Adolescents Suspended in the Space-Time: Problematic Use of Smartphone between Dissociative Symptoms and Flow Experiences

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Abstract

Based on current digital culture, this chapter aims to provide an updated view of dissociative experiences as no-psychopathological symptoms of flow experiences. It has been hypothesized that prolonged exposures to smartphone screens could be a predictor of altered states of consciousness (flow) and that sometimes these prolonged exposures could degenerate into dissociative phenomena. Participants were 643 high school students aged between 13 and 23 years (M = 16.08; SD = 1.79). They were asked to answer four self-report questionnaires about the habits of smartphone usage, the perception of problematic smartphone use, and the assessment of dissociative symptoms and experiences (e.g., bizarre sensory experiences, absorption and imaginative involvement [AII], depersonalization and derealization). Gender differences emerged both in smartphone usage habits and some dissociative scales. Two gender-specific stepwise linear regressions showed that problematic smartphone use is one of the stronger predictors of dissociative symptoms. Results support the idea that in an adolescents’ community sample prolonged exposition to smartphone screens plays a role in the manifestation of dissociative symptoms. This is closely connected with experiences of AII, which could reinforce the use of devices contributing significantly to establishing a causal circularity between smartphone prolonged usage and AII phenomena.

Keywords: smartphone overuse, flow experience, dissociative symptoms, digital habits, adolescents

1. Introduction

Typical images of our time show teenagers, side by side, with their eyes lost in their smartphones. Currently, the majority of children and teens prefer smartphones to connect online. The time spent online is difficult to estimate accurately, because with a smartphone always at hand “internet use has become continuous and interstitial, filling up the intervals between daily activities” ([1], p. 22).
Moreover, children and teens often do not perceive watching a series episode or a film by a subscription video on demand services (SVOD) as time spent online [1]. Nevertheless, it seems important to succeed in estimating the online spent time and the engaging activities to evaluate their psychological consequences too. It has been estimated that the time spent by Italian adolescents on social networks ranged from “less than an hour a day” (8%) to “I’m always connected” (4%), with a prevalence of “2/3 hours a day” (43%) [2]. If interacting through a social is a Bronfenbrenner’s molar daily activity [3], it is also “a constraint on involvement in alternative activities” because time is finite ([4], p. 1188).

The smartphone is a device built to return immediate rewards during its use. Therefore, it is plausible to say that the various visual elements on the backlit screens function as “attentional facilitators” capable of helping the user to maintain an active, pleasant, and positive concentration on the action to the point of experiencing total absorption. Csíkszentmihályi [5, 6] defines as “flow experience” the total absorption in an activity, whereby a person loses the awareness of the surrounding space and its stimuli, including time and even physiological needs.

1.1 Flow experience

Flow is “the holistic sensation that people feel when they act with total involvement and the experience is so enjoyable that people will do it even at great cost, for the sake of doing it” ([5], p. 36). According to Csíkszentmihályi, the necessary condition for experiencing a state of flow is to perceive enjoyment and concentration. People who experience a state of flow will find an assuring pleasure in their activities that are perceived to be doing. The optimal experience is a flow of consciousness in which the person becomes one with the action he or she performs, is completely involved, and absorbed in the activity. This concept has been extensively studied and analyzed from different perspectives and in relation to many other factors, including time. Concentration is very intense, there is no time for problems or stimuli from the external environment. The sense of time becomes distorted, the experience is so satisfying that the person will do it just for the sake of it. The activity becomes so engaging that the person places him/herself in a condition of passivity toward time. It happens to everyone to be so immersed in reading or browsing online that they do not perceive the passage of time. This dynamic is very interesting if we think about how much flow can intervene in our daily commitments. Flow experiences sometimes occur by chance, other times they are actively sought by the person, they are sought because they are associated with a pleasant experience that provides satisfaction. Csíkszentmihályi [6] analyzed different types of activities to identify those that most frequently create an optimal experience condition. He found that the activities that give a sense of discovery, even if minimal, were the ones that put the person into a state of flow more frequently. Thus, the more interesting and stimulating the activity is, the more the likelihood that the person enters a state of flow increases. Boring activities or activities with a low creativity index limit the feeling of discovery in the person and therefore also the possibility of entering a state of flow. In this regard, we can remember that surfing online and social is very stimulating.

Surfing online, on social networks, or searching for information on Google allows us to always have an incentive to continue browsing, discover new things, and stay in the state of flow. Neuroscientific research has shown interesting data [7]: cortical activity decreases when people focus intensely on a task. Instead of increasing with effort, it seemed that the investment of attention decreased it. A different measurement also showed that people who focus intensely
on a specific task were more accurate in sustained attention tasks. This leads us to believe that flow contributes and influences concentration on the task. The more the individual focuses on browsing online, the more he/she has the feeling of being absorbed and external stimuli, including time, fade into the background (for a review see [7]).

Within the flow theory, concentration explains the individual’s state of flow. One’s addiction to smartphone usage requires a time-consuming flow where one spends full and unbroken concentration [8]. For an addiction to happen, one needs to acquire temporal and cognitive concentration on the task at hand. As the concentration intensifies, one can be said to be in a state of addiction [8]. Another term for concentration is “attention focus” [9]. It reflects users’ immersion in doing something they prefer. Users may often concentrate on the smartphone which can lead to harmful consequences, especially on movement. When someone is focusing on using a smartphone in a dangerous place whereby right, they should focus on a task at hand such as in a subway or while driving, the use of smartphone is shifting their experience and attentional focus. Thus, the need to develop an in-depth analysis of concentration in smartphone addition is influential in understanding this addictive behavior [9].

In fact, we all experience flow on a daily basis and at many times of the day. We experience it while we are doing something that we know how to do very well or something we have learned so precisely and mechanically that we do not need to think while we do it. Flow can modify the perception of the passage of time and other individuals’ emotional and cognitive processes. Sometimes prolonged exposures can degenerate into dissociative phenomena.

1.2 Visual display unit dissociative trance

The flow experience has some points in common with visual display unit (VDU) dissociative trance [10], a state that has been studied in people who experimented with a different state of consciousness while using computers for a prolonged time. In this case, it is referred to VDU dissociative trance as a clinical manifestation of compulsive use of technology that could lead to compromise people’s daily lives.

However, some flow conditions seem non-pathological dissociative experiences, but they typically occur as moments of the day when you simply “go away” for a few seconds. Contrary to Caretti’s views [10], we consider these VDU dissociative trances as a form of normative dissociation [11], which refers more specifically to the disconnection between the cognitive processes of thought, memory, sense of identity, and the rest of individual psychological systems.

Milton Erickson [12] was the first to realize that trance states are not extraordinary phenomena but are rather frequent events common to all people. The term “dissociation” means the separation of a part or group of mental processes from the rest of consciousness. The concept of “trance” describes an alteration of the state of consciousness like sleep, but with electroencephalographic waves like the waking state. During the trance state, people lose consciousness and contact with reality until they return to their normal conditions, often accompanied by amnesia. These alterations can be sudden or gradual, transitory, or chronic [13]. The state of trance implies dissociation. Thus, we speak of non-pathological dissociation, an alteration of the state of consciousness, which however is not part of a psychiatric disorder. Non-pathological dissociation typically involves the alteration or the temporary separation of normally integrated mental processes: these experiences include “daydreaming,” the imagination and the absorption experienced in “normal” everyday experiences [14].
1.3 Aims and hypothesis of the study

This study aimed to explore the possible precursors of dissociative experiences associated with problematic smartphone usage.

It was hypothesized that: (a) extended exposures to smartphone screens could induce altered states of consciousness (flow) capable of modifying the perception of the passing time and other emotional and cognitive aspects of the individual; and (b) sometimes, if prolonged these altered states can degenerate into dissociative phenomena. Therefore, the hypothesis we tested with a community sample of adolescents are:

H1: Problematic use of smartphones is positively related to dissociative phenomena.
H2: The prolonged exposure to a smartphone’s backlit screen is a predictor of different states of consciousness (flow).

2. Method

2.1 Participants

Participants were 643 students (337 males, 52.1%; 294 females, 46.0%; 12 undeclared-gender people, 1.9%) aged 13–23 years (\(M = 16.08; SD = 1.79\)). They were recruited in three public high schools in Messina (Italy): a random sampling of 24 first, third and fifth classes was carried out. Participants were presented with an informed consent form with the study aims and the authorization to detect personal data in accordance with Italian legislation. Underage participants were authorized by their parents.

2.2 Measures and procedure

A pen-and-paper self-report survey was applied. It consisted of:

a. A questionnaire (14 items) detecting participants’ personal data (i.e., age and gender) and habits in smartphone usage. The items assessed through Likert point scales: (1) the frequency (1 = never to 4 = always) of some smartphone activities (i.e., social networking, playing a game, calling people, messaging, browsing, streaming, recording photos/videos, listening to music, shopping, and editing); and (2) other behavioral measures: (i) if in the past participants sometimes lied about the time they had spent online (1 = never to 4 = always); (ii) if they used their smartphone in bed before falling asleep (1 = never to 4 = always); (iii) if they have been constantly thinking about online activities even when they were not connected and were busy doing other things (1 = never to 4 = always); (iv) the time spent with smartphone and other devices (5 = More than 5 h, 4 = Between 3 and 5 h, 3 = Between 1 and 3 h, 2 = Less than an hour, and 1 = Never); (v) if in the last year the time spent on screen was: 3 = increased, 2 = the same, or 1 = decreased.

b. The Smart_Q-R [15], a questionnaire evaluating the perception of smartphone problematic use and the negative consequences experienced by respondents. The questionnaire lists 14 items with responses on a 4-points Likert scale (1 = never to 4 = often) and reports thoughts and ideas that guide adolescents’ online behaviors and smartphone addiction. Indeed, some items investigate teenagers’ impulse to connect, to check notifications, to use the smartphone to escape unpleasant thoughts; an item investigates the night-time
smartphone’s usage, others items help to investigate adolescents’ behavior in social decision making (e.g., choosing between meeting a friend in vivo or contacting him/her through the smartphone).

The scale is monofactorial. The score is obtained by adding the points of each item (range 14–56): The higher the score, the more intense the involvement in the use of the smartphone. In this study, the reliability of the scale was confirmed to be good (Cronbach’s alpha = .80).

c. The Dissociation scale of the Internet Use, Abuse, Addiction (UADI) [16].

UADI is an Italian questionnaire composed of 75 items with responses on 5-points Likert scale (1 = absolutely false to 5 = totally true). The UADI consists of five different scales that allow to investigate the degree of impairment of adolescent behavior in relation to Internet use. For this research, only the 15-item Dissociation (Dis) subscale was used.

The DisUADI scale presents a list of items describing some dissociative symptoms such as bizarre sensory experiences, depersonalization, derealization, tendency to alienate or to escape from reality, that are thought to be associated with long exposure to Web surfing. In this study, the DisUADI scale has been modified from the original to make it more suitable for the modern use of internet access by smartphone. Very good the reliability in this study (Cronbach’s alpha = .85).

d. The Adolescent Dissociative Experience Scale (A-DES), a 30-item questionnaire about the dissociative experiences that people can usually have in their everyday life [17]. The Italian version developed by Schimmenti [18] was used. Respondents were asked to answer (from 0 = never to 10 = always) about the frequency of the experiences they had had in specific situations. The A-DES total score is equal to the mean of all item scores. Four subscale scores can also be calculated in the following areas: dissociative amnesia (e.g., sense of loss during action executions, lack of memories of what has just been done, perceived past events as fragmentary, and so on), absorption and imaginative involvement (e.g., dissociative phenomena linked to the sense of time-related to the activities, the degree of attentional involvement experienced, and to confusion about the actions in progress, with a mixture of reality and imagination), depersonalization and derealization (e.g., mind-body-context dissociations, phenomena of “identity fluctuation,” and a sense of estrangement from oneself), and passive influence (i.e., the passivity of the individual with regard to the actions performed by him/herself, as if actions did not depend on his/her will and therefore they were suffered) [19]. In this study, for all subscales reliability was acceptable (Cronbach’s alpha = .77 for dissociative amnesia; .69 for absorption and imaginative involvement; .88 for depersonalization and derealization; .76 for passive influence), and excellent for A-DES total (alpha = .93).

After the principal’s authorization, the questionnaires were collectively administered in every classroom under the supervision of two of the study authors.

2.3 Data analysis

First, distribution statistics for all measures were calculated and then group differences (males vs. females) were tested through F tests (ANOVAs and MANOVAs). Subsequently, measure associations by Pearson’s $r$ coefficients were
estimated. Finally, two stepwise linear regressions were calculated to identify predictor factors of DisUADI scores. Data were processed with IBM SPSS Statistics for Windows 19.0.

3. Results

3.1 Habits and time on the web

Only two out of 643 people (0.3%) did not have their own smartphones. What habits did the participants highlight? Table 1 shows mean frequencies of males and females related to some typical behaviors with this device assessed by specific items of the smartphone-usage questionnaire.

Gender differences (m vs. f) were tested through a multivariate analysis of variance (MANOVA) with the 10 behavior frequencies as dependent variables. MANOVA revealed a significant multivariate test (Pillai’s trace = 0.239, \( p < 0.001 \), \( \eta_p^2 = 0.24 \)) and several significant effect tests (Table 2).

Overall, messaging, social networking, listening to music, and browsing were the preferred activities. Males play games and watch streaming videos significantly more than females; females attend social networks, send messages, record photos, and videos, and listen to music significantly more than males.

| Behavior                | Gender | Mean | SD  |
|-------------------------|--------|------|-----|
| Social networking       | Male   | 3.10 | 0.81|
|                         | Female | 3.46 | 0.67|
| Playing a game          | Male   | 2.44 | 0.84|
|                         | Female | 1.87 | 0.68|
| Calling people          | Male   | 2.59 | 0.74|
|                         | Female | 2.66 | 0.66|
| Messaging               | Male   | 3.37 | 0.71|
|                         | Female | 3.63 | 0.54|
| Browsing                | Male   | 3.04 | 1.30|
|                         | Female | 3.02 | 0.72|
| Streaming               | Male   | 2.99 | 0.78|
|                         | Female | 2.76 | 0.81|
| Recording photos/videos| Male   | 2.17 | 0.72|
|                         | Female | 2.69 | 0.79|
| Listening to music      | Male   | 3.19 | 0.77|
|                         | Female | 3.34 | 0.75|
| Shopping                | Male   | 1.76 | 0.74|
|                         | Female | 1.76 | 0.79|
| Editing (filters, meme, etc.) | Male | 1.65 | 0.78|
|                         | Female | 1.75 | 0.83|

Table 1. Estimated frequencies were rated through a Likert scale: 1 = never, 2 = sometimes, 3 = often, and 4 = always.
On average, women always rated that they were more active than men in all other measures of the smartphone usage questionnaire, except gaming by a console. Some of these differences were highly significant (*Table 3*).

Males and females differed also for Smart_Q-R scores: $M_m = 29.21$, $SD_m = 6.24$, vs. $M_f = 31.53$, $SD_f = 6.81$, $MS_e = 42.394$, $F(1, 629) = 19.941$, $p < 0.0001$, $\eta^2_p = 0.031$. With a range of 14–56, women revealed greater involvement than men in smartphone use.

### 3.2 Dissociative phenomena

Some differences related to dissociative phenomena between men and women emerged too.

In relation to the DisUADI scale, over a range of points from 15 to 75, the group of participants averaged 32.98 ($SD = 9.76, N = 625$). Women scored significantly higher (*Table 4* and 5).

Differently with the A-DES – Total, which is a measure developed for adolescents (average score ranging between 1 and 10), this group of participants settled on an average score of 2.09 ($SD = 1.59, N = 628$), with no significant difference between males and females. Indeed, differences emerged for the All and DD subscales, but not for DA and PI subscales (*Tables 4* and 5).
| Behavior                                      | Gender | Mean  | SD   | N   | F (df)       | MS_e | p    | η²_p |
|----------------------------------------------|--------|-------|------|-----|--------------|------|------|------|
| Lying about the time spent online¹           | Male   | 1.50  | 0.70 | 335 | 0.22 (1, 626) | 0.12 | 0.637 | 0.000 |
|                                              | Female | 1.53  | 0.73 | 293 |              |      |      |      |
| Using smartphone in bed before falling asleep¹ | Male   | 3.12  | 0.93 | 335 | 7.44 (1, 626) | 6.15 | 0.007 | 0.012 |
|                                              | Female | 3.32  | 0.89 | 293 |              |      |      |      |
| Constantly thinking about online activities¹ | Male   | 1.91  | 0.71 | 335 | 1.57 (1, 626) | 0.81 | 0.211 | 0.002 |
|                                              | Female | 1.98  | 0.74 | 293 |              |      |      |      |
| Time spent on                               |        |       |      |     |              |      |      |      |
| smartphone or tablet²                       | Male   | 2.70  | 0.87 | 334 | 19.81 (1, 624) | 0.79 | < 0.0001 | 0.031 |
|                                              | Female | 3.01  | 0.91 | 292 |              |      |      |      |
| messaging²                                   | Male   | 2.83  | 1.03 | 334 | 27.95 (1, 624) | 0.94 | < 0.0001 | 0.043 |
|                                              | Female | 3.24  | 0.89 | 292 |              |      |      |      |
| gaming by console (PlayStation, etc.)²       | Male   | 2.70  | 1.29 | 336 | 318.12 (1, 627) | 1.04 | < 0.0001 | 0.337 |
|                                              | Female | 1.25  | 0.57 | 293 |              |      |      |      |
| in front of a computer each day²            | Male   | 2.20  | 1.09 | 336 | 1.07 (1, 626) | 1.02 | 0.301 | 0.002 |
|                                              | Female | 2.11  | 0.90 | 292 |              |      |      |      |
| In the last year, time spent on screen³     | Male   | 2.00  | 0.75 | 331 | 9.82 (1, 622) | 0.56 | 0.002 | 0.016 |
|                                              | Female | 2.19  | 0.74 | 293 |              |      |      |      |

*df = degrees of freedom; and MS_e = error mean of squares. Significant results are in boldface.

### Table 3.
Descriptive (means and standard deviations) and inferential statistics (univariate ANOVAs – Males vs. females) of other smartphone usage measures estimated by participants: ¹frequencies were expressed through four points (1 = never, 2 = sometimes, 3 = often, 4 = always); ²time was estimated through five points (5 = more than 5 h, 4 = between 3 and 5 h, 3 = between 1 and 3 h, 2 = less than an hour, and 1 = never); ³duration was estimated through three points (3 = increased, 2 = same, 1 = decreased).

| Dissociative measures | Gender | Mean  | SD   |
|-----------------------|--------|-------|------|
| DisUADI               | Male   | 31.54 | 9.13 |
|                       | Female | 34.60 | 10.21|
| A-DES – DA            | Male   | 1.81  | 1.67 |
|                       | Female | 1.82  | 1.80 |
| A-DES – AII           | Male   | 2.16  | 1.62 |
|                       | Female | 2.53  | 1.78 |
| A-DES – DD            | Male   | 1.67  | 1.60 |
|                       | Female | 1.94  | 1.87 |
| A-DES – PI            | Male   | 2.33  | 1.92 |
|                       | Female | 2.49  | 2.14 |
| A-DES – Total         | Male   | 1.99  | 1.50 |
|                       | Female | 2.19  | 1.68 |

DisUADI = dissociation scale of internet use, abuse, addiction questionnaire; A-DES = adolescent dissociative experience scale; DA = dissociative amnesia; AII = absorption and imaginative involvement; DD = depersonalization and derealization; and PI = passive influence.

### Table 4.
Means and standard deviations of dissociative measures (males = 332 for DisUADI, 334 for A-DES; females = 293 for DisUADI, 294 for A-DES).
If the group means scores are relatively low, the large variability around the means reveals that several dissociative phenomena occurred. The A-DES standards state that a score of 4 can be considered the cut-off value for a presence of dissociative phenomena out the normality [17]. In the A-DES total score, 48 men (14.37%) and 59 women (20.02%) achieved scores of 4 or higher; the highest score was 9 from a single male participant. By dichotomizing the groups into participants who have A-DES scores less than 4 or equal/greater than 4, a two-by-two contingency table revealed the non-independence of two factors: $\chi^2(1, N = 628) = 4.01, p = 0.045$, two-ways.

3.3 Regression analysis

The next step of the analysis was the estimate of the associations between all the measures, differentiating males from females, since the two groups showed significantly different percentages of dissociative experiences. The analysis of the associations revealed numerous and interesting correlations between smartphone behavioral habits, the Smart_Q-R scores, and the dissociation scales. These results are reported in Tables 6–10.

Two separate stepwise linear regressions (for male and female groups), with DisUADI measures as dependent variables and smartphone usage behaviors, Smart_Q-R indexes, and A-DES subscale and total scores as predictors were performed. The analysis revealed that the strongest predictors were A-DES total score for men and Smart_Q-R index for women, respectively (Table 11).

4. Discussion

Analysis revealed several differences in smartphone preferred activities as a function of users’ gender. Some of these differences were expected: women more
attended socials and were more engaged in relational behaviors than men; instead, men resulted more engaged in playing games and watching videos by streaming than women. These results are literature confirmations [20].

However, more interesting were the gender differences related to the measures of smartphone overuse and dissociative phenomena. Indeed, women estimated more frequent smartphone usage than men. Women also reported more dissociative phenomena. This gender difference results from both when the mean group scores on the DisUADI are considered, and when percentages of scores equal to/above the

| Male behaviors          | Smart_Q-R | DisUADI | A-DES – DA  | A-DES – AII | A-DES – DD  | A-DES – PI  | A-DES – Tot |
|-------------------------|-----------|---------|-------------|-------------|-------------|-------------|-------------|
| Social networking       | $r$       | $-0.014$| $-0.010$    | $-0.013$    | $-0.012$    | $-0.020$    | $-0.015$    |
|                         | $p$       | $<0.001$| $0.801$     | $0.854$     | $0.811$     | $0.827$     | $0.711$     | $0.791$     |
|                         | $N$       | $335$   | $330$       | $332$       | $332$       | $332$       | $332$       |
| Playing a game          | $r$       | $0.170$ | $0.185$     | $0.157$     | $0.203$     | $0.096$     | $0.090$     | $0.146$     |
|                         | $p$       | $0.002$ | $0.001$     | $0.004$     | $<0.001$    | $0.079$     | $0.101$     | $0.008$     |
|                         | $N$       | $336$   | $331$       | $333$       | $333$       | $333$       | $333$       |
| Calling people          | $r$       | $0.090$ | $0.048$     | $0.064$     | $0.047$     | $0.027$     | $0.058$     | $0.051$     |
|                         | $p$       | $0.100$ | $0.380$     | $0.243$     | $0.390$     | $0.621$     | $0.288$     | $0.356$     |
|                         | $N$       | $335$   | $330$       | $332$       | $332$       | $332$       | $332$       |
| Messaging               | $r$       | $0.210$ | $-0.042$    | $0.053$     | $0.078$     | $0.041$     | $0.032$     | $0.055$     |
|                         | $p$       | $<0.001$| $0.449$     | $0.331$     | $0.155$     | $0.451$     | $0.566$     | $0.316$     |
|                         | $N$       | $336$   | $331$       | $333$       | $333$       | $333$       | $333$       |
| Browsing                | $r$       | $0.216$ | $0.132$     | $0.058$     | $0.130$     | $0.085$     | $0.042$     | $0.089$     |
|                         | $p$       | $<0.001$| $0.016$     | $0.289$     | $0.018$     | $0.123$     | $0.441$     | $0.105$     |
|                         | $N$       | $335$   | $330$       | $332$       | $332$       | $332$       | $332$       |
| Streaming               | $r$       | $0.151$ | $0.157$     | $0.103$     | $0.148$     | $0.093$     | $0.013$     | $0.101$     |
|                         | $p$       | $0.005$ | $0.004$     | $0.060$     | $0.007$     | $0.090$     | $0.813$     | $0.064$     |
|                         | $N$       | $336$   | $331$       | $333$       | $333$       | $333$       | $333$       |
| Recording photos/videos | $r$       | $0.072$ | $-0.055$    | $-0.008$    | $-0.043$    | $-0.038$    | $-0.025$    | $-0.033$    |
|                         | $p$       | $0.188$ | $0.322$     | $0.889$     | $0.437$     | $0.489$     | $0.656$     | $0.547$     |
|                         | $N$       | $335$   | $330$       | $332$       | $332$       | $332$       | $332$       |
| Listening to music      | $r$       | $0.025$ | $0.035$     | $0.087$     | $0.115$     | $0.127$     | $0.102$     | $0.123$     |
|                         | $p$       | $0.649$ | $0.523$     | $0.115$     | $0.037$     | $0.021$     | $0.064$     | $0.025$     |
|                         | $N$       | $335$   | $330$       | $332$       | $332$       | $332$       | $332$       |
| Shopping                | $r$       | $0.051$ | $0.020$     | $0.031$     | $0.010$     | $0.044$     | $0.010$     | $0.032$     |
|                         | $p$       | $0.350$ | $0.723$     | $0.570$     | $0.861$     | $0.419$     | $0.853$     | $0.564$     |
|                         | $N$       | $335$   | $330$       | $332$       | $332$       | $332$       | $332$       |
| Editing (filters. Meme. etc.) | $r$ | $0.156$ | $0.126$ | $0.141$ | $0.141$ | $0.125$ | $0.119$ | $0.147$ |
|                         | $p$       | $0.004$ | $0.022$     | $0.010$     | $0.010$     | $0.023$     | $0.031$     | $0.007$     |
|                         | $N$       | $335$   | $330$       | $332$       | $332$       | $332$       | $332$       |

Table 6. Pearson’s $r$ coefficients between typical smartphone habits and Smart_Q-R and dissociation measures of male group. Significance ($p$) levels and Ns are reported too.

attended socials and were more engaged in relational behaviors than men; instead, men resulted more engaged in playing games and watching videos by streaming than women. These results are literature confirmations [20].

However, more interesting were the gender differences related to the measures of smartphone overuse and dissociative phenomena. Indeed, women estimated more frequent smartphone usage than men. Women also reported more dissociative phenomena. This gender difference results from both when the mean group scores on the DisUADI are considered, and when percentages of scores equal to/above the
4-point cutoff in A-DES are compared. Women showed higher scores than men in absorption and imaginative involvement and depersonalization and derealization subscales of A-DES too.

These differences suggested to analyze separately women and men associations between study variables. Numerous significant associations were found for both groups. Several associations resulted weak ($r$ indices less than 0.30): both genders highlighted dissociative measures correlating with perceived daily time spent with the smartphone, in messaging, and in front of a computer, with the feeling that

| Female behaviors       | Smart_Q-R | DisUADI | A-DES – DA | A-DES – AII | A-DES – DD | A-DES – PI | A-DES – Tot |
|------------------------|-----------|---------|------------|-------------|------------|------------|-------------|
| Social networking      | $r$       | 0.274   | 0.101      | 0.045       | 0.057      | –0.030     | 0.044       | 0.019       |
|                        | $p$       | <0.001  | 0.083      | 0.445       | 0.331      | 0.611      | 0.448       | 0.740       |
|                        | $N$       | 293     | 292        | 293         | 293        | 293        | 293         | 293         |
| Playing a game         | $r$       | 0.057   | 0.093      | 0.106       | 0.146      | –0.003     | –0.011      | 0.054       |
|                        | $p$       | 0.329   | 0.114      | 0.072       | 0.012      | 0.961      | 0.850       | 0.357       |
|                        | $N$       | 292     | 291        | 292         | 292        | 292        | 292         | 292         |
| Calling people         | $r$       | –0.109  | –0.113     | –0.047      | –0.018     | –0.057     | –0.055      | –0.052      |
|                        | $p$       | 0.064   | 0.054      | 0.427       | 0.758      | 0.334      | 0.352       | 0.375       |
|                        | $N$       | 291     | 290        | 291         | 291        | 291        | 291         | 291         |
| Messaging              | $r$       | 0.196   | 0.010      | 0.019       | 0.085      | 0.034      | 0.037       | 0.046       |
|                        | $p$       | 0.001   | 0.868      | 0.752       | 0.148      | 0.564      | 0.528       | 0.437       |
|                        | $N$       | 294     | 293        | 294         | 294        | 294        | 294         | 294         |
| Browsing               | $r$       | 0.203   | 0.134      | 0.017       | 0.009      | –0.011     | –0.004      | 0.001       |
|                        | $p$       | <0.001  | 0.022      | 0.766       | 0.882      | 0.857      | 0.950       | 0.987       |
|                        | $N$       | 293     | 292        | 293         | 293        | 293        | 293         | 293         |
| Streaming              | $r$       | 0.311   | 0.278      | 0.145       | 0.180      | 0.115      | 0.129       | 0.153       |
|                        | $p$       | <0.001  | 0.001      | 0.013       | 0.002      | 0.050      | 0.027       | 0.009       |
|                        | $N$       | 293     | 292        | 293         | 293        | 293        | 293         | 293         |
| Recording photos/videos| $r$       | 0.115   | 0.034      | 0.085       | 0.082      | 0.088      | 0.077       | 0.094       |
|                        | $p$       | 0.050   | 0.565      | 0.149       | 0.160      | 0.131      | 0.188       | 0.108       |
|                        | $N$       | 292     | 291        | 292         | 292        | 292        | 292         | 292         |
| Listening to music     | $r$       | 0.177   | 0.132      | 0.133       | 0.173      | 0.171      | 0.167       | 0.182       |
|                        | $p$       | 0.002   | 0.024      | 0.023       | 0.003      | 0.003      | 0.004       | 0.002       |
|                        | $N$       | 292     | 291        | 292         | 292        | 292        | 292         | 292         |
| Shopping               | $r$       | 0.175   | 0.016      | –0.021      | –0.149     | –0.041     | –0.075      | –0.071      |
|                        | $p$       | 0.003   | 0.786      | 0.724       | 0.011      | 0.487      | 0.200       | 0.228       |
|                        | $N$       | 292     | 291        | 292         | 292        | 292        | 292         | 292         |
| Editing (filters. Meme. etc.) | $r$     | 0.242   | 0.190      | 0.101       | 0.138      | 0.119      | 0.118       | 0.132       |
|                        | $p$       | <0.001  | 0.001      | 0.086       | 0.018      | 0.043      | 0.043       | 0.024       |
|                        | $N$       | 292     | 291        | 292         | 292        | 292        | 292         | 292         |

Table 7. Pearson’s $r$ coefficients between smartphone habits and Smart_Q-R and dissociation measures of female group. Significance ($p$) levels and Ns are reported too.
annual time spent on-screen increased, and with more frequent use of smartphone before falling asleep.

However, stronger indices ($r > 0.30$) emerged between DisUADI scores and the estimates of two specific behaviors: overthinking (i.e., constantly thinking about online activities even when he/she was not connected and was busy doing other things) and lying (i.e., if in the past he/she sometimes lied about the time he/she had spent online). Similarly, Smart_Q-R scores resulted strongly associated with all dissociative scales in both groups, particularly to DisUADI scores.

In both genders DisUADI scale resulted strongly associated also with the A-DES scale and subscales: this is a proof of concurrent validity.

Therefore, at this point, we wondered which was the best predictor of the DisUADI index and if predictors would have been different for men and women. Some differences emerged again. In both male and female groups, A-DES total score and Smart_Q-R emerged as the strongest predictors, but in reverse order: for men, A-DES total was the strongest one, for women the Smart_Q-R. These two measures

| Male behaviors                                  | Smart_Q-R | DisUADI | A-DES – DA | A-DES – AII | A-DES – DD | A-DES – PI | A-DES – Tot |
|-------------------------------------------------|-----------|---------|------------|-------------|------------|------------|-------------|
| Lying about the time spent online               | $r$       | 0.311   | 0.353      | 0.248       | 0.204      | 0.234      | 0.153       | 0.243       |
|                                                 | $p$       | <0.001  | <0.001     | <0.001      | <0.001     | <0.001     | <0.001      | <0.001      |
|                                                 | $N$       | 335     | 330        | 332         | 332        | 332        | 332         | 332         |
| Using smartphone in bed before falling asleep  | $r$       | 0.335   | 0.139      | 0.175       | 0.135      | 0.145      | 0.194       | 0.179       |
|                                                 | $p$       | <0.001  | 0.011      | 0.001       | 0.014      | 0.008      | <0.001      | 0.001       |
|                                                 | $N$       | 335     | 330        | 332         | 332        | 332        | 332         | 332         |
| Constantly thinking about online activities     | $r$       | 0.432   | 0.374      | 0.229       | 0.206      | 0.168      | 0.144       | 0.208       |
|                                                 | $p$       | <0.001  | <0.001     | <0.001      | <0.001     | 0.002      | 0.008       | <0.001      |
|                                                 | $N$       | 335     | 330        | 332         | 332        | 332        | 332         | 332         |
| Time spent on: smartphone or tablet             | $r$       | 0.353   | 0.191      | 0.192       | 0.078      | 0.140      | 0.107       | 0.150       |
|                                                 | $p$       | <0.001  | <0.001     | <0.001      | 0.156      | 0.011      | 0.051       | 0.006       |
|                                                 | $N$       | 334     | 329        | 331         | 331        | 331        | 331         | 331         |
| messaging                                       | $r$       | 0.236   | 0.072      | 0.119       | 0.021      | 0.083      | 0.013       | 0.074       |
|                                                 | $p$       | <0.001  | 0.190      | 0.030       | 0.702      | 0.131      | 0.810       | 0.179       |
|                                                 | $N$       | 334     | 329        | 331         | 331        | 331        | 331         | 331         |
| gaming by console (PlayStation, etc.)           | $r$       | 0.055   | 0.054      | 0.122       | 0.143      | 0.074      | 0.002       | 0.095       |
|                                                 | $p$       | 0.315   | 0.328      | 0.026       | 0.009      | 0.180      | 0.970       | 0.084       |
|                                                 | $N$       | 336     | 331        | 333         | 333        | 333        | 333         | 333         |
| in front of a computer each day                 | $r$       | 0.120   | 0.173      | 0.167       | 0.112      | 0.170      | 0.116       | 0.166       |
|                                                 | $p$       | 0.028   | 0.002      | 0.002       | 0.040      | 0.002      | 0.034       | 0.002       |
|                                                 | $N$       | 336     | 331        | 333         | 333        | 333        | 333         | 333         |
| In the last year, time spent on screen          | $r$       | 0.242   | 0.134      | 0.116       | 0.151      | 0.087      | 0.076       | 0.118       |
|                                                 | $p$       | <0.001  | 0.015      | 0.036       | 0.006      | 0.114      | 0.171       | 0.033       |
|                                                 | $N$       | 331     | 326        | 328         | 328        | 328        | 328         | 328         |

**Table 8.**

Pearson’s $r$ coefficients between other smartphone habits and Smart_Q-R and dissociation measures of male group. Significance ($p$) levels andNs are reported too.
alone accounted for 41% and 53% of the variance by male and female group, respectively. The two measures together accounted for 51% and 63% of the variance by male and female group, respectively.

If we look at the other variables entered the models, in the male group three variables emerged that explained another 0.04% of the variance; in the female group, five variables emerged that explained another 0.03% of the variance: a negligible contribution for both groups, even if some of these variables (such as overthinking) had shown a strong positive correlation index.

These results suggest taking into consideration the Smart_Q-R index above all to explain the dissociative phenomena measured with the DisUADI. The Smart_Q-R index summarizes an estimate of the intensity of 14 behaviors (e.g., frequency of connections, positive mood and facilitation of social relationships, and so on) foreshadowing an unhealthy overuse of the smartphone if it is high [21]. Some of the Smart_Q-R behaviors are typical behaviors referred to flow (e.g., lack of perception of passing time) or to dissociative experiences (e.g., sense of alienation when connected). Therefore, the strict associations that emerged between

| Female behaviors                         | Smart_Q-R | DisUADI | A-DES – DA | A-DES – AII | A-DES – DD | A-DES – PI | A-DES – Tot |
|------------------------------------------|-----------|---------|------------|-------------|------------|------------|-------------|
| Lying about the time spent online        | $r$ 0.450 | 0.455   | 0.242      | 0.289       | 0.286      | 0.281      | 0.309       |
|                                           | $p<0.001$ | $<0.001$| $<0.001$   | $<0.001$    | $<0.001$   | $<0.001$   | $<0.001$    |
|                                           | $N$ 293   | 292     | 293        | 293         | 293        | 293        | 293         |
| Using smartphone in bed before falling asleep | $r$ 0.367 | 0.209   | 0.128      | 0.124       | 0.150      | 0.105      | 0.147       |
|                                           | $p<0.001$ | $<0.001$| 0.029      | 0.034       | 0.010      | 0.072      | 0.012       |
|                                           | $N$ 293   | 292     | 293        | 293         | 293        | 293        | 293         |
| Constantly thinking about online activities | $r$ 0.547 | 0.467   | 0.208      | 0.230       | 0.232      | 0.247      | 0.257       |
|                                           | $p<0.001$ | $<0.001$| $<0.001$   | $<0.001$    | $<0.001$   | $<0.001$   | $<0.001$    |
|                                           | $N$ 293   | 292     | 293        | 293         | 293        | 293        | 293         |
| Time spent on: smartphone or tablet      | $r$ 0.384 | 0.222   | 0.088      | 0.088       | 0.118      | 0.145      | 0.124       |
|                                           | $p<0.001$ | $<0.001$| 0.133      | 0.044       | 0.103      | 0.034      |             |
|                                           | $N$ 292   | 292     | 293        | 292         | 292        | 292        | 292         |
| messaging                                | $r$ 0.252 | 0.071   | 0.030      |             | 0.009      | 0.030      | 0.052       |
|                                           | $p<0.001$ |         | 0.226      | 0.608       | 0.613      | 0.375      | 0.609       |
|                                           | $N$ 292   | 291     | 292        | 292         | 292        | 292        | 292         |
| gaming by console (PlayStation, etc.)    | $r$ 0.094 | 0.161   | 0.111      | 0.103       | 0.073      | 0.111      |             |
|                                           | $p$ 0.108 | 0.006   | 0.057      | 0.078       | 0.080      | 0.212      | 0.058       |
|                                           | $N$ 293   | 292     | 293        | 293         | 293        | 293        | 293         |
| in front of a computer each day          | $r$ 0.195 | 0.260   | 0.151      | 0.145       | 0.137      | 0.059      | 0.142       |
|                                           | $p$ 0.001 |         | 0.010      | 0.013       | 0.019      | 0.311      | 0.015       |
|                                           | $N$ 292   | 291     | 292        | 292         | 292        | 292        | 292         |
| In the last year, time spent on screen   | $r$ 0.297 | 0.214   | 0.015      | 0.085       | 0.018      | 0.023      | 0.035       |
|                                           | $p<0.001$ |         | 0.803      | 0.148       | 0.755      | 0.696      | 0.553       |
|                                           | $N$ 293   | 292     | 293        | 293         | 293        | 293        | 293         |

Table 9. Pearson’s $r$ coefficients between other smartphone habits and Smart_Q-R and dissociation measures of the female group. Significance ($p$) levels and $Ns$ are reported too.
Smart_Q-R, DisUADI and A-DES scores in both regressions supported the idea that smartphone overuse can induce flow and dissociative experiences, especially in the female gender.

Why did women seem more vulnerable than men? The results of this study say that female participants were above all more intense smartphone users than men. An aim for future research is to find out which model of smartphone using is more likely to activate dissociative phenomena: this study suggests various potential behaviors (e.g., overthinking, streaming, playing games, etc.) but without one more strongly emerging.

5. Conclusions

Currently, the demand for the use of mobile devices to communicate, have fun and relax, read and study, search for information, etc., is so intense that it is impossible to escape it. Particularly, adolescents need to stay connected through their devices to be updated on the activities of the group and peers and to extend the school time of interactions. The time to devote to all these societal demands is increasing, so they are needed to always remain connected.
### Table 11.
Stepwise-linear regression analysis for the male and female groups: Dependent variable DisUADI.

| Gender | Model | Predictor | $B$ | $SE$ | $\beta$ | $t$ | $R^2$ | $F$ per $\Delta R^2$ |
|--------|-------|-----------|-----|------|---------|-----|-------|----------------------|
| Male   | Step 1 | A-DES – Tot | 3.91 | 0.26 | 0.64 | 15.191*** | 0.406 | 230.76*** |
|        |        | Smart_Q-R  | 0.53 | 0.61 | 0.37 | 8.690*** |
|        | Step 2 | A-DES – Tot | 2.92 | 0.26 | 0.48 | 11.278*** | 0.514 | 75.51*** |
|        |        | Smart_Q-R  | 0.58 | 0.06 | 0.40 | 9.507*** |
|        |        | Messaging   | -1.94 | 0.49 | -0.15 | -3.971*** |
|        | Step 3 | A-DES – Tot | 2.88 | 0.25 | 0.47 | 11.347*** | 0.535 | 15.77*** |
|        |        | Smart_Q-R  | 0.58 | 0.06 | 0.40 | 9.507*** |
|        |        | Messaging   | -1.90 | 0.48 | -0.15 | -3.952**  |
|        |        | Lying a. time spent online a. online activities | 1.74 | 0.52 | 0.14 | 3.330*** |
|        | Step 4 | A-DES – Tot | 2.86 | 0.25 | 0.47 | 11.446*** | 0.548 | 11.09*** |
|        |        | Smart_Q-R  | 0.50 | 0.07 | 0.35 | 7.651*** |
|        |        | Messaging   | -1.90 | 0.48 | -0.15 | -3.952**  |
|        |        | Constantly thinking a. online activities | 1.74 | 0.52 | 0.14 | 3.330*** |
|        | Step 5 | A-DES – Tot | 2.79 | 0.25 | 0.48 | 11.176*** | 0.554 | 5.14*  |
|        |        | Smart_Q-R  | 0.48 | 0.07 | 0.33 | 7.249*** |
|        |        | Messaging   | -1.75 | 0.48 | -0.14 | -3.629*** |
|        |        | Lying a. time spent online a. online activities | 1.45 | 0.54 | 0.11 | 2.707**  |
|        |        | Constantly thinking a. online activities | 1.17 | 0.52 | 0.09 | 2.266*  |
| Female | Step 1 | Smart_Q-R  | 1.09 | 0.06 | 0.73 | 19.052*** | 0.526 | 325.874*** |
|        | Step 2 | Smart_Q-R  | 0.84 | 0.06 | 0.56 | 14.234*** | 0.632 | 85.055*** |
|        |        | A-DES – Tot | 2.22 | 0.24 | 0.37 | 9.223*** |
|        | Step 3 | Smart_Q-R  | 0.88 | 0.06 | 0.59 | 14.895*** | 0.645 | 11.927*** |
|        |        | A-DES – Tot | 2.18 | 0.24 | 0.36 | 8.218*** |
|        |        | Messaging   | -2.30 | 0.67 | -0.12 | -3.454*** |
|        | Step 4 | Smart_Q-R  | 0.82 | 0.06 | 0.55 | 12.991*** | 0.653 | 7.255**  |
|        |        | A-DES – Tot | 2.09 | 0.24 | 0.35 | 8.878*** |
|        |        | Messaging   | -2.21 | 0.67 | -0.12 | -3.343*** |
|        |        | Lying a. time spent online | 1.46 | 0.54 | 0.11 | 2.694**  |
|        | Step 5 | Smart_Q-R  | 0.79 | 0.06 | 0.53 | 12.409*** | 0.662 | 9.044**  |
|        |        | A-DES – Tot | 2.04 | 0.23 | 0.34 | 8.758*** |
|        |        | Messaging   | -2.08 | 0.65 | -0.11 | -3.194**  |
|        |        | Lying a. time spent online | 1.62 | 0.54 | 0.12 | 3.010**  |
|        | Time spent at computer | 1.19 | 0.40 | 0.11 | 3.007**  |
|        | Step 6 | Smart_Q-R  | 0.78 | 0.06 | 0.52 | 12.389*** | 0.666 | 4.219*  |
|        |        | A-DES – Tot | 1.18 | 0.48 | 0.20 | 2.469*   |
|        |        | Messaging   | -2.01 | 0.65 | -0.12 | -3.095**  |
|        |        | Lying a. time spent online | 1.72 | 0.54 | 0.12 | 3.196**  |
|        | Time spent at computer | 1.16 | 0.40 | 0.10 | 2.936**  |
|        | A-DES – DD | 0.89 | 0.43 | 0.16 | 2.054*   |
|        | Step 7 | Smart_Q-R  | 0.71 | 0.07 | 0.48 | 10.128*** | 0.670 | 4.683*  |
|        |        | A-DES – Tot | 1.12 | 0.48 | 0.19 | 2.356*   |
|        |        | Messaging   | -1.99 | 0.65 | -0.11 | -3.074**  |
|        |        | Lying a. time spent online | 1.68 | 0.53 | 0.12 | 3.150**  |
|        | Time spent at computer | 1.15 | 0.39 | 0.10 | 2.916**  |
|        | A-DES – DD | 0.95 | 0.43 | 0.17 | 2.194*   |
|        |        | Constantly thinking a. online activities | 1.21 | 0.56 | 0.09 | 2.164*   |

*p ≤ 0.05.
**p ≤ 0.01.
***p ≤ 0.001.
In this digital cultural context, the time that teenagers have to dedicate to viewing their smartphone backlit screens is enormously dilated. In this context, the outcome of compulsive and problematic smartphone use becomes highly probable [22, 23]. If this happens, it is not uncommon to experience a complete absorption in the activity that is taking place with the smartphone, encountering flow experiences [24, 25].

The study presented in this chapter finds precisely the prolonged use of the smartphone as an important precursor of the dissociative experiences declared by a convenience sample of adolescents. Experiencing complete absorption in the activity that is taking place can reinforce the activity itself and thus initiate a circular causality loop that reinforces the problematic use of the device and leads to dissociative experiences.

The study has some limitations: the individual characteristics (e.g., extroversion, sensation seeking, or sensitivity to rewards) were not investigated. Some personal characteristics could shed light on different dispositions/risk factors regarding problematic smartphone use [26] and therefore the predisposition to dissociation. Furthermore, the data do not show a clear direction of causality between problematic smartphone use and levels of dissociation, but an evident concomitance that represents a start for the study of dissociative phenomena connected to the overuse of backlit screens. This research line could serve to redefine the concept of VDU dissociative trance in terms of cognition and flow experiences. Understanding the nature of these processes will help to understand the “suspensive” and dissociated risk of the digital mind and to prevent psychopathological problems through the correct use of digital technology while respecting human neurodevelopment.

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