value <.05 was considered significant.

Results

Comparison of sociodemographic variables, FB using motivations, BFAS, BIS and CASS:L scores of ADHD and non-ADHD groups

In Table 1, the rates, means and standard deviations of sociodemographic variables, time of having a FB accounts and using smartphone for access FB of ADHD–non-ADHD adolescents were summarized. There were no significant differences in terms of gender, age, and socioeconomic status and smartphone usage between groups but on the other hand, time of having a FB account were significantly longer in ADHD group than the non-ADHD group.

Adolescents with ADHD had significantly higher BFAS (40.4 ± 18.0 vs. 27.9 ± 12.2; $F = 39.3$, $p < .001$) BIS and CASS:L scores when compared with the non-ADHD group. FB overuse and FB addiction were significantly common among adolescents with ADHD (for FB overuse: 42.2% vs. 12.2%, $\chi^2 = 28.4$, $df = 1$, $p < .001$; for FB addiction: 10.7% vs. 2%, $\chi^2 = 7.1$, $df = 1$, $p = .004$) (Table 2). In terms of FB use

Table 1. Demographic characteristics of groups.

Characteristics	ADHD (n = 187)		Non-ADHD (n = 102)		P value and statistics
	n	%	n	%	
Gender					$\chi^2 = 0.08$ $df = 1, p = .43$
• Male	95	50.8	50	49	
• Female	92	49.2	52	51	
Age (years); mean ± SD	14.9 ± 1.7		14.9 ± 1.4		$t = -.28, p = .77$
Socioeconomic status					
• Monthly income (lira); mean ± SD	2188 ± 1406		2333 ± 1366		$t = -.84, p = .39$
• Maternal education (years) mean ± SD	8.1 ± 4.8		7.8 ± 4.1		$t = .60, p = .54$
• Paternal education (years) mean ± SD	8.9 ± 4.1		9.2 ± 3.9		$t = -.49, p = .62$
Time of having an FB account(months) mean ± SD	37.2 ± 24.1		27.9 ± 24.0		**$t = 3.1, p = .002$**
Using smartphone for access FB					$\chi^2 = 2.85$ $df = 4, p = .58$
	109	58.3	63	61.8	

	FB overuse group (n = 91)		Normal use group (n = 198)		
	n	%	n	%	P value and statistics
Gender					$\chi^2 = 0.85, df = 1, p = .21$
• Male	42	46.2	103	52	
• Female	49	53.8	95	48	
Age (years); mean ± SD	14.9 ± 1.6		14.8 ± 1.5		$t = 0.46, p = .64$
Socioeconomic status					
• Monthly income (lira); mean ± SD	2143 ± 1271		2283 ± 1444		$t = 0.79, p = .42$
• Maternal education (years) mean ± SD	8.0 ± 4.0		7.9 ± 5.5		$t = 0.09, p = .92$
• Paternal Education (years) mean ± SD	9.1 ± 4.1		8.8 ± 3.9		$t = 0.62, p = .53$
Time of having a FB account(months) mean ± SD	41.5 ± 24.1		30.5 ± 23.9		**$t = -3.6, p < .001$**
Using smartphone for access FB					$\chi^2 = 2.85, df = 1, p = .27$
	57	54.2	115	58.1	

Table 2. The scale scores according to groups ADHD and non-ADHD.

	ADHD (n = 187)		Non-ADHD (n = 102)		P value and statistics
	n	%	n	%	
FB overuse	79	42.2	12	11.8	$\chi^2 = 28.4, df = 1, p < .001$
FB addiction	20	10.7	2	2	$\chi^2 = 7.1, df = 1, p = .004$
Internalizing symptoms	70	37.4	63	61.8	$\chi^2 = 15.7, df = 1, p < .001$
Externalizing symptoms	41	21.9	6	5.9	$\chi^2 = 12.4, df = 1, p < .001$
	Mean ± SD		Mean ± SD		
BFAS total score	40.4 ± 18.0		27.9 ± 12.2		$U = 5302, p < .001$
• Saliance[a]	6.0 ± 3.3		4.1 ± 1.8		$U = 6158, p < .001$
• Mood modification[a]	6.9 ± 3.9		4.7 ± 2.7		$U = 6104, p < .001$
• Tolerance[a]	7.0 ± 3.8		5.2 ± 3.3		$U = 6715, p < .001$
• Withdrawal[a]	7.1 ± 4.4		4.6 ± 3.1		$U = 6366, p < .001$
• Conflict[a]	6.5 ± 3.9		4.2 ± 2.2		$U = 6310, p < .001$
• Relapse[a]	6.7 ± 3.6		4.8 ± 3.0		$U = 6417, p < .001$
Conners-Wells'Adolescent scale					
• Family problems[a]	17.1 ± 8.0		7.1 ± 5.2		$U = 3011, p < .001$
• Emotional problems[a]	21.2 ± 5.6		11.9 ± 3.7		$U = 1951, p < .001$
• Conduct problems[a]	16.7 ± 7.1		1.7 ± 2.8		$U = 207, p < .001$
• Anger-control problems[b]	20.6 ± 3.9		6.4 ± 4.1		$t = 28.36, p < .001$
• ADHD Index[b]	21.0 ± 4.4		9.6 ± 4.5		$t = 20.55, p < .001$
• Cognitive problems[a]	19.3 ± 6.2		6.6 ± 4.6		$U = 1526, p < .001$
• Hyperactive-impulsive[a]	15.1 ± 3.4		7.4 ± 4.8		$U = 2350, p < .001$
Barratt total score[a]	74.3 ± 10.6		59.7 ± 6.7		$U = 2209, p < .001$
• Attentional impulsivity[a]	19.8 ± 3.8		15.1 ± 2.9		$U = 3136, p < .001$
• Motor impulsivity[a]	23.8 ± 4.7		18.7 ± 3.7		$U = 3731, p < .001$
• Nonplannig[a]	30.6 ± 4.5		25.8 ± 3.7		$U = 4020, p < .001$

[a]Mann–Whitney U test.
[b]t test.

patterns and motives; rates of having a nonstop Internet access (65.2% vs. 51.0%, $\chi^2 = 5.6$, $df = 1$, $p = .02$), having a fake FB account (16.6% vs. 2.9%, $\chi^2 = 11.8$, $df = 1$, $p < .001$) using FB for passing time (75.9% vs. 58.0%, $\chi^2 = 9.1$, $df = 1$, $p = .002$), for meeting new people (27.8% vs. 18.6%, $\chi^2 = 3.0$, $df = 1$, $p = .05$), for relaxing (36.9% vs. 24.5%, $\chi^2 = 4.9$, $df = 1$, $p = .01$), for updating status (32.6% vs. 12.7%, $\chi^2 = 13.6$, $df = 1$, $p < .001$), for sharing photos and videos (46.0% vs. 32.4%, $\chi^2 = 5.0$, $df = 1$, $p = .01$), for initiating/terminating romantic relationship (8% vs. 2%, $\chi^2 = 4.4$, $df = 1$, $p = .02$), and for like'ing (32.6% vs. 22.5%, $\chi^2 = 3.6$, $df = 1$, $p = .03$) were significantly higher in ADHD group (Figure 1). Externalizing symptoms were higher in ADHD and internalizing symptoms were higher in non-ADHD group (Table 2).
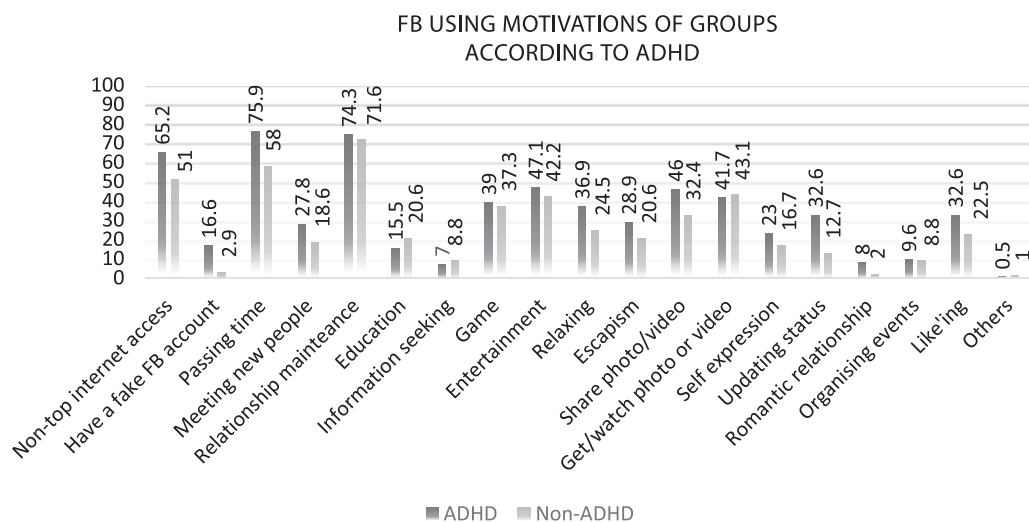
Figure 1. Using FB for passing time, meeting new people, relaxing, share photo/video, updating status, initiating/terminating romantic relationship and like'ing are significantly higher in ADHD group ($p < .05$).

Comparison of sociodemographic variables, FB using motivations, BIS and CASS:L scores of FB overuse and normal use groups

In Table 1, the rates, means and standard deviations of sociodemografic variables, time of having a FB account and using smartphone for access FB between the groups were summarizied. There were no significant differences in terms of gender (34% of girl and 29% of boys were in FB overuse group and 8.3% of girls and 6.9% of boys were in FB addicted group), age, socioeconomic status and smartphone usage between groups but on the other hand, time of having a FB account were significantly longer in FB overuse group than normal use group.

Adolescents with FB overuse had significantly higher CASS:L and BIS scores when compared with the normal use group. Externalizing symptoms were significantly higher in FB overuse group (27.5% vs. 11.1%, $\chi^2 = 12.2$, $df = 1$, $p = .001$). In terms of FB use patterns and motives; rates of having a nonstop Internet access (74.7% vs. 53.5%, $\chi^2 = 11.6$, $df = 1$, $p < .001$), having a fake FB account (25.3% vs. 5.6%, $\chi^2 = 23.1$, $df = 1$, $p < .001$) using FB for passing time (86.3% vs. 62.1%, $\chi^2 = 18.0$, $df = 1$, $p < .001$), for meeting new people (44% vs. 15.7%, $\chi^2 = 26.9$, $df = 1$, $p < .001$), for relationship maintenance (83.5% vs. 68.7%, $\chi^2 = 7.0$, $df = 1$, $p = .005$), for game (48.4% vs. 33.8%, $\chi^2 = 26.9$, $df = 1$, $p = .01$), for entertainment (59.3% vs. 38.9%, $\chi^2 = 10.5$, $df = 1$, $p = .001$), for relaxing (52.7% vs. 23.7%, $\chi^2 = 23.7$, $df = 1$, $p < .01$), for escapism (45.1% vs. 17.2%, $\chi^2 = 28.5$, $df = 1$, $p < .001$) for self expression (39.6% vs. 12.1%, $\chi^2 = 28.5$, $df = 1$, $p < .001$) for updating status (49.5% vs. 14.6%, $\chi^2 = 39.6$, $df = 1$, $p < .001$), for sharing photos and videos (63.7% vs. 30.8%, $\chi^2 = 27.9$, $df = 1$, $p < .001$), for initiating/terminating romantic relationship (13.2% vs. 2.5%, $\chi^2 = 12.8$, $df = 1$, $p = .001$), for organizing events (16.5% vs. 6.1%, $\chi^2 = 12.8$, $df = 1$, $p = .006$), and for like'ing (49.5% vs. 20.2%, $\chi^2 = 25.6$, $df = 1$, $p < .001$), were significantly higher in FB Over use group (Figure 2). In addition, externalizing symptoms were higher in FB overuse group (Table 3).

Correlation analyses about the relationships between scale scores and FB motivation

We examined how addiction symptoms were related to each other, to impulsivity scores and ADHD-related scores by correlation analyses. As summarizied in Table 4, there were positive correlations between BFAS, BIS and CASS:L scales. Correlations were generally weak except the ones between Barrat total, BFAS, attentional impulsivity and motor impulsivity.

Correlations between motivation types and scale scores were also significant but modest. Passing time, updating status, sharing photo/video and like'ing motivations were the most correlated ones with the scale scores (Table 5). Interestingly, internalizing symptoms were negatively, and externalizing symptoms were positively correlated with the scales.

Which variables predict FB overuse and FB addiction among adolescents with ADHD?

We explored the differences in demographic variables, FB using characteristics, motivations for using FB, impulsivity subtypes and ADHD-related behavioural problems in FB addicted/non addicted and FB overuse/normal use subgroups of adolescents.

As summarizied in Table 6, according to univariate analyses, significant differences at $p < .1$ were found between some variables (having ADHD, time of having FB account, having a nonstop Internet access, having a fake account, using FB for some of the motivations,
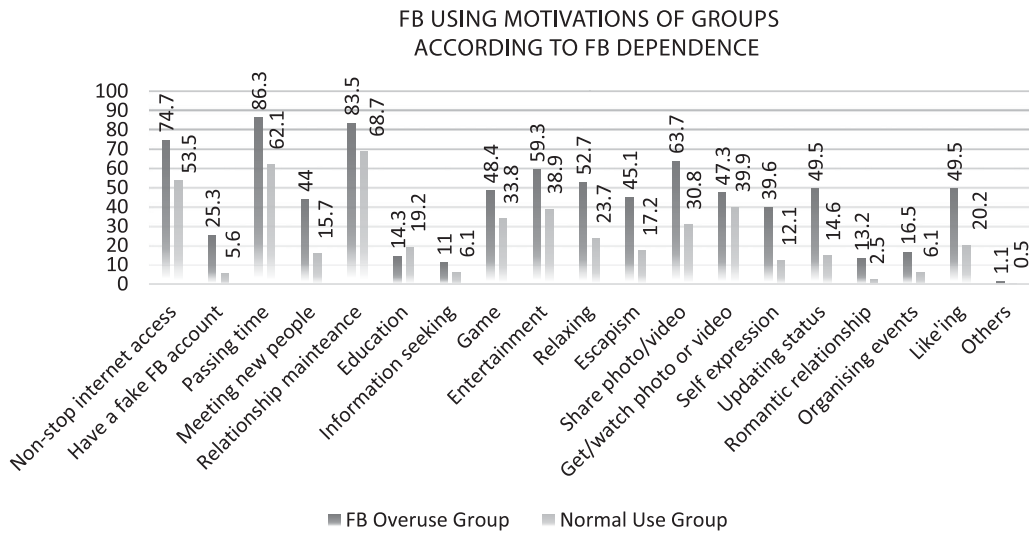
Figure 2. All motivations, except education, information seeking, get/watch photo or video and others, are used significantly higher in FB dependent group than the non-dependent group ($p < .05$).

Table 3. TheScale scores according to groups FB dependent and non-dependent.

	FB overuse group ($n = 91$)		Normal use group ($n = 198$)		
	n	%	n	%	P value and statistics
Internalizing symptoms	36	39.6	97	49	$\chi^2 = 2.2$, $df = 1$, $p = .08$
Externalizing symptoms	25	27.5	22	11.1	$\chi^2 = 12.2$, $df = 1$, $p = .001$
	Mean ± SD		Mean ± SD		
Conners-Wells'Adolescent Scale					
• Family problems[b]	15.8 ± 8.8		12.6 ± 8.3		$t = -2.96$, $p = .003$
• Emotional problems[b]	20.3 ± 6.4		16.9 ± 6.6		$t = -4.15$, $p < .001$
• Conduct problems[a]	15.2 ± 8.2		9.7 ± 9.3		$U = 5834.5$, $p < .001$
• Anger-control problems[a]	18.9 ± 6.4		14.1 ± 8.0		$U = 6009.5$, $p < .001$
• ADHD Index[a]	19.4 ± 6.0		15.9 ± 7.2		$U = 6573$, $p < .001$
• Cognitive problems[a]	18.6 ± 7.5		13.1 ± 8.1		$U = 5834.5$, $p < .001$
• Hyperactive-impulsive[a]	14.6 ± 4.5		11.3 ± 5.5		$U = 6175$, $p < .001$
Barratt total score[a]	76.2 ± 11.3		65.9 ± 10.4		$t = -7.5$, $p < .001$
• Attentional impulsivity[a]	20.3 ± 4.0		17.2 ± 3.8		$t = -6.1$, $p < .001$
• Motor impulsivity[a]	24.9 ± 5.0		20.7 ± 4.3		$t = -7.1$, $p < .001$
• Nonplannig[a]	30.9 ± 4.8		27.89 ± 4.5		$t = -5.0$, $p < .001$

[a]Mann–Whitney U test.
[b]t test.

Table 4. Correlations between scale scores.

Variable	BFAS total	Saliance	Mood modification	Tolerance	Withdrawal	Conflict	Relapse
Barrat total	**.46****	.36**	.27**	**.41****	.38**	**.41****	.35**
Attentional impulsivity	**.40****	.31**	.26**	.34**	.31**	.35**	.31**
Motor impulsivity	**.43****	.35**	.24**	.38**	.37**	.38**	.31**
Nonplanning	.33**	.23**	.19**	.30**	.27**	.31**	.26**
Self-control	.29**	.14**	.16**	.29**	.29**	.29**	.19**
Cognitive complexity	.15**	.11**	.06	.15**	.10	.15*	.14*
Perseverance	.18**	.16**	.13*	.18**	.11*	.18**	.12*
Cognitive instability	.28**	.20**	.22**	.26**	.20**	.25**	.21**
Family problem	.21**	.15**	.16**	.17**	.11	.24**	.17**
Emotional problems	.25**	.20**	.17**	.20**	.17**	.25**	.21**
Conduct problems	.33**	.27**	.23**	.25**	.24**	.30**	.25**
Anger control	.29**	.25**	.18**	.22**	.22**	.26**	.22**
ADHD Index	.27**	.22**	.18**	.21**	.18**	.27**	.21**
Cognitive problems	.30**	.25**	.18**	.25**	.22**	.29**	.24**
Hyperactivity problems	.29**	.21**	.21**	.26**	.22**	.27**	.17**

Note: Pearson and Spearman correlations were used where appropriate.
*$p < .05$ (two-tailed).
**$p < .01$ (two-tailed).

impulsivity subtypes, ADHD-related problems, comorbid externalization disorders) and FB addiction–FB overuse. Multivariate logistic regression analysis revealed that having a fake FB account and higher ADHD index scores increase the FB overuse risk among adolescents. Also, attentional impulsivity, conduct problems and ADHD index scores are the predictors of FB addiction (Table 7).

Table 5. Correlations among the FB motivations and impulsivity types.

FB motivations	Attentional impulsivity	Motor impulsivity	Nonplanning	Family problems	Emotional problems	Conduct problems	Anger-control problems	ADHD Index score	Cognitive problems score	Hyperactivite-impulsive
Passing time	**.10***	**.12***	**.11***	**.10***	**.13***	**.15***	**.13***	**.12***	**.13***	**.11***
Meeting new people	**.23***	**.17***	. 11	.06	.03	.07	.05	.05	.05	.06
Relationship maintenance	.01	.07	.05	.04	.02	.03	−.02	.01	.04	.003
Game	−.04	.05	−.07	−.004	.004	.02	−.01	−.004	.004	−.013
Entertainment	.03	.08	−.02	**.10***	**.10***	.09	.006	.080	**.11***	−.008
Relaxing	**.15***	**.19***	.08	.07	.08	**.10***	.06	**.10***	**.10***	.09
Escapism	**.20***	**.16***	**.12***	.03	.01	.07	.03	.04	.05	.06
Updating status	**.21***	**.29***	**.16***	**.17***	**.12***	**.17***	**.13***	**.18***	**.15***	**.20***
Education	.02	.06	−.004	−.09	−.09	−.09	−.04	−.08	−.09	−.04
Information seeking	.06	.10	−.02	−.08	−.01	−.06	−.01	−.05	−.03	−.01
Share photo/video	**.15***	**.15***	**.12***	**.09**	**.10***	**.11***	**.08**	**.10***	**.11***	**.05**
Get/watch photo/video	**.13***	.09	.03	−.02	.02	.01	−.009	.004	.010	−**.10***
Self-expression	**.22***	**.20***	.07	.04	.004	.07	.008	.03	.055	.06
Initiating/terminating relationship	**.13***	**.22***	**.11***	.06	.05	**.10***	.05	.07	.08	.08
Like'ing	**.15***	**.16***	**.10***	**.12***	**.10***	**.14***	**.04**	**.13***	**.11***	**.12***
Organizing events	.10	**.16***	.06	.003	.12	.04	.008	.058	.04	−.03
İnternalizing symptoms	.01	−.09	.07	−**.12***	−**.11***	−**.14***	−**.19***	−**.14***	−**.12***	−**.12***
Externalizing symptoms	−.01	.08	.09	**.14***	**.16***	**.16***	**.15***	**.14***	**.14***	**.15***

Note: Pearson and Spearman correlationswere used where appropriate.
*$p < .05$ (two-tailed).
**$p < .01$ (two-tailed).

Table 6. Effects of various variables on FB overuse and FB addiction of adolescents in univariate logistic regression analyses.

Variables	FB overuse		FB addiction	
	OR (95% CI)	p value	OR (95% CI)	p value
Age	1.03 (0.88–1.20)	.64	0.90 (0.69–1.1)	.46
ADHD	5.48 (2.81–10.7)	**<.001**	5.98 (1.37–26.1)	**.01**
Male gender	0.79 (0.48–1.30)	.35	0.81 (0.34–1.95)	.64
Time of having a FB account	1.01 (1.008–1.029)	**.001**	1.01 (1.002–1.036)	**.03**
Access FB by smart phone	1.21 (0.72–2.01)	.46	0.65 (0.27–1.57)	.34
Having a nonstop Internet access	2.56 (1.48–4.44)	**.001**	2.38 (0.85–6.64)	**.09**
Having a fake FB account	0.17 (0.08–0.37)	**<.001**	5.29 (2.03–13.80)	**.001**
Using FB for				
• Passing time	4.01 (2.05–7.85)	**<.001**	9.97 (1.32–75.40)	**.02**
• Meeting new people	4.22 (2.40–7.42)	**<.001**	8.07 (3.14–20.75)	**<.001**
• Relationship maintenance	2.31 (1.23–4.33)	**.009**	2.42 (0.69–8.44)	.163
• Game	1.83 (1.10–3.03)	**.019**	1.12 (0.46–2.71)	.802
• Entertainment	2.29 (1.38–3.80)	**.001**	1.82 (0.75–4.41)	.182
• Relaxing	3.58 (2.12–6.06)	**<.001**	5.00 (1.96–12.75)	**.001**
• Escapism	3.95 (2.27–6.88)	**<.001**	5.91 (2.36–14.74)	**<.001**
• Updating status	5.70 (3.22–10.07)	**<.001**	12.52 (4.43–35.41)	**<.001**
• Education	0.70 (0.35–1.39)	.31	1.04 (0.33–3.21)	.945
• Information seeking	1.91 (0.79–4.60)	.14	3.07 (0.94–10.04)	.06
• Share photo/video	3.94 (2.33–6.60)	**<.001**	5.50 (1.69–15.36)	**.001**
• Get/watch photo/video	1.34 (0.81–2.22)	.24	1.71 (0.71–4.10)	.227
• Self expression	4.74 (2.60–8.63)	**<.001**	10.57 (4.07–27.40)	**<.001**
• Initiating/terminating relationship	5.86 (2.00–17.19)	**.001**	8.72 (2.86–26.63)	**<.001**
• Like'ing	3.86 (2.25–6.61)	**<.001**	13.43 (4.39–41.09)	**<.001**
• Organizing events	3.05 (1.36–6.84)	**.006**	4.39 (1.55–12.41)	**.005**
Attentional impulsivity scores	1.21 (1.13–1.29)	**<.001**	1.32 (1.18–1.49)	**<.001**
Motor impulsivity scores	1.20 (1.13–1.28)	**<.001**	1.24 (1.13–1.36)	**<.001**
Nonplanning scores	1.14 (1.08–1.21)	**<.001**	1.18 (1.07–1.30)	**.001**
Family problems scores	1.04 (1.01–1.07)	**.004**	1.06 (1.01–1.12)	**.015**
Emotional problems scores	1.08 (1.04–1.12)	**<.001**	1.05 (0.98–1.13)	.120
Conduct problems score	1.06 (1.03–1.09)	**<.001**	1.08 (1.035–1.143)	**.001**
Anger-control problems score	1.09 (1.05–1.13)	**<.001**	1.05 (0.99–1.12)	.08
ADHD Index score	1.08 (1.03–1.12)	**<.001**	1.07 (1.00–1.15)	**.049**
Cognitive problems score	1.08 (1.05–1.12)	**<.001**	1.06 (1.001–1.124)	**.048**
Hyperactivite-impulsive score	1.14 (1.07–1.20)	**<.001**	1.20 (1.07–1.35)	**.001**
İnternalizing symptoms	0.68 (0.41–1.12)	.136	0.64 (0.26–1.59)	.347
Externalizing symptoms	3.03 (1.59–5.74)	**.001**	2.64 (1.01–6.90)	**.046**

Note: OR: Odds ratio; CI: confidence interval.

Discussion

To our knowledge, this study was the first to examine the effect of ADHD, impulsivity types, using motivations, internalizing and externalizing symptoms on FB overuse and FB addiction among adolescents. Our results indicated that ADHD adolescents have more fake FB accounts, have their own accounts for longer time, are using FB for more motivation types and FB overuse is more frequent than in non-ADHD counterparts. When we divided the participants according to the degree of FB use, we have shown that adolescents with FB overuse behaviour have more externalizing symptoms, have higher CASS:L and Barrat impulsivity

Table 7. Effects of various variables on FB addiction of adolescents in multivariate logistic regression analyses.

Statistically significant variables	Adjusted OR	95% CI	p value
FB addiction in adolescents[a]			
Attentional impulsivity	1.40	1.04–1.90	**.027**
Conduct problems	1.40	−1.09 to 1.80	**.008**
ADHD Index	0.63	0.40–0.98	**.04**
FB overuse in adolescents[a]			
Having a fake FB account	2.99	1.05–8.55	**.04**
ADHD Index	0.79	0.63–0.99	**.04**

[a]Adjusted for time of having a FB account, having a fake FB account, motivations for using FB, attentional impulsivity, motor impulsivity, nonplanning, ADHD-related problems and externalizing according to univariate analyses in Table 6. OR: Odds ratio; CI: confidence interval.

scores than normal use group. The results of logistic regression analysis demonstrated that risk factors for FB overuse are: having a fake FB account and have higher ADHD index scores and risk factors for FB addiction are: higher attentional impulsivity, higher conduct problems and higher ADHD index scores.

Previous studies had shown that ADHD in children and adolescents is significantly associated with Internet addiction [32,33–38]. Our results also showed that a new type of Internet overuse and addiction (FB overuse and FB addiction) are also higher among ADHD adolescents.

Firstly, we want to address the relationships between impulsivity, ADHD, externalizing symptoms and addictive behaviours. According to studies, these are all associated with the addictive behaviours in general [39,40]. For example, nicotine and alcohol use are positively associated with self-reported impulsivity symptoms [41] and increases in the number of impulsivity and conduct disorder (CD) symptoms are also associated with increased risk of other substance use disorders (SUDs) too [42]. There seems to be a similar pattern for Internet and SNSs addictions [43]. Recent studies demonstrated that impulsivity symptoms are associated with Internet addiction symptoms among children and college students with ADHD [44–46] and attention

deficits were more related to Internet addiction than hyperactivity symptoms [47]. Other studies which focused on FB addiction reported that individuals with reduced self-control were at increased risk [48]. Our results contributed to the literature by showing that particularly attentional impulsivity, CD and ADHD index scores were independently associated with increased risk of FB addiction among adolescents.

Secondly, we want to address the relationship between internalizing/externalizing symptoms and FB overuse/FB addiction. Many researchers argued that neuroticism, a personality trait that characterized by anxiety, fear, moodiness, worry, envy, frustration, jealousy and loneliness, was significantly associated with SNS addiction/problematic use [49–54]. In addition, a large body of research in literature has assessed the association between depression and FB addiction. Some researchers reported that depressive character, low self esteem, fear of rejection and high need for acceptance by others were the positive predictors of FB addiction [15,48,55], while some studies found no relationship or showed a lower level of depression by having a FB account [56]. Conversely, our results indicated that internalizing symptoms are not associated with the overuse/addiction behaviour; on the other hand, higher conduct problems are associated with the FB addiction but not with FB overuse among adolescents. These results suggest two important points: Firstly, there could be different FB addiction types according to age groups and internalizing/externalizing symptoms may reveal different effects on FB addiction behaviour across the generations. This hypothesis is partially supported by a recent research which has demonstrated the differences among young adults and older ones, that sharing information on social media improves life satisfaction and loneliness for younger users, whereas the opposite was true for older ones [57]. On the other hand, our results could be interpreted as FB addiction is more associated with the psychopathologies than FB overuse and also there could be two different pathway that causes overuse and addiction behaviour among adolescents. While it is difficult to compare our results across studies and generalize them, we would suggest exploring FB overuse and addiction within the different adolescents groups in future studies.

Thirdly, we found that having a fake FB account was associated with higher risk of FB overuse. FB allows individuals represent themselves using individual profiles and wall posts. Often, this provides connecting with real life friends and maintain the connections over time [58]. But having a fake FB account is a popular entity among adolescents. Although we could not find any study in the literature about this phenomenon, according to our clinical observations, they mostly get a fake account for online games and having cyber sexual relationships. So this may be associated with a dimension of temperament like novelty seeking or risky behaviour. If so, could be having a fake FB account a risk factor for online gaming disorder or pornography addiction among adolescents? It also seems important to consider this issue in future studies.

In terms of motivations, we found that using FB for passing time, meeting new people, relationship maintenance, game, entertainment, relaxing, escapism, self expression, updating status, sharing photos and videos, initiating/terminating romantic relationship, organizing events and like'ing were significantly higher in FB over use group. There has been considerable research on intrinsic need gratification and media use. Intrinsic needs have been described as needs for autonomy, competence and relatedness [59]. It has been argued that expected gratification from media use might lead to excessive and addictive use [60]. Studies based on uses and gratifications approach [61] suggested that motivations including seeking a virtual community, entertainment, relationship maintenance [62], seeking excitement, escapism [60,63], self-presentation and relation building [64] might be associated with problematic and compulsive Internet and FB use. Our findings were consistent with the idea that thwarted autonomy need satisfaction might be associated with presenting oneself at FB without external pressure and escape from daily life among adolescents too [60].

In a recent review about the studies of SNSs addiction, it has been suggested that smartphone addiction may be a part of SNS addiction [43]. We did not explore the smartphone addiction but we analysed the effects of "using FB via smartphone" on FB overuse and addiction and we could not find a significant association between these variables.

And finally, in terms of gender, studies' results still appear to be contradictory. In a German sample with age 14–16 years, girls appeared to show a higher prevalence of addictions to the Internet and SNSs [65], but on the other hand among Turkish teacher candidates (young adults), the trend was reversed, suggesting males were significantly more likely to be addicted to using FB [66], and in a young adult Chinese group, authors reported that they did not find a relationship between gender and SNS dependence [67]. According to our results, we did not find a significant gender differences according to FB overuse and addiction behaviours, but both of them were higher in female adolescents.

Our results must be evaluated in light of limitations. Firstly, due to a cross-sectional design, it is not possible to comment on causality. Secondly, the study group was composed of adolescents from mid-low socioeconomic status, which limits the generalizability of the study findings. And non-ADHD

group also had subclinical psychiatric symptoms which could be related with FB addiction. By working with the healthy control group, more information can be obtained. And thirdly the data for FB overuse, addiction, impulsivity types, motivations of FB using and ADHD symptoms were collected by self reports.

Conclusion

Despite these limitations, the results of this study have improved our understanding about the risk factors of a new behavioural addiction type among adolescents. We hope that our results can be helpful and have implications for psychoeducation in this group.

Disclosure statement

No potential conflict of interest was reported by the authors.

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