Computers in Human Behavior 93 (2019) 33–39

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

# The interplay between time perspective, internet use and smart phone in-class multitasking: A mediation analysis

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ARTICLE INFO

*Keywords:*
Time perspective
Internet use
In-class multitasking
Smart phone

ABSTRACT

The present study proposes a new predictor of in-class smart phone multitasking, namely students' time perspectives (i.e., past negative, past positive, present fatalistic, present hedonistic, and future orientation, respectively), with problematic internet use as a potential mediator of these relations. Participants were 348 university students (62.9% females), self-assessing their time perspectives, generalized problematic internet use, and in-class smart phone multitasking, respectively. Results showed that problematic internet use fully mediated the positive relation between past negative and multitasking. It also partially mediated the negative relation between future orientation and multitasking. No significant mediation was found for the relations between either present hedonistic or present fatalistic, and multitasking. Still, present hedonistic proved to be a marginally significant positive predictor for students' in-class multitasking. Educational implications are discussed in terms of enhancing students' cognitive engagement in academic contexts, as well as increasing their self-regulated learning and awareness towards the detrimental effect of their in-class multitasking.

## 1. Introduction

Ubiquitous access to digital devices and internet connection make nowadays teens and young adults always "on", constantly checking and using their mobile devices. They are the "digital natives", born and grown up in the era of technology, digital devices being an integral part of their everyday lives. They prefer parallel processing and multitasking, and they function best when "connected" (Prensky, 2001). Smart phones are the most at hand device, usually also with internet connection, easily making their users prone to what some called "smart phone addiction" (Gökçearslan, Mumcu, Haşlaman, & Çevik, 2016). Therefore it is natural to think that their habits will be prolonged also at work or during classes. The most intriguing and problematic aspect revealed by a large amount of research is that instead of leveraging their digital abilities for improving the quality of their academic achievement, students frequently use technology mostly for social and leisure purposes to the detriment of their overall academic performance, and socio-emotional functioning (see Van der Schuur, Baumgartner, Sumter, & Valkenburg, 2015; for a meta-analysis).

In Romania, we are dealing with a widespread use of computers and mobile devices, as well as with problematic internet use, especially in the urban areas (Kaess et al., 2016; Macarie, Ştefănescu, Tebeanu, & Chele, 2012; Tzavela et al., 2015). In our universities, information and communication technologies (ICTs) have been integrated in the academic field mainly as a teaching tool and mostly under teachers' control. Our university students do not use computers, laptops or tablets during classes (except for very few specific practical laboratories), they are not required to and, most of the times, they are not allowed to bring and use them. But when it comes to smart phones, we get quite a different picture. Almost every student has a smart phone, and, except for the evaluation sessions, teachers do not forbid keeping them unless they are on silent mode and do not disturb the lecture or discussion. So, officially, there is no explicit/implicit rule or norm preventing smart phones use, hence smart phone multitasking.

As Wood et al. (2012) phrased it, "the combination of availability, perceived ease of use, and the wide range of activities available through portable digital technologies, increases the probability that learners will engage in off-task behaviors in instructional contexts". Still, though everybody has a smart phone, not everybody uses it as a distracter during classes. So what makes some of the students multitask during lectures, while others manage to refrain from this impulse?

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https://doi.org/10.1016/j.chb.2018.11.050
Received 28 July 2018; Received in revised form 27 November 2018; Accepted 29 November 2018
Available online 30 November 2018

## 2. Problematic internet use and in-class multitasking

There are plenty of studies on multitasking while studying or attending classes, meaning not only cyberloafing (i.e., using the internet during classes for activities unrelated to their academic work), but also texting and reading messages (see Chen & Yan, 2016; Flanigan & Kiewra, 2017, for theoretical reviews). This aspect was investigated especially on using laptops and ICTs in university laboratories or classrooms, in a more "licit" manner, the technology being already there and with students' having permission to use it. Due to the particular Romanian academic context with regard to technology access and use, in the present research we were interested only in the more "illicit" smart phone multitasking during classes.

We assent to multitasking seen as a behavioral outcome of people's habit of technology use and of their problematic internet use defined as a general tendency to overuse internet and online socialization (Caplan, 2010). Judd (2013) found that multitasking was by far much more frequent than both focused sessions (without task switching) and the sequential ones (task switching without multitasking). A worrying result of this study was that less than 10% of the sessions were exclusively focused, reinforcing indirectly the negative influence of technology use on students' school task performance. As shown by previous research, many students are "technology dependent", as they were found to be both unwilling and unable to live without internet connection on a daily basis (Aagaard, 2015; Moeller et al., 2010).

Internet use has become an ordinary daily activity, neither negative nor positive in itself. It has undoubtedly its benefits: easy and quick access to information, keeping in touch with friends and family anywhere, entertainment, efficiency in technology use. From an educational perspective, these outcomes remain beneficiary only when complementing the cognitive engagement in studying, and in well-controlled classroom settings (Downs, Tran, McMenemy, & Abegaze, 2015; Kay & Lauricella, 2011; Tzavela et al., 2015). Otherwise, when internet use leads to disruptive multitasking while learning, there are plenty of costs, including distraction, difficulties in following and understanding teachers' explanations, additional time and effort required when studying alone outside the class, inefficient study habits (Bellur, Nowak, & Hull, 2015; Rosen, Carrier, & Cheever, 2013) and, finally, poorer overall academic performance (Junco, 2012; Junco & Cotten, 2012; Lau, 2017; Olufadi, 2015; Ravizza, Hambrick, & Fenn, 2014).

A worrying psychological aspect is that many students overestimate their ability to multitask effectively, seeing no significant consequences on their academic performance (Bowman, Levine, Waite, & Gendron, 2010). Results on laptop use in unregulated large classes reinforced this idea. A quite significant minority (41%) of the surveyed students reported that they do not bring in their laptops mainly because they did not perceive it to be necessary or practical. Only 18% of these students reported to find laptop use distracting during classes, a result that indicates quite a small amount of awareness of the cognitive interference and potential drawbacks of multitasking during lectures (Ragan, Jennings, Massey, & Doolittle, 2014). Higher levels of metacognitive awareness might lead to higher behavioral management tendencies, positively correlated with greater control of technology use (Terry, Mishra, & Roseth, 2016).

In their theoretical review on multitasking with mobiles, Chen and Yan (2016) reviewed three major aspects: distraction sources, distraction targets (reading and attending), and distraction subjects (in terms of personality, gender and culture). In the present article, the latter aspect is of more interest. Synthetically, those more prone to multitasking are those impulsive, with higher levels of sensation seeking, and with a poor executive control. Still, as Qian and Li (2017) recently pointed out, only few studies explicitly focused on pinning down the predictors of students' off-task electronic multitasking. Generally, the related factors can be divided into two broad categories – internal and external factors, respectively (Chen, Nath, & Insley, 2014). Internal factors include needs and rather stable personal characteristics like consumerism, escapism (Taneja, Fiore, & Fischer, 2015), external locus of control (Blanchard & Henle, 2008), self-regulation (Zhang, 2015), a constant degree of boredom leading to an urge for continuous entertainment, as well as technology and internet dependence (Gerow, Galluch, & Thatcher, 2010; Qian & Li, 2017). External factors refer to more contextual and environmental characteristics such as supporting norms (Blanchard & Henle, 2008; Gerow et al., 2010), class engagement, class easiness, apathy towards course materials (Gupta & Irwin, 2016; Qian & Li, 2017), distraction by others, or awareness of instructor monitoring (Gerow et al., 2010; Taneja et al., 2015).

In this two broad categories framework, the present study reinforces the assumption that problematic internet use is a significant proximal predictor of multitasking. More importantly, we contribute to the existing literature by proposing a new internal factor predicting students' proneness to smart phone multitasking during classes, namely their time perspectives.

## 3. Time perspective

Time perspective (TP) has been defined as "the often non-conscious process whereby the continual flows of personal and social experiences are assigned to temporal categories, or time frames, that help to give order, coherence, and meaning to those events" (Zimbardo & Boyd, 1999, p. 1271). Seen also as a trait, individuals' TP profile emphasizes a habitual focus on a particular temporal frame (i.e. the past, the present or the future), this relatively stable bias affecting individuals' judgment, decision-making, and actions (Boniwell & Zimbardo, 2004; Stolarski, Fieulaine, & Zimbardo, 2018; Zimbardo & Boyd, 1999). The five time perspectives distinguished in this model are: Past Positive (PP; reflecting a positive, warm, and nostalgic attitude towards the past), Past Negative (PN; revealing a rather negative, pessimistic, even aversive view of the past), Present Fatalistic (PF; emphasizing a fatalistic, helpless and hopeless view of life), Present Hedonistic (PH; revealing a hedonistic, risk-taking and pleasure-seeking attitude towards the present), and Future (F; reflecting a general orientation towards planning and striving for future goals), respectively.

There is an extensive literature documenting significant correlations between these temporal perspectives and various personality characteristics. For example, PP and F were found to correlate positively with extraversion, agreeableness, conscientiousness, openness (Jochemczyk, Pietrzak, Buczkowski, Stolarski, & Markiewicz, 2017; Stolarski, 2016; Zhang & Howell, 2011), vitality, resilience, hope (Davis & Ortiz, 2017), self-esteem (Perry et al., 2015; Sobol-Kwapinska, 2016), emotional intelligence (Stolarski, Bitner, & Zimbardo, 2011), and self-control (Orkibi, 2015), and negatively with machiavellianism, psychopathy (Stolarski, Czarna, Malesza, & Szymańska, 2017), and hopelessness (Orkibi, 2015). The valence of these correlations is reversed for the orientation on the negative time frames, namely PN and PF, respectively. The PH perspective has rather mixed consequences, falling somehow in-between this two-sided associative pattern, being positively correlated with extraversion, agreeableness, openness, psychopathy, narcissism, vitality, hope, and self-control, and negatively related to conscientiousness and emotional stability.

In educational contexts, previous research focused on the relations between students' time perspectives and their performance and learning motivation revealed quite similar associative patterns as the above-mentioned ones, the positive temporal focus (i.e., F and PP) having more favorable academic outcomes than the negative one. Specifically, academic achievement was consistently found to be positively correlated with both F and PP, while negatively correlated with PN, PF, and PH perspectives (Barber, Munz, Bagsby, & Grawitch, 2009; Barnett, Melugin, & Hernandez, 2018; Mello & Worrell, 2006; Zimbardo & Boyd, 1999). Additionally, both positive time perspectives showed positive correlations with academic self-efficacy, the latter being negatively related to all other three TPs (Perry et al., 2015).

In motivational terms, future orientation was consistently proven to

be the most favorable for students, being positively correlated with academic engagement either real (Horstmanshof & Zimitat, 2007) or intended (Barnett et al., 2018), with academic self-regulation and self-regulated learning (de Bilde, Vansteenkiste, & Lens, 2011), and with intrinsic motivation, while being negatively related to amotivation and academic cheating (Orosz et al., 2016). The correlations appeared to be reversed, especially for the two perspectives of the present (i.e., PF and PH), more related to external regulation and extrinsic motivational factors.

Still, of main interest for the present research, are the results of the very few (and relatively recent) studies investigating the relationships between individuals' focus on certain temporal frames and their internet use. Based on previous research documenting the significant links between time perspectives and various types of addiction, these studies focused on internet use mainly in terms of maladaptive behavior, namely internet addiction or general problematic internet use (GPIU). In this venue, the most consistent findings regard especially the more negative time perspectives. Thus, PN and PF orientations proved to be significant positive predictors for individuals' general problematic internet use, internet addiction, Facebook intensity use, or addictive Facebook use, probably as a way to escape from their negative emotions or state of mind (Chittaro & Vianello, 2013; Przepiorka & Blachnio, 2016; Settanni, Marengo, Fabris, & Longobardi, 2018). PF correlated positively also with the amount of time spent playing massive multiplayer online role-playing games (MMORPGs; Lukavska, 2012). Moreover, Kim, Hong, Lee, and Hyun (2017) also found that only present orientation (i.e., cumulative scores for PH and PF) proved to be a significantly positive predictor of internet addiction, with the relation being mediated by self-control. Additionally, part of these studies showed that F orientation negatively correlated with the time spent playing MMORPGs, and negatively predicted both internet addiction and Facebook intensity use (Lukavska, 2012; Przepiorka & Blachnio, 2016).

To our knowledge there is no prior study explicitly investigating the predictive relations between students' TPs and multitasking with smart phones during classes. Therefore, adding to the aforementioned findings, we bring forth the idea that individuals' habitual temporal focus, seen as an internal, rather stable psychological trait, might be a significant predictor also for proneness to multitasking. More specifically, we hypothesized that:

**H1.** PN, PF, PH, and GPIU are positively related with MT.

**H2.** F is negatively related with MT.

**H3.** GPIU mediates the positive relationship between PN and MT.

**H4.** GPIU mediates the positive relationship between PF and MT.

**H5.** GPIU mediates the positive relationship between PH and MT.

**H6.** GPIU mediates the negative relationship between F and MT.

## 4. Method

### 4.1. Participants and procedure

Participants were 348 undergraduate students in Humanities and Social Sciences from one of the largest Romanian public universities, enrolled in the 1st and the 2nd year of study, respectively. The mean age of the participants was 20.16 years (SD = 2.79), with 62.9% of them being female students. Participation in the study was entirely voluntary and anonymity was guaranteed. Self-assessing questionnaires were administered in paper-and-pencil format with written instructions. Students completed the questionnaires in group format and received course points for their participation.

### 4.2. Measures

#### 4.2.1. Time perspectives

For assessing students' time perspectives, we used a 36-item adapted Romanian version (Labăr & Ţepordei, 2018) of Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999). The scale consists of five subscales: Past Negative (PN; 7 items, e.g., "*I've taken my share of abuse and rejection in the past*"), Past Positive (PP; 6 items, e.g., "*Happy memories of good times spring readily to mind*"), Present Hedonistic (PH; 11 items, e.g., "*I try to live my life as fully as possible, one day at a time*"), Present Fatalistic (PF; 5 items, e.g., "*My life path is controlled by forces I cannot influence*"), and Future (F; 7 items, e.g., "*When I want to achieve something, I set goals and consider specific means for reaching those goals*"). Participants responded to questions using a 5-point Likert scale (from 1 = *very uncharacteristic of me*, to 5 = *very characteristic of me*). Average scores were computed for each subscale, with higher scores reflecting a higher level of a specific TP.

#### 4.2.2. Multitasking during classes

In-class smart phone multitasking was measured using the seven items proposed by Bellur et al. (2015). This scale showed a good reliability in this study (see Table 1). All ratings were made on a 5-point scale, where 1 = "Never" and 5 = "Very frequently". Average scores were computed, with higher scores reflecting a more frequent in-class multitasking. We performed a confirmatory factor analysis (CFA) with a maximum likelihood approach. The indices revealed a relative good fit of the single factor solution (with three correlated errors): $\chi^2$ (12, N = 348) = 5.64,p = .000; GFI = 0.95; NFI = 0.90; CFI = 0.91; SRMR = 0.06; RMSEA = 0.11.

#### 4.2.3. Problematic internet use

This variable was assessed by using the Generalized Problematic Internet Use Scale 2 (GPIUS2; Caplan, 2010). This instrument includes 15 items that are rated on a8-point Likert scale, where 1 = "Strongly disagree" and 8 = "Strongly agree").The scale measures the beliefs, behaviors, and outcomes that characterize problematic internet use. A sample item is: "I find it difficult to control my Internet use". The indices of the confirmatory factor analysis revealed a good fit of the five-factor solution as proposed by the author (with three pairs of errors correlated): $\chi^2$ (79, N = 348) = 3.43, p = .000; GFI = .91; NFI = .92; CFI = .94; SRMR = .06; RMSEA = .08. Nonetheless, for the purpose of this study an average score of all items was computed and entered into the data analyses, with higher scores reflecting a higher problematic Internet use.

The last two instruments were translated and adapted for the purpose of the present study. Two experts translated them into Romanian, and then a third expert back-translated the questionnaires.

**Table 1**
Scale means, standard deviations, reliability coefficients, and correlations (N = 348).

| Variables | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1. MT | 1.99 | .70 | *.78* | | | | | | |
| 2. GPIU | 2.84 | 1.25 | .23** | *.90* | | | | | |
| 3. PN | 2.70 | .95 | .13* | .45** | *.85* | | | | |
| 4. PH | 3.48 | .62 | .11* | -.02 | .02 | *.78* | | | |
| 5. F | 3.74 | .62 | -.21** | -.18** | -.08 | -.08 | *.68* | | |
| 6. PP | 3.58 | .71 | -.08 | .01 | .04 | .20** | .14** | *.65* | |
| 7. PF | 2.36 | .74 | .14** | .25** | .35** | .16** | -.14** | .13* | *.70* |

Note: MT - phone multitasking during classes, GPIU–generalized problematic internet use, PN – past negative, PH – present hedonistic, F – future, PP – past positive, PF – present fatalistic.
* $p < .05$; ** $p < .01$. Reliabilities are provided along the diagonal.

### 4.3. Data analyses

The data analyses were conducted using IBM SPSS and AMOS version24.0. First, we calculated descriptive statistics, Cronbach's alpha and correlations between measures. Then, path analysis using maximum likelihood estimation were conducted to examine our research hypotheses regarding the mediating effect of GPIU on the relations between PN, PF, PH and F, and MT. To evaluate the overall fit of the model tot the data, several indices recommended by Hu and Bentler (1999) and Kline (2011) were calculated in the present study: chi-square statistic ($\chi^2$), $\chi^2$/df ratio, Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tuker-Lewis Index (TLI). According to Hu and Bentler (1999) and Kline (2011), goodness-of-fit criteria were used in the current study that acknowledged the potential for acceptable ($\chi^2$/df ratio < 3, CFI and TLI > 0.90, SRMR < 0.10, RMSEA < 0.08) and excellent fit ($\chi^2$/df ratio < 2, CFI and TLI > 0.95, SRMR < 0.08, RMSEA < 0.05). For mediation analyses, we used bootstrapping with 5000 bootstrap resamples to examine indirect effects in mediation models. Confidence intervals that do not contain zero indicate a significant indirect effect (mediation).

## 5. Results

### 5.1. Preliminary analyses

Descriptive statistics, Cronbach's alpha and correlations between measures are reported in Table 1. As predicted, smart phone multitasking during classes was significantly positively correlated with PN (r = 0.13, p < .05), PH (r = 0.11, p < .05), and PF (r = 0.14, p < .01), while being significantly negatively correlated with F (r = – 0.21, p < .01). GPIU was also found to be significantly positively correlated with phone multitasking during classes (r = 0.23, p < .01). Hypotheses H1 and H2 are therefore supported by our results.

Next, in order to determine whether measured variables fulfill necessary conditions for mediation analyses (i.e., significant intercorrelations among the considered variables), we analyzed correlations of each of the five time perspectives with GPIU (Table 1). Results showed that GPIU was significantly positively correlated with both PN (r = 0.45, p < .01) and PF (r = 0.25, p < .01), significantly negatively correlated with F (r = – 0.18, p < .01), and not significantly correlated with PH.

No significant gender differences were found regarding in-class smart phone multitasking (t (346) = 1.096, p > .05).

### 5.2. Mediation analyses

To examine whether GPIU is a significant mediator on the associations between PN, PF, and F, respectively, and smart phone multitasking during classes we conducted a path analysis in AMOS 24.0.

Hypothesis H5 was not supported. As PH did not significantly correlate with GPIU, it was not entered in the mediation analysis.

The proposed mediation model (see Fig. 1) demonstrated excellent goodness of fit to the data, $\chi^2$/df = 1.31, CFI = 0.99, TLI = 0.97, SRMR = 0.01, RMSEA = 0.03, (90% CI from 0.00 to 0.150).

The results of path analysis (Fig. 1) showed that PN positively predicted GPIU (β = 0.41, p < .01), but it was no longer a significant predictor for MT (β = 0.01, p > .05). F negatively predicted both GPIU and MT (β = −0.14, p < .01, β = −0.16, p < .01, respectively). PF did not significantly predict either GPIU or MT (β = 0.08, p > .10, β = 0.05, p > .05, respectively).

GPIU positively predicted MT (β = 0.19, p < .01). There was also a marginally significant positive effect of PH on MT (β = 0.09, p < .10).

The results of mediation analyses are presented in Table 2. The indirect effect of PN on MT through GPIU was significant (indirect effect = 0.077, 95% CI = [0.028, 0.136]), but the direct effect of PN on MT was not significant. Therefore, hypothesis H3 was supported as GPIU fully mediated the relation between PN and MT.

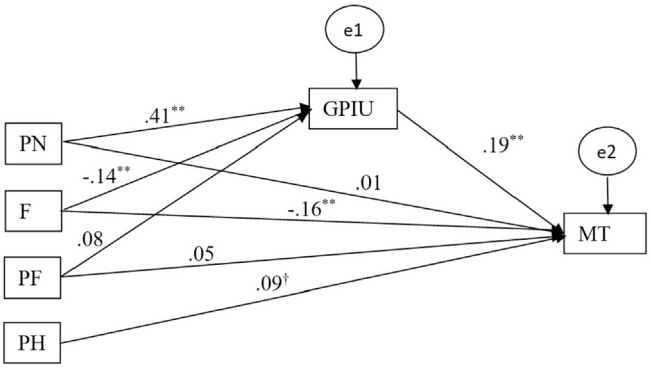


**Fig. 1.** Path analysis depicting direct and indirect effects of TPs on MT. Standardized coefficients are presented. Covariances were included in the model but are not presented for simplicity. Note: †p < .10, *p < .05, **p < .01.

**Table 2**
Standardized estimates of the direct, total, and indirect effects of TPs on MT through GPIU.

| Predictor | Direct effect | Total effects | Indirect effect (95% CI) |
|---|---|---|---|
| PN | .011 | .089 | .077 (.028, .136) |
| F | –.158** | –.183** | –.026 (−.059, −.007) |
| PF | .053 | .068 | .015 (.000, .040) |

Note: Results based on 5000 bootstrap samples; CI – bias-corrected 95% confidence interval for the indirect effects and ratio of the indirect effect to total effect; PN – past negative, F – future, PF – present fatalistic.
** $p < .01$.

After including GPIU as an intermediate variable, the association between F and MT was reduced, but it still remained significant. This indicates that GPIU partially mediated the relation between F and MT, hence hypothesis H6 was supported. The indirect effect between F and MT through GPIU was significant (indirect effect = −0.026, 95% CI = [–0.059, −0.007]).

The indirect effect of PF on MT through GPIU was not significant (indirect effect = 0.015, 95% CI = [0.000, 0.040]). Since GPIU did not mediate the relation between PF and MT hypothesis H5 was not supported.

## 6. Discussion

As already documented in the theoretical section, multitasking during classes was found to be influenced not only by contextual educational factors like boredom, class norms or class disengagement, but also by more stable, cross-situational internal factors like locus of control, self-regulation, the urge for continuous entertainment or internet dependence. In this vein, the aim of the present study was to take a closer look at the potential predictive relations between students' time perspectives (seen as internal stable factors) and their multitasking with smart phones during classes. Moreover, since general problematic internet use has already been found to significantly correlate with both time perspective and multitasking, we also expected the proposed predictive relations to be mediated by students' GPIU.

First, our results showed a significant positive correlation between GPIU and multitasking during classes, a result in line with previous studies (Gerow et al., 2010; Gökçearslan et al., 2016; Qian & Li, 2017). Also consistent with existing findings, we found GPIU to be significantly positively correlated with students' both past negative and present fatalistic perspectives, significantly negatively correlated with future orientation, and not significantly related to past positive perspective

(Chittaro & Vianello, 2013; Kim et al., 2017; Lukavska, 2012; Przepiorka & Blachnio, 2016; Settanni et al., 2018). The expected significant positive correlation between GPIU and present hedonistic was not found. Also in the previous literature, the relation between PH and problematic internet use or internet addiction is not as consistent as for PN, PF, or F, with studies finding positive (Kim et al., 2017; although they used in their research a composite score for PH and PF), negative (Przepiorka & Blachnio, 2016), or non-significant correlations (Chittaro & Vianello, 2013).

Second, overall our results partially supported our hypothesized mediated relations, emphasizing the role of time perspectives as more distal predictors influencing students' multitasking via their problematic internet use. More specifically, GPIU fully mediated the positive relation between the past negative perspective and multitasking during classes. It appears that having a negative view of one's past leads to a higher probability of anxiety, depression, and addictive behaviors, this maladaptive conduct being, more probably, an avoidant coping strategy (Zimbardo & Boyd, 1999), as a way of alleviating or eluding this aversive shadow of the past. Multitasking seems to be a direct derivate of this addictive profile, a behavioral manifestation hard to control (Aagaard, 2015; Moeller et al., 2010), especially when it comes to smart phones which are always at hand, appearing not only during classes, but also in other various daily circumstances (Gökçearslan et al., 2016).

Contrary to our expectation, the present fatalistic perspective was not found to be a significant positive predictor of either GPIU, or multitasking during classes, although the initial correlational analyses showed significant positive relations between PF and these variables. This result might be explained by the fact that when PF is entered in the path analysis together with the other TPs, especially with PN, its significance as a predictor might decrease because usually, the correlation between PN and PF is stronger than the correlations among the other TPs. This situation appeared also in other previous studies where PN and PF correlated moderately, the dependent variable correlated stronger with PN than with PF, and when entered together into a predictive model, PF was no longer a significant predictor of the dependent variable. For example, this was the case when the dependent variable was the intensity and frequency of Facebook use (Przepiorka & Blachnio, 2016), decisional procrastination (Díaz-Morales, Ferrari, & Cohen, 2008), individual's affective experience (i.e., energetic arousal, tense arousal and hedonic tone; Stolarski, Matthews, Postek, Zimbardo, & Bitner, 2014), or life satisfaction (Zhang & Howell, 2011).

Results also showed that students' future orientation was a significant negative predictor of multitasking during classes, with GPIU partially mediating this relation. The indirect effect is again similar to previous studies emphasizing that those more future-oriented are more resistant to addictive or risky behaviors, including problematic internet use which, in turn, makes them less likely to engage in multitasking with smart phones while attending classes. Specifically, in educational settings, F perspective negatively predicts multitasking because students with this temporal focus are more oriented towards setting and achieving their goals (Barnett et al., 2018; Horstmanshof & Zimitat, 2007; Perry et al., 2015). One of the strongest and consistent correlations found by previous research was the positive relation between F and conscientiousness (Jochemczyk et al., 2017; Stolarski, 2016; Zhang & Howell, 2011), meaning that individuals more future-oriented are more able to delay immediate gratification, are less hedonist, have a higher level of self-regulation and maybe are more aware of the detrimental interference of multitasking with their academic achievement (de Bilde et al., 2011; Orkibi, 2015; Zimbardo & Boyd, 1999).

Present hedonistic orientation was found to positively predict multitasking during classes (though marginally significant), but without GPIU mediating this relation. Due to their low ability of delaying immediate satisfaction or pleasure, those with a hedonistic view of the present tend to engage in multitasking during classes, most probably when less engaged in tasks or academic activities, related to apathy towards course contents and less controlled classes (Gupta & Irwin, 2016; Qian & Li, 2017). Although in our study we did not consider these variables, it is plausible to assume a more significant influence of contextual educational factors on hedonists' behavior. As previously reported, PH correlates positively with risky behaviors (Orkibi, 2015; Zimbardo & Boyd, 1999), but also with openness and agreeableness (Jochemczyk et al., 2017; Stolarski, 2016; Zhang & Howell, 2011), suggesting that internet and technology use might not be the only source of gratification for these more hedonistic students. They might seek and find alternative sources of entertainment and pleasure, including, why not, even the cognitive challenges of an academic task or lecture.

Finally, past positive perspective was not significantly correlated with either GPIU or multitasking during classes. Similarly, previous studies found no significant relations between PP and problematic internet use or internet and Facebook addiction. Also, as already argued and documented by previous research, the “diagnostic” power of PP orientation on various present characteristics or behaviors seems to be weaker or, let us say, less straightforward than of its counterpart, namely the PN perspective (see Kostić, Pejičić, & Chadee, 2017, for a review). This means that either having a general warm and pleasant view of the past or a nostalgic and idealized view of “glorious past moments”, a PP temporal frame generally correlates with openness, extraversion, conscientiousness, decreased anxiety or depression, and greater self-respect and global self-esteem. We argue that this general positive past profile might be a background equally fostering a potential present hedonistic, or a future orientation, depending on individuals' other personal characteristics and experiences, hence its weaker predictive power on present behaviors.

Taken all together, these direct and indirect effects of students' temporal perspectives on their multitasking on smart phones during classes suggest two broad ways of looking at this academic misbehavior. On the one hand, multitasking could be seen as a direct derivate, a prolongation of some students' general addictive profile and their internet problematic use, due to a global negative cognitive and emotional set, rather independent of immediate academic contextual factors. Especially those with a past negative orientation, but also those less future orientated, seem to be unwilling and/or unable to control this disruptive internet dependence, thus becoming more prone to also succumbing to multitasking on smart phones in various daily contexts, including during university courses. On the other hand, students' temporal focus could be seen as a predisposing internal characteristic for this multitasking behavior, with the latter still needing more specific contextual factors in order to appear. Lack of class control, lower general learning motivation or a more specific apathy towards course contents, boredom, lower academic self-efficacy, lower endorsement of performance oriented goals, or lower self-determined learning are such examples of specific academic factors potentially triggering multitasking behaviors in the case of those students who have a present hedonistic perspective, as well as in the case of those with a lower future orientation.

According to our results, time perspective significantly influences in-class smart phone multitasking. Therefore, the simplest practical implication would be to change students' TPs, if necessary, in order to reduce their multitasking tendencies. But this is not a very easy thing to do, as it implies long-term specialized interventions, either psychotherapeutic or developmental. For example, specialists within the area of positive psychology proposed a form of developmental intervention called *TP coaching*, in which practitioners perform initial diagnostics, distinguish problems associated with excessive focus on particular timeframes, and then help individuals to overcome the negative consequences associated with them (Stolarski et al., 2018). Obviously, these types of specialized interventions exceed not only the contexts of regular academic classes or activities within the university field, but also the expertise of most university teachers. So what else could they do in order to reduce their students' in-class multitasking?

As university teachers, usually working with large groups of

students, we have quite a limited class control, especially during courses. Still, we must avoid the fundamental attribution error (Ross, 1977) acknowledging that students' multitasking during classes is not entirely an "internal" personal problem, and that we are also partially responsible, especially by our academic choices regarding the contents and format of our lectures. We might as well see multitasking as an old symptom in new "digital" clothes. In the past, before phone multitasking, there were other forms of class disengagement (and still are) like thinking astray, talking to a neighbor, or reading unrelated materials. Now it is all the same, but transposed into the virtual medium. Therefore, there is a need for educators to increase students' engagement with their learning tasks by increasing their value, thus diminishing the multitasking (Flanigan & Kiewra, 2017; Gupta & Irwin, 2016). Instead of passively and quietly attending our lecture, students should be actively challenged cognitively by interesting or intriguing contents and questions, with interactive discussions and problematizations, with clear and well structured learning tasks, thus hindering their cognitive disengagement and avoidance.

Smart phones could be incorporated in some of our teaching activities, encouraging students to use their phones for educational purposes such as finding examples or definitions for a concept, finding graphic or movie illustrations for specific ideas, inquiring into a specific topic etc. We could also take some "breaks" during our teaching activities, by using humor or other playful elements that would lighten the atmosphere and would make things more relaxing and appealing, especially for those students with a present hedonistic orientation. Students with a past negative orientation might also benefit from a supportive, positive affective classroom climate where they would feel encouraged and appreciated by the others. In this way, they might be more interested in the academic activities and, consequently, less tempted to check and use their smart phones during classes.

In our opinion, formally banning smart phones from the class would be a very extreme measure, with the potential risk of being perceived by students as a personal intrusion or attack to their rights, which will lead to frustration, anger, or resent, thus negatively affecting our educational interactions. What we could do instead, apart from proposing more appealing cognitive contents, is to have a more out fronted attitude by helping our students to understand that delaying immediate gratification and increasing their involvement during academic activities will have more long-term benefits for their future academic outcomes. By training students' both self-regulation and time management skills, teachers might make their students more aware of the disruptive effect of mobile multitasking during school-related activities on their overall academic achievement, either at the university or at home (Chen & Nath, 2016; Chen et al., 2014; Flanigan & Kiewra, 2017; Gökçearslan et al., 2016; Olufadi, 2015).

## 7. Limitations and suggestions

Apart from its contribution to the existing literature by validating the significant influence of students' time perspectives on their smart phone academic multitasking, the present study has, like any other research, its limitations. First, there are the inherent shortcomings of cross-sectional designs and self-assessment measures. Second, the data was collected from a single university which, despite of being one of the largest in the country, might not be representative of all Romanian university students. In order to generalize our results, future data should be analyzed by using larger samples from different universities, especially from different regions of the country.

Thirdly, regarding the academic field, our sample was quite homogeneous, with all students being enrolled in Humanities and Social Sciences. Recent research showed that students in Natural Science have significantly lower levels of in-class media use than students in both Arts and Social Science and Medicine and Health Science, with the latter having also higher scores than students in Engineering (le Roux & Parry, 2017). Mobile social media usage was also found to be more detrimental to the academic performance of students in Science than of those in Humanities (Giunchiglia, Zeni, Gobbi, Bignotti, & Bison, 2018). Hence, future studies looking into understanding students' smart phones multitasking in relation to their time perspectives should also consider their academic field as a moderator, alongside with other potentially significant variables such as students' year of study (Junco, 2015) or the time point of the semester when data is collected.

Lastly, and most importantly, in the present research we did not consider more contextual factors, either motivational or educational, which might act as moderators or partial mediators of the predictive relations revealed by our results. Since to our knowledge, no previous study explicitly analyzed the predictive relations between time perspectives and in-class multitasking, the purpose of the present research was mainly exploratory, verifying the validity of these assumed relations. Now that we "have taken the pulse" of the matter, more in-depth future analyses are needed, with more comprehensive models to be tested, necessarily including the contextual academic factors such as those already mentioned in the discussion section above: class control and structure (especially courses vs. seminars), teaching methods, cognitive engagement, academic self-efficacy, learning motivation, self-determination, or self-regulated learning.

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