## ORIGINAL RESEARCH

# Problematic WhatsApp Use Among Adolescents: Linking Fear of Missing Out and Psychiatric Symptoms

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### Abstract

Objective: WhatsApp (WA) is the most popular instant message application all over the world. Although communication has become easier and enjoyable with the help of this application, the overuse, and addiction of WA has become an important problem among adolescents. WhatsApp addiction is a part of problematic smartphone use (PSU). When we examined previous studies, we found that the samples were generally composed of young adults, but studies on adolescents who are at high risk for problematic Whatsapp use (PWU) were insufficient, and almost no studies were conducted in the clinical adolescent sample. In this study, we aimed to increase our knowledge about problematic PWU and possible risk factors including fear of missing out (FoMO), PSU, and psychiatric symptoms among adolescents who applied to outpatient psychiatry clinics.

Methods: 197 adolescents (136 boys, 61 girls, age: 12-18 years) recruited the study. Problematic Mobile Phone Usage Scale (PMPUS), Bergen Whatsapp Addiction Scale, Brief Symptom Inventory, and Fear of Missing Out (FoMO) Scale were used.

Results: We grouped the sample as PWU (Problematic WhatsApp use) and Normal Use group due to Bergen WA Addiction Scale. PWU group's adolescents were significantly older than others (p=0.03), and had higher scores in all subscales of Brief Symptom Inventory (BSI), FoMO and PMPUS (for all scale scores p<0.001). Regression analysis demonstrated that FoMO is a predictor of PWU. Also, paranoid ideation, psychoticism, phobic anxiety, and somatization had a positive effect (β=1.80, 0.98, 1.26, 0.52; respectively) while obsession-compulsion and depression had a negative effect on PWU (β=-0.76, − 1.22, respectively).

Conclusion: Our results demonstrated that problematic Whatsapp use is an important internet-related behavioral problem and have specific risk factors among adolescents. Adolescents use Whatsapp generally with their real friends/relatives. Adolescents who have depression, obsession-compulsion mostly have social withdrawal, and would not be interested in communicating their real social environment. On the other hand, adolescents who have phobic anxiety, paranoid ideation, psychoticism and somatization symptoms would follow the changes and events more closely. The associations between different psychiatric symptoms and PWU could guide the practitioners in the psychiatric care of adolescents.

Keywords: Problematic Whatsapp Use, Fear of Missing Out, Problematic Smartphone Use, Psychiatric Symptoms, Adolescents

## INTRODUCTION

WhatsApp (WA) is the most popular instant message application all over the world. It represents important features of a smartphone, by easy communication via text or voice messages, pictures, videos, and video calls between two-person or groups. Although communication has become easier, faster, cheaper, and enjoyable with the help of this application, as in other

behaviors associated with the internet, overuse, and addiction of WA has become an important problem among adolescents.

WhatsApp addiction is a part of problematic smartphone use (PSU). To date, many studies have been completed about PSU, and WA addiction in young adults. These studies demonstrated that PSU is linked with lower empathy, lower life satisfaction, fear of missing out (FoMO) and psychiatric symptoms (1-4). Studies demonstrated that the relationship between FoMO and PSU is mediated by depression, anxiety, and stress (5, 6). Besides results indicated that the effect of FoMO on PSU is related to the higher use of social network sites and Whatsapp (7).When we address the WA addiction specifically, we found that the prevalence is quite high among young adults (51% in medical students)(8).

Females use WhatsApp for longer periods than males and younger participants tend to have longer daily WhatsApp use (9). In addition, studies addressing the relationship between WA addiction and psychiatric/psychological symptoms showed that introverted personality traits, neuroticism, shyness, moody behavior, loneliness, and stress are linked to WA addiction (10).

When we examined the previous studies, we found that studies on adolescents who are at high risk for problematic Whatsapp use were insufficient, and almost no studies were conducted in the clinical adolescent sample.

In this study, we aimed to increase our knowledge about problematic Whatsapp use (PWU) and associated problems among adolescents who applied to outpatient psychiatry clinics.

Our hypotheses were:

• Adolescents who have PWU have higher psychiatric symptom, PSU, and FoMO scores than others.

• Adolescents with PWU have lower academic achievements than adolescents without PWU. In addition, they could have different sociodemographic features than others.

• FoMO is a predictor of PWU.

• Psychiatric problems could affect PWU.

## METHODS

The research was approved by the Ethics Committee of Ankara University School of Medicine (Date: 25.07.2016/ Number: 13-612-16). We invited the adolescents who were referred to psychiatry/child and adolescent psychiatry outpatient clinics. Inclusion criteria were being 12-18 years old and having an own smartphone. Adolescents who have autism spectrum disorder, chronic medical or neurological disease, mental retardation, or have not own smartphones were excluded. Written informed consent was obtained from all adolescents and their parents who agreed to participate. The study was carried out in Ufuk and Ankara University School of Medicine and Kahramanmaras City Hospital Psychiatry or Child and Adolescent Psychiatry clinics.

There were 136 boys and 61 girls aged between 12-18 (15.5±1.6) years. The median maternal age was 41 (31-58), the median maternal education was 6 (3-16), the median paternal age was 44.5 (36-76) and the median paternal education was 8 (5-16). The median monthly income of the sample was 2000(0-5000) Turkish Liras (Table 1). Demographic Information Form, Problematic

Mobile Phone Usage Scale (PMPUS), Bergen Whatsapp Addiction Scale, Brief Symptom Inventory (BSI), and FoMO were used.

**Table 1.** Demographic characteristics of sample

| Characteristics | | |
|---|---|---|
| | **N (197)** | **%** |
| **Gender** | | |
| **Boys** | 136 | (69) |
| **Girls** | 61 | (31) |
| **Age (years)** | 15.5±1.6 | |
| **Education** | 10 (0-12) | |
| **Socioeconomic Status** | | |
| **Monthly income (lira); median(min-max)** | 2000(0-5000) | |
| **Maternal education (years) median(min-max)** | 6(3-16) | |
| **Paternal Education (years) median(min-max)** | 8(5-16) | |
| **Maternal age(years) median(min-max)** | 40(31-58) | |
| **Paternal age(years) median(min-max)** | 44.5 (36-76) | |

## MEASUREMENTS

**Demographic Information Form:** This form consisted of questions about the age, school, parental age, parental education, monthly income, marital status of parents and the academic achievement of adolescents.

**Problematic Mobile Phone Usage Scale (PMPUS):** This scale was developed by Augner and Hacker. It includes questions about the excessive use of mobile phone, the relationship between mobile phone using and some mental health variables, and the negative effects of long term use. It is a Likert-type scale scored between 0 (no) – 4 (very frequent). The total score ranges from 0-104 (the cut-off point for problematic use is 30). Taking a high score indicates that someone is having more problematic and addictive mobile phone using. The Turkish validity and reliability study of the scale was made by Tekin and colleagues (11). For our sample, the value of Cronbach α is =0.94.

**Brief Symptom Inventory (BSI):** The Brief Symptom Inventory was developed by Derogatis (1992) for the purpose of screening various psychiatric symptoms(12). It is the short form of SCL-90-R, and has 53 items. It is a 4 point Likert type scale. It has items for somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism symptoms. Turkish adaptation studies was made by Sahin and Durak (1994)(13).

**Fear of Missing Out Scale (FoMO):** It is a 5 point Likert type scale, and consisted of ten items. The total scores range between 10-50 and higher scores indicate a higher level of FoMO. The Cronbach α coefficient of the original

version is .90. Turkish validity and reliability studies demonstrated that the Cronbach α values were ranged between 0.78 to 0.86 in three different Tuskish sample (14).

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

It a 5-point Likert type scale. Higher scores indicate greater Whatsapp addiction. According to polythetic scoring method, we determined the cutoff score for problematic PWU as 42 points. The validity and reliability study of Turkish version was conducted by Akin. 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 fitted ($x^2$=291.88, df=118, p=0.0000, 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 were .96.

## Statistical Analysis

We used IBM SPSS Statistics for Windows 22.0 software for statistical analyzes. Pearson Chi-square and Fisher's exact tests were used to compare the differences of the categorical variables; Independent Sample T-Test or Mann Whitney U test were used to compare differences of demographic characteristics and scale scores between PWU and normal use groups. Pearson correlation analyzes were used to examine the relationships between scale scores. The multiple linear regression–Stepwise model was used to identify independent predictors of PWU. The model fit was assessed using appropriate residual and goodness-of-fit statistics. A 5% type-I error level was used to infer statistical significance. We used G* Power 3.1.9.7 programme for post hoc power analysis. We found that Power (1-β)=0.91 when the two-tailed effect size (d) is 0.5 (medium effect size).

## RESULTS

We grouped the sample as PWU, and normal use group due to Bergen WA Addiction scale scores. In Table 2, the rates, means, and standard deviations of sociodemographic variables, FoMO, and PMPUS scores of adolescents were demonstrated. There were no significant differences in terms of gender, academic achievement, and socioeconomic status but the PWU group's adolescents were significantly older than others (15.9 ± 1.3 vs. 15.3 ± 1.6; F = 2.8, p=0.03) We also found that PWU group had significantly higher scores in total, and all subscales of Brief Symptom Inventory (BSI), FoMO and PMPUS (for all scale scores p<0.001, Cohen's d value were > 0.79, and $\eta^2$ values were >0.09)(Table 2).

We examined how scale scores were related to PWU scores by correlation analyses. As summarized in Table 3, there were positive correlations between PWU, FoMO, PMPUS, and BSI subscales including somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Correlations were generally moderate except the ones between WA addiction-paranoid ideation and PMPUS (There were strong relationships between WA addiction and paranoid ideation and problematic mobile phone use: r=.61, .73, respectively. For all others r is between .40-.60) (Table 3).

**Table 2.** Comparison of PWU and normal use groups according to BSI Sub-Scales, FoMO and PMPUS Scores

| | PWU Group | Normal Use Group | Statistics and p value |
|---|---|---|---|
| *Demographic Characteristics* | | | |
| Gender | | | $x^2$=0.79, df=1, p=0.23 |
| Girl | 49 (%73.1) | 87 (%66.9) | |
| Boy | 18 (%26.9) | 43 (%33.1) | |
| Parental Education (years) | 8.9±3.4 | 8.7±3.6 | F=1.3, df=185, p=0.65 |
| Academic Achievement (School report card score) | 76.7±14.4 | 77.8±39.0 | F=0.2, df=185, p=0.81 |
| Age | 15.9±1.3 | 15.3±1.6 | **F=2.8, df=195, p=0.03** |
| *Scale Scores* | | | |
| 1. BSI-Somatization | 15.8±6.3 | 8.8±6.4 | **F=1.0, t=-7.2, p<0.001, $\eta^2$ =0.21, d=1.10** |
| 2. BSI-Obsession-Compulsion | 16.1±5.3 | 10.8±5.7 | **F=0.3, t=-6.2, p<0.001, $\eta^2$ =0.16, d=0.96** |
| 3. BSI-Interpersonal Sensitivity | 11.2±3.4 | 7.0±4.3 | **F=7.9, t=-6.7, p<0.001, $\eta^2$ =0.19, d=1.08** |
| 4. BSI-Depression | 16.9±4.7 | 9.5±7.2 | **F=27.9, t=7.3, p<0.001, $\eta^2$ =0.22, d=1.21** |
| 5. BSI-Anxiety | 15.5±5.4 | 8.8±5.5 | **F=0.6, t=-7.3, p<0.001, $\eta^2$ =0.24, d=1.22** |
| 6. BSI-Hostility | 14.3±4.7 | 8.9±5.4 | **F=4.0, t=-6.7, p<0.001, $\eta^2$ =0.19, d=1.06** |
| 7. BSI-Phobic Anxiety | 11.4±5.0 | 5.8±4.3 | **F=2.8, t=-8.0, p<0.001, $\eta^2$ =0.25, d=1.20** |
| 8. BSI-Paranoid Ideation | 14.6±2.0 | 7.9±4.6 | **F=23.6,t=10.4, p<0.001, $\eta^2$ =0.36, d=1.88** |
| 9. BSI-Psychoticism | 11.6±4.1 | 6.1±4.6 | **F=1.7, t=-8.1, p<0.001, $\eta^2$ =0.25, d=1.26** |
| 10. BSI-Total | 137.3±38.8 | 80.1±46.0 | **F=8.5, t=-8.5, p<0.001, $\eta^2$ =0.27, d=1.34** |
| 11. FoMO | 29.7±11.5 | 21.8±7.9 | **F=19.4, t=-5.6, p<0.001, $\eta^2$ =0.14, d=0.8**0 |
| 12. PMPUS | 58.4±13.2 | 24.1±7.2 | **F=31.6, t=-23.2, p<0.001, $\eta^2$ =0.38, d=3.22** |

$\eta^2$ =Eta Squared, effect size ( medium/large effect size for all comparisons: $\eta^2$ values were >0.09)
d= Cohens d value, (Cohens d values represented a high effect size, all d values were >0.79).
PWU: Problematic Whatsapp Use; BSI: Brief Symptom Inventory, FoMO: Fear of Missing Out Scale, PMPUS: Problematic Mobile Phone Usage Scale

**Table 3.** Correlations of BSI Sub-Scales, BWAS, FoMO and PMPUS Scores

| BSI – Subscales | BWAS |
|---|---|
| Somatization | .54** |
| Obsession-Compulsion | .48** |
| Interpersonal Sensitivity | .49** |
| Depression | .53** |
| Anxiety | .56** |
| Hostility | .49** |
| Phobic Anxiety | .59** |
| Paranoid Ideation | **.61**** |
| Psychoticism | .59** |
| FoMO | .44** |
| PMPUS | **.73**** |

Note. Pearson correlations, **correlations are significant at 0.01 level(2-tailed), * correlations are significant at 0.05 level, (2-tailed), BSI: Brief Symptom Inventory; BWAS: Bergen Whatsapp Addiction Scale; ; FoMO; Fear of Missing Out; PMPUS: Problematic Mobile Phone Usage Scale

**Table 4.** The Predictors of PWU by lineer regression analysis

| PW$^{U*}$ | | Unstandardized Coefficients | | Standardized Coefficients | t | p | 95.0% Confidence Interval for B | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower | Upper | Tolerance | VIF |
| **Model-1** | | | | | | | | | | |
| | Paranoid Ideation | 2.24 | .20 | .61 | 10.86 | <.001 | 1.84 | 2.65 | 1.00 | 1.00 |
| **Model-2** | | | | | | | | | | |
| | Paranoid Ideation | 1.89 | .21 | .52 | 8.98 | <.001 | 1.48 | 2.31 | .87 | 1.15 |
| | FoMO | .50 | .11 | .26 | 4.63 | <.001 | .29 | .72 | .87 | 1.15 |
| **Model-3** | | | | | | | | | | |
| | Paranoid Ideation | 1.16 | .31 | .32 | 3.73 | <.001 | .54 | 1.78 | .38 | 2.62 |
| | FoMO | .48 | .10 | .25 | 4.47 | <.001 | .27 | .69 | .86 | 1.15 |
| | Psychoticism | .97 | .31 | .26 | 3.12 | .002 | .35 | 1.59 | .39 | 2.56 |
| **Model-4** | | | | | | | | | | |
| | Paranoid Ideation | 1.65 | .39 | .45 | 4.21 | <.001 | .87 | 2.42 | .23 | 4.22 |
| | FoMO | .49 | .10 | .26 | 4.62 | <.001 | .28 | .70 | .86 | 1.16 |
| | Psychoticism | 1.31 | .35 | .35 | 3.73 | <.001 | .62 | 2.01 | .30 | 3.32 |
| | Depression | -.62 | .30 | -.24 | -2.02 | .045 | -1.23 | -.01 | .19 | 5.17 |
| **Model-5** | | | | | | | | | | |
| | Paranoid Ideation | 1.53 | .38 | .42 | 3.96 | <.001 | .76 | 2.29 | .23 | 4.26 |
| | FoMO | .49 | .10 | .26 | 4.69 | <.001 | .28 | .69 | .86 | 1.16 |
| | Psychoticism | 1.02 | .35 | .27 | 2.85 | .005 | .314 | 1.72 | .27 | 3.58 |
| | Depression | -1.06 | .33 | -.41 | -3.17 | .002 | -1.72 | -.40 | .15 | 6.34 |
| | Phobic Anxiety | 1.12 | .37 | .31 | 3.05 | .003 | .39 | 1.85 | .25 | 3.98 |
| **Model-6** | | | | | | | | | | |
| | Paranoid Ideation | 1.72 | .39 | .47 | 4.37 | <.001 | .94 | 2.50 | .22 | 4.52 |
| | FoMO | .49 | .10 | .26 | 4.76 | <.001 | .29 | .70 | .86 | 1.16 |
| | Psychoticism | 1.17 | .36 | .31 | 3.24 | .001 | .46 | 1.89 | .26 | 3.74 |
| | Depression | -1.03 | .33 | -.40 | -3.12 | .002 | -1.69 | -.38 | .15 | 6.35 |
| | Phobic Anxiety | 1.35 | .38 | .37 | 3.54 | <.001 | .60 | 2.11 | .23 | 4.34 |
| | Obsession-Compulsion | -.58 | .28 | -.18 | -2.07 | .040 | -1.14 | -.02 | .31 | 3.22 |
| **Model-7** | | | | | | | | | | |
| | Paranoid Ideation | 1.80 | .39 | .49 | 4.60 | <.001 | 1.03 | 2.58 | .21 | 4.57 |
| | FoMO | .49 | .10 | .26 | 4.79 | <.001 | .29 | .69 | .86 | 1.16 |
| | Psychoticism | .98 | .37 | .26 | 2.63 | .009 | .24 | 1.71 | .24 | 4.01 |
| | Depression | -1.22 | .34 | -.47 | -3.57 | <.001 | -1.89 | -.54 | .14 | 6.82 |
| | Phobic Anxiety | 1.26 | .38 | .35 | 3.30 | .001 | .50 | 2.01 | .22 | 4.41 |
| | Obsession-Compulsion | -.76 | .29 | -.24 | -2.59 | .010 | -1.34 | -.18 | .28 | 3.53 |
| | Somatization | .52 | .26 | .19 | 2.02 | .044 | .01 | 1.04 | .26 | 3.80 |

Note.*Dependent variable; Stepwise model was used for lineer regression analyzes; PWU: Problematic Whatsapp Use, FoMO: Fear of Missing Out;
Model-1: $R^2$=0.38, F change=, df1=1, df2=191, p<0.001
Model-2: $R^2$=0.44, F change=, df1=1, df2=190, p<0.001
Model-3: $R^2$=0.47, F change=, df1=1, df2=189, p<0.001
Model-4: $R^2$=0.48, F change=, df1=1, df2=188, p<0.001
Model-5: $R^2$=0.50, F change=, df1=1, df2=187, p<0.001
Model-6: $R^2$=0.51, F change=, df1=1, df2=186, p<0.001
Model-7: $R^2$=0.52, F change=, df1=1, df2=185, p<0.001, Durbin-Watson=1.99

We used the multivariate Lineer regression-Stepwise analyzes method to identify the predictors of PWU. For analysis, we used FoMO and BSI subscale scores as independent variables (We did not include PMPUS scores because problematic Whatsapp use is a type of PSU). The regression models were significant (p<0.001).

Results demonstrated that FoMO is a predictor of PWU. Also, paranoid ideation, psychoticism, phobic anxiety and somatization had a positive effect (β=1.80, 0.98, 1.26, 0.52; respectively) while obsession-compulsion and depression had a negative effect on PWU (β=-0.76, – 1.22, respectively) (Table 4).

## DISCUSSION

Our study investigated the relationships between PWU, PSU, FoMO, and psychiatric symptoms among adolescents who applied to psychiatry outpatient clinics. Our results demonstrated that adolescents with PWU were older than others but there were no significant differences instead of gender and academic achievement. PWU group adolescents have higher FoMO, PSU, and psychiatric symptoms including somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, phobic anxiety, paranoid ideation and psychoticism. Due to regression analysis, we found that higher levels of FoMO, phobic anxiety, psychoticism, paranoid ideation, and somatization increase the risk of PWU, but obsession-compulsion, and depression symptoms have a negative effect on PWU.

Previous studies demonstrated that people are not addicted to the smartphone; addiction typically refers to applications or functions provided by smartphones (15). Major motivations of smartphone use are the social network applications such as Facebook, Instagram, and Twitter. People can communicate with real/online friends by these applications and the problematic use of these applications are different from those used for shopping, playing games, listening music, watching video, etc. Another type of smartphone use is using applications for communication like Whatsapp, Snapchat, Telegram, etc. A study by Montag, Zhao, et al. (2018) demonstrated that the problematic WeChat use (a Chinese application that serves as a messenger and a social platform but also allows payment services) was linked to smaller gray matter volume of the subgenual anterior cingulate cortex and nucleus accumbens, which have been linked with the brain reward system and addictive behaviors including internet gaming disorder, substance addiction and pathological gambling in earlier studies(16, 17). In this context, it has been argued that Internet Communication Disorder (ICD) (the problematic use of online communication applications) could constitute a distinct form of PSU (16, 18, 19).

Previous studies linked the problematic mobile/smartphone use with lower life satisfaction, higher tendencies of FoMO (1, 4, 19-21), somatization, interpersonal sensitivity, hostility (22), depression, obsession-compulsion, anxiety, and impulsiveness (23). Although PWU is a type of PSU, we found that psychopathologies have different effects on these problems. Our results demonstrated that higher levels of obsession-compulsion and depression are negatively associated with PWU. This difference may be related to the features of Whatsapp and other PSU-causing applications. As known, an individual could use Whatsapp mostly with real friends, family members, relatives and collegeaus and can not use a fake account on this application. Adolescents who have depression, obsession-compulsion mostly have social withdrawal and would not be interested in communicating the real social environment. On the other hand, adolescents who have phobic anxiety, paranoid ideation, psychoticism, and somatization symptoms would follow the changes and events in the real social environment more closely.

The other possibility about the differences of PSU-PWU predictors is the using motivations. Most popular SNSs like Facebook, İnstagram, and Twitter, or other PSU-causing applications like online games are mostly used for escapism (the tendency to seek distraction and relief from unpleasant realities, especially by seeking entertainment or engaging in fantasy). In addition, these applications allow fake accounts or nicknames in which adolescents can have the ideal self in their dreams. So, using these applications could be a coping style by escaping from the actual self to the ideal one. Supporting this idea, in a recent study, we found that adolescents who have Facebook addiction/overuse symptoms have more fake accounts than others (24). Besides a recent study demonstrated that problematic Instragram use is associated with the frequency of watching live streams, liking, commenting on others' posts, feeling a higher sense of presence on Instagram, and using it as an escape from reality (25).

Another important issue is the effect of FoMO on PWU among adolescents. FoMO is defined as the tendency towards having fear to miss out on actions/status that others are experiencing and rewarding. Wegmann et al. (2017) defined two types of FoMO: 1. Trait-FoMO which refers to a dispositional characteristic like '' fearing that others are having fun without me'' and 2.Internet Specific-FoMO which has more direct relevance in the context of online use like ''not wanting to miss out on anything online (4). Their study indicated that Internet specific FoMO mediated the effect of trait-FoMO and depression-interpersonal sensitivity on internet communication disorder. Furthermore, they showed that the effects of trait and Internet specific FoMO were specific to internet communication disorder, did not predict the internet gaming disorder which is another type of problematic internet use. These results are supported by other studies which reported the links between FoMO-SNS addiction (26) (27) and FoMO-PSU (3). Also,

recent studies revealed that higher levels of depression, anxiety, stress, and SNS use mediated the relationship between FoMO and PSU(5, 6) . In brief, it appears that FoMO is an important risk factor particularly in the context of excessive SNS use. However, the link between FoMO and specific social media channels accessed from a smartphone like WhatsApp and Facebook has been examined separately in a few studies. One of these studies (Participants were 12-75 years and the mean age was 30 years), revealed that PSU was linked to PW, and to a lesser extent, Facebook Use Disorder. Additionally, FoMO predicted PSU, PWU, and Facebook Use Disorder (19). In another study (participants were all teenagers, mean age was 14.5 years) results demonstrated that FoMO was a positive predictor of both how frequently adolescents use social media platforms and of how many platforms they actively use. Also, they found that FoMO is a stronger predictor of the use of social media platforms that are more private (Facebook, Snapchat, etc.) than platforms that are more public in nature (Twitter, Youtube, etc.) (28). Once again, our results indicated that FoMO is a predictor of a private platform, Whatsapp, for adolescents.

Our study seems important to guide clinical practice with adolescents but has some limitations. Firstly, we used self-report scales, so we could not get information from parents and teachers. As the adolescents tend to score their internet usage lower, PWU rates could be higher than detected. In addition, it is difficult to compare the results because different scales were used in the previous studies. Unfortunately, this difficulty is a common limitation of studies measuring social media overuse and addiction (29). Secondly, although there was a valid post-hoc statistical power analysis, the sample size is relatively small, and the study has a cross-sectional design so it is difficult to generalize our findings for all adolescents. Thirdly, it would be useful to address the diagnoses of adolescents (e.g ADHD, depression, anxiety disorders, OCD, etc.) rather than measuring psychiatric symptom scores. We want to underline that large sample sizes and case-control studies are needed to determine multiple relationships between PWU, FoMO, and psychiatric problems.

## CONCLUSION

Our results demonstrated that problematic Whatsapp use is an important internet related-behavioral problem and has specific risk factors among adolescents**.** Adolescents use Whatsapp generally with their real friends/relatives. Adolescents who have depression, obsession-compulsion mostly have social withdrawal and would not be interested in communicating their real social environment. On the other hand, adolescents who have phobic anxiety, paranoid ideation, psychoticism, and somatization symptoms would follow the changes and events more closely. We hope that our study will increase clinicians' awareness of PWU and guide future studies.

**Data Availability Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request

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