Factors Influencing Undergraduate Students' Decision to Migrate to Social Network Sites as Part of their Studies

American Journal of Education and Learning
Vol. 7, No. 2, 44-57, 2022
e-ISSN:2518-6647

(Corresponding Author)

Ioannis Chalkiadakis[1]
Aspasia Dania[2]
Manolis Adamakis[3]
Fotios Dimopoulos[4]
Iakovos Chasapis[5]
Christos Christopoulos[6]

[1,2,3,4,5,6]*School of Physical Education and Sport Science, National and Kapodistrian University of Athens, Greece.*
[1]*Email: giannisx13@gmail.com*
[2]*Email: adania@phed.uoa.gr*
[3]*Email: manosadam@phed.uoa.gr*
[4]*Email: dimopfot@gmail.com*
[5]*Email: Hasapisjack@yahoo.com*
[6]*Email: ch10940958ch@gmail.com*

ABSTRACT

Previous research has shown that university students' decision to use social networks for academic reasons is influenced by several factors. However, until today there is no validated instrument measuring the factors that influence undergraduates to migrate to online networks for educational purposes. The aim of this study was to propose and validate the Push–Pull–Mooring - Physical Education (PPM-PE) questionnaire and examine possible factors that contribute to students' decisions for social network use. Participants were 302 Physical Education (PE) students from a Greek Faculty of PE and Sport Science. Data analysis with exploratory factor analysis identified a three-factor structure that measured undergraduates' use of social networks for academic learning purposes. Multivariate analyses of covariance indicated that gender had a significant effect on students' social networking patterns, while device access did not. Age and hours spent online significantly contributed to the above differences. Findings are discussed in relation to the PPM framework and the idiosyncrasies of online instruction within PE university contexts.

Keywords: *Push-pull-mooring framework, Physical education, Social networks, Higher education, Teacher education, Instrument validation.*

DOI: 10.55284/ajel.v7i2.669
Citation | Ioannis Chalkiadakis; Aspasia Dania; Manolis Adamakis; Fotios Dimopoulos; Iakovos Chasapis; Christos Christopoulos (2022). Factors Influencing Undergraduate Students' Decision to Migrate to Social Network Sites as Part of their Studies. American Journal of Education and Learning, 7(2): 44-57.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
History: Received: 2 June 2022/ Revised: 18 July 2022/ Accepted: 4 August 2022/ Published: 15 August 2022
Publisher: Online Science Publishing

Highlights of this paper:

- This study is innovative in proposing the 'Push-Pull-Mooring framework' as a human migration sensitizing concept for developing, validating and implementing an instrument to assess undergraduate Physical Education students' decision to migrate from onsite places to online social networks for academic learning purposes.

1. INTRODUCTION

The fast-pace changes in higher education, as a result of the digital world challenges, have raised concerns about whether social networks, as sites for interaction among university students and teachers can facilitate learning. Youth hangout, mess around and geek out (Ito, Baumer, Bittanti, Boyd, & Cody, 2010) in online spaces, seamlessly integrating formal and informal forms of interaction (Dabbagh & Kitsantas, 2012). Each time being driven by varying social networking behaviors, youth use social media to communicate, publish and manage content, via their public or private profiles (Chugh & Ruhi, 2018; Dahlstrom, De Boor, Grunwald, & Vockley, 2011; Junco, Heiberger, & Loken, 2011).

Relevant literature shows that university students spend many hours on social networks for accessing content and personalizing learning (Carpenter & Krutka, 2015), socializing and organizing their academic and free time activities (Jacobsen & Forste, 2011), facilitating their transition into university life (Thomas, Orme, & Kerrigan, 2020), enacting more meaningful engagement in learning activities (Gurjar, 2020) and gaining access to study and self-expression sources (Park, 2010). Compared to previous years' deterministic arguments, studies show that the supposedly digitally literate university students are often not as tech-savvy as expected (Adamakis & Zounhia, 2013; Marín, Carpenter, & Tur, 2021). Researchers have highlighted students' difficulties to incorporate technology within their studies (Prendes, Castañeda, Gutiérrez, & Sánchez, 2016), their need for guidance on how to use digital media (Cigognini, Pettenati, & Edirisingha, 2012), their reluctance to interact with teachers in online classes (Deng & Tavares, 2013; Gettman & Cortijo, 2015) and their lack of interest for privacy policies (Steinfeld, 2016).

In terms of gender differences, studies have shown that female students are heavy users of digital media (Walsh, Fielder, Carey, & Carey, 2013), mainly turning to the internet for communication and class work (Jones, Johnson-Yale, Millermaier, & Pérez, 2009; Padilla-Walker, Nelson, Carroll, & Jensen, 2010). On the other hand, males tend to use digital devices for entertainment and leisure, as well as for functional and task-related purposes (e.g., reading the news, finding financial information, etc.) (Kimbrough, Guadagno, Muscanell, & Dill, 2013; Kita & Luria, 2020).

Within Physical Education (PE) university courses, the recent switch to digital modes of instruction, due to the pandemic, has raised concerns about the teacher-student relationship and the way that it could be supported by online networks (O'Brien et al., 2020). With the absence of physical presence and body-as-assemblage interactions (Varea, González-Calvo, & García-Monge, 2022), as well as the pause and/or reduction in field placements and performance-based experiences, the PE community has faced a great challenge in digitally supporting undergraduates. At this stage, there is a consensus among scholars to keep educational interaction at high levels via the use of social networks, since this could be vital for achieving a smooth transition to new modes of learning to teach PE and sport (Harvey, Carpenter, & Hyndman, 2020; Hyndman & Harvey, 2020). Undergraduate PE students cite interaction as an important determinant of social media use (Hyndman & Harvey, 2019; Hyndman & Harvey, 2020; Stoicescu & Stănescu, 2018), and seem to use different devices (i.e. computers, smartphones) to obtain information and communicate fast. However, little is known about the reasons behind PE students' decision to access social networks. Such knowledge could help teacher educators to decide whether it is necessary to adapt, modify, and redesign their course content, media and teaching approach in order to fit with students' interests.

According to the Push-Pull-Mooring (PPM) framework (Moon, 1995), an individual's decision to switch between

an old and a new mode of behavior is influenced by push (i.e., barriers that drive people away from the old behavior), pull (i.e., attributes/opportunities that make the new behavior appealing), and mooring (i.e., personal and social moderators of the decision to continue or abandon one of the two behaviors) factors. In the case of undergraduate PE students', their decision to migrate from face-to-face to digital learning interactions may be influenced both by subjective and group norms or beliefs concerning the utility of this mode of learning. Factors like undergraduates' satisfaction (or lack of it) with the modes of interaction occurring in their online classes (e.g., long lectures) (push factor), along with the attractiveness of the digital learning services (e.g., online communities, breakout rooms) (pull factor), and the contextual characteristics of their connectedness (e.g., access to e-class learning platforms via computers, tablets or smartphones) (mooring factor), may influence their decision to switch from on site to online learning modes. Acknowledging the hands-on nature of the PE profession, it is important to gain a combined understanding of potential push, pull and mooring influences on students' online behaviors and preferences.

Until today, the PPM theoretical framework has been used to evaluate students' social network use (Balakrishnan, 2014). However, no valid and reliable instrumentation of this kind exists in relative PE literature. The availability of such an instrument could be an initial step in understanding and evaluating the factors that can facilitate or inhibit undergraduate students' decision to migrate to social networks for online learning purposes.

Based on the above, the aim of the present study was to propose and validate the Push–Pull–Mooring - Physical Education (PPM-PE) questionnaire, as an instrument for evaluating the factors that influence undergraduate PE students' social network use for online learning. Research aims included: (a) the development of the PPM-PE questionnaire and the identification of its factorial structure and validity; (b) the examination of the extent to which the PPM-PE questionnaire can be used to trace differences in students' social networking behaviors based on their age, gender and preferred device of social networking. Our intention was to gain a bottom-up understanding of students' networking habits and use this afterwards as a reference point for shaping the discussion around the idiosyncrasies of online interaction within PE university settings.

2. METHOD

2.1. Instrument Development

Following institutional ethical approval, we used a translated version of an instrument proposed by Balakrishnan (2014) to develop the PPM-PE questionnaire. The decision to use the Balakrishnan (2014) instrument was based on the fact that it was originally designed according to the PPM framework (Moon, 1995). The advice from an expert panel of three sport pedagogues was taken into account to adapt it and establish content validity. The experts were asked to check the translated instrument structure, and identify potential wording problems. As a result of the experts' feedback, minor structural improvements were made. The newly developed PPM-PE questionnaire was divided in three sections, with all questions being closed-ended:

- Demographic information: respondents were required to provide their socio-demographic details such as age, gender, year of studies, PC/tablet/smartphone ownership and use, etc.
- Social networks: twenty-five items that measured participants' perceptions on the possible use of social networking sites in an e-learning context. Examples of the instrument's questions in this section were: 'Communications in social networks platforms is much faster', and 'I use social networks to meet people of the same field of study'. Based on the recommendations of the expert panel, three items of the original questionnaire were not deemed relevant to the study (i.e., 'Intellectuals attract my attention in social networks', 'On searching for a specific video/audio clip, YouTube always suggests similar related video/audio clips', and 'YouTube simplifies sharing of audio/video files online') and were removed from the final questionnaire. In agreement

with Balakrishnan (2014), the items of this section of the questionnaire had high internal consistency (Cronbach α=.933).

- Barriers: six items, referring to the reasons that might prevent students from using social networking sites for e-learning. Examples of the statements used were: 'I do not know that I can use social networks for academic benefits', and 'I enjoy working alone, social sites distract my attention'. Items in this section had acceptable internal consistency (Cronbach α=0.802).

For both sections (i.e., social networks and barriers) a five-point Likert-type scale was used, ranging from strongly disagree (1) to strongly agree (5).

2.2. Sample and Procedures

Following the development of the PPE-PE questionnaire, a total of 302 PE students [142 males, 160 females, aged 20.17 years (SD=3.48)], undergraduates from a major public Greek Faculty of PE and Sport Science were invited to participate in the study. A convenience sampling procedure was used, and the total sample was divided into 181 first-year (59.9%), 37 second-year (12.3%), 40 third-year (13.2%), 18 fourth-year (6.0%) students and 26 students (8.5%) who had failed a year or more.

Participants were recruited via a number of different approaches (e.g., e-mail invitations, invitations in lectures, invitations in e-classes) and completed a pencil-paper version of the instrument used, either before or after formal lectures. All participants were informed about the purpose of the study, provided consent and it was made clear that participation was voluntary, anonymous, and confidential.

2.3. Instrument Validation and Data Analysis

Initially, an exploratory factor analysis (EFA) (maximum-likelihood method, direct oblimin rotation) (25 maximum iterations for convergence) was conducted to investigate the factor structure of the two questionnaire's sections combined (social networks and barriers). This method was selected due to its superiority to other methods that are common in behavioral research, in explaining the latent structure of a set of variables (Conway & Huffcutt, 2003; Gaskin & Happell, 2014). To determine the number of factors to retain, the parallel analysis Monte Carlo simulation method was selected over the eigenvalue >1 rule and the Cattell's scree test (Gaskin & Happell, 2014; Hayton, Allen, & Scarpello, 2004). An extension package for SPSS available to download for free was used, which enabled the research team to perform parallel analysis with polychoric correlations (Basto & Pereira, 2012). Items were assigned to a factor on the basis of the following criteria: (a) they that had a loading of .32 or greater, (b) they did not have cross-loadings, (c) they demonstrated a difference of .15 between their primary and alternative factor loadings, and (d) they demonstrated single communalities over .30 (Tabachnick & Fidell, 2013; Worthington & Whittaker, 2006).

Additionally, Cronbach *a* coefficients, composite reliability (CR), average variance extracted (AVE), and square root of the AVE, as well as the correlations between the constructs were examined. A Cronbach *a* reliability coefficient above .70 was considered acceptable (Houser, 2008). Convergent validity was assessed by the loadings of all the items; CR, AVE, and discriminant validity were evaluated by examining whether AVEs were higher than the inter-construct correlations. We followed relevant research guidelines stating that CR should be higher than .60 and AVE should be higher than .50 to indicate that the convergence and distinct validity of the proposed model is adequate (Fornell & Larker, 1981). If the square root of the mean variance extraction rate (AVE value) of each factor appeared to be greater than the correlation coefficient between the variables, this would indicate that the difference between each measurement variable can be considered acceptable (Hair, Black, Babin, & Anderson, 2010).

Following the instrument validation process, data were further analyzed through descriptive [mean, standard deviation, and 95% confidence intervals (CI)] and inferential statistics [multivariate analysis of covariance (MANCOVA)], with the use of bootstrapping procedure by 1000 number of samples. The independent variables for the two performed MANCOVA were: (a) gender (including age as covariate); and (b) most commonly used device to view social networks [personal computer (PC), tablet, or smartphone (hours spent daily viewing social networks as covariate)], on the extracted factors of the questionnaire. To control whether the design was unbalanced, the equality of covariance matrices using Box's M test was used. Furthermore, the partial η^2 was presented as a measure of effect size for F-Tests. A partial η^2 value between .01 and .06 was associated with a small effect, between .06 and .14 with a medium effect, and .14 or greater with a large effect (Warner, 2013). For purposes of interpretation, significant multivariate effects were followed by univariate F-ratios [analysis of variance (ANOVA)] with Bonferroni corrected values, as well as multiple regressions for the covariates. The significance level for all analyses was set at $p<.05$.

Before the main statistical procedures, variables were screened for accuracy of data entry, missing values, potential outliers, and distribution (skewness and kurtosis). No missing values were observed, and the box plots, skewness and kurtosis analysis indicated that no extreme values existed, and data were normally distributed. All statistical analyses were conducted with the use of the statistical package SPSS version 23.0 (IBM SPSS Corp., Armonk, NY, USA).

3. RESULTS

3.1. Exploratory Factor Analysis

The EFA extracted three factors that accounted for 40.96% of the total variance Table 1. Based on the results of the parallel analysis these factors had an eigenvalue of 1.54. Bartlett's test of sphericity ($\chi^2=2975.82$, df=465, $p<0.001$) and Kaiser-Meyer-Olkin (KMO=0.833) indices were satisfactory. Factor one accounted for the largest proportion of the total variance (19.14%) as most of the items loaded on this factor, and included items related to participants' *Beliefs & Preferences* concerning social network use (e.g., 'I believe social networks can be used to improve teaching', 'I am benefitting a lot (academically) through social networks usage', 'I would like academicians to join Facebook, YouTube and Twitter to assist students', etc.). The second factor accounted for 10.78% of the total variance, including items referring to *Usefulness* related to the use of social networks (e.g., 'Communications in social network platforms is much easier', 'Communications in social network platforms is much faster', etc.). Lastly, factor three accounted for the remaining 11.04% of the total variance, with items related to participants' *Barriers* concerning social network use (e.g., 'I do not know that I can use social networks for academic benefits', 'Lack of motivation from colleagues discourages me from joining social networks', etc.).

Three items (*Friends and family influence the way I use social networks in learning*, *Groups and page participation in Facebook make access to learning materials easier*, and *Instant response to information request influences my stay in social networks*) had loadings less than .32, significant cross-loadings, did not demonstrate a difference of .15 between their primary and alternative factor loadings, and single communalities were less than .30 (.279, .236 and .282 respectively), so they were removed from the final instrument. Following the removal of these items, 17 items were included in the first factor labelled as *Beliefs & Preferences*, five items in the second factor labelled as *Usefulness*, and six items in the third factor labelled as *Barriers*. The loadings of all items were above .32, indicating that the observed variables had adequate convergent validity.

Table 1. EFA with rotated factor loadings of the PPE-PE questionnaire.

Social Networks	Beliefs & Preferences	Usefulness	Barriers
I believe social networks can be used to improve teaching	0.659	-0.075	-0.223
I am benefitting a lot (academically) through social networks usage	0.632	0.064	-0.350
I believe social networks can be used to improve the interaction among peers and between students and academicians	0.598	-0.245	-0.262
I believe social networks can be used to improve the collaboration among peers and between students and academicians	0.584	-0.179	-0.313
I would like academicians to join Facebook, YouTube and Twitter to assist students	0.576	-0.028	0.015
I am always happy to add academicians/students to my Facebook/Twitter friends' list	0.481	-0.047	-0.034
Academicians respond quickly to my academic queries in social networks	0.455	0.078	0.004
I use social networks for educational purpose	0.431	-0.029	-0.156
I use Facebook to make appointments with my academicians/students	0.418	-0.054	0.085
Friends taught me how to access learning materials through social network sites	0.409	0.043	0.219
I would prefer to use social networks compared to other modes (emails, phone calls) as a communication medium with peers and/or academicians as it is simple and easy to use	0.405	-0.243	0.030
I use social networks to make new friends	0.384	-0.028	0.129
Academicians in my university/college use social networks to enhance teaching methods	0.378	-0.049	-0.109
I am careful of the content I post on my Facebook/Twitter update status due to the presence of my academicians	0.366	0.094	0.187
My academician taught me how to access learning materials through social network sites	0.361	0.017	0.068
I use social networks to meet people of the same field of study	0.352	-0.273	-0.053
My academicians influence the way I use social networks in learning	0.323	0.014	0.099
Friends and family influence the way I use social networks in learning	0.313	-0.062	0.240
Groups and page participation in Facebook make access to learning materials easier	0.296	-0.165	-0.105
Instant response to information request influences my stay in social networks	0.251	-0.250	-0.066
Communications in social network platforms is much easier	-0.137	-0.882	0.098
Communications in social network platforms is much faster	-0.128	-0.867	0.150
I am attracted to variety of communication mediums in social networks (able to upload materials, posts, send messages, etc.)	0.105	-0.588	-0.055
Social networks are good medium for students and academicians' meetings and communications	0.311	-0.448	-0.099
I use social networks to stay in touch with my friends and families	0.190	-0.434	-0.063
I joined social networks before but had to quit due to its constant requirement of time and management	0.231	0.112	0.624
Lack of motivation from colleagues discourages me from joining social networks	0.144	0.083	0.544
I enjoy working alone, social networks distract my attention	-0.072	0.031	0.509
I do not know that I can use social networks for academic benefits	0.070	-0.101	0.490
I am conservative as such I do not like socializing on internet	-0.178	0.112	0.380
I am concerned about privacy issues on social networks	-0.065	-0.071	0.370
Eigenvalue	1.73	1.62	1.54
Factor variance (%)	19.14	10.78	11.04
Total variance (%)	19.14	29.92	40.96

3.2. Validity and Reliability

Table 2 shows Cronbach *a* coefficients, CR, AVE, and square root of the AVE, as well as the correlations between the factors. Cronbach *a* coefficients of the three factors were all above the recommended criterion of .70, ranging from 0.701 (*Barriers*) to 0.834 (*Beliefs & Preferences*), which showed that the measures were reliable and internally consistent. The correlations between the three factors ranged from -0.361 to 0.205 Table 2. CR was greater than 0.60, and AVE was lower than 0.50, indicating moderate levels of convergent validity (especially for AVE). Furthermore, the square root of the factors AVE values was greater than the absolute values of the correlation coefficients among factors, showing adequate levels of discriminant validity Table 2. According to Fornell and Larker (1981), if AVE is less than 0.50, but CR values are higher than 0.60, then the convergent validity of a construct is adequate (Fornell & Larker, 1981). Taken all together, the above analyses supported the factorial and discriminant validity of the PPM-PE questionnaire.

Table 2. Instrument's validity and reliability analysis.

Factors	AVE[1]	CR[2]	Cronbach *a*	Beliefs & Preferences	Usefulness	Barriers
Beliefs & Preferences	0.222	0.822	0.834	0.471*		
Usefulness	0.453	0.791	0.795	-0.361	0.673*	
Barriers	0.245	0.652	0.701	0.001	0.205	0.494*

Note: [1]AVE: average variance extracted; CR[2]: composite reliability; *The bold number is the square root of AVE. The bold numbers listed diagonally are the square root of the variance shared between the factors and their measures. The off-diagonal elements are the correlations among the factors. For discriminate validity, the diagonal elements should be larger than the off-diagonal elements.

3.3. Group Differences: Inferential Statistical Analyses

Using the same sample of 302 undergraduate students we conducted MANCOVAs to trace possible differences in students' social network use depending on their gender and preferred device of online communication, including age and hours spent on social networks as covariates. Descriptive statistics showed that most students owned a smartphone (97.4%) and a PC (94.7%), and only one fourth owned a tablet (25.8%). Furthermore, students mentioned that they most commonly accessed social networks with their smartphones (84.8%), followed by PCs (11.2%) and tablets (4.00%). Lastly, the average amount of hours they spent daily viewing social networks was 3.23±2.43 hours. Female students spent significantly more time [t(300)=-2.24, p=.026, Cohen's d=2.418] on viewing social networks (3.52±2.33 hours/day) than their male counterparts (2.89±2.51 hours/day).

The Box-M test of equality of covariance for the first MANCOVA for the gender independent variable on three factors of the questionnaire, including age as covariate, was statistically significant (Box's M=24.18, p=.001). The normality assumption was not met and the Pillai's Trace test was implemented, since it is considered to be the most powerful and robust statistic for general use, especially for departures from normality assumptions. Results indicated that statistically significant differences were observed between males and females on the three dependent variables [Pillai's Trace=0.06, $F(3,297)=6.55$, $p<.001$, $\eta^2=0.062$], and age statistically significantly contributed to these differences [Pillai's Trace=0.06, $F(3,297)=6.55$, $p<.001$, $\eta^2=0.063$], with medium effect sizes. Follow-up univariate ANOVAs with a Bonferroni correction on the separate factors Table 3 revealed significant differences for the *Usefulness* and *Barriers* factors. Females used social networks more than males for purposes related to convenience and ease of academic or social communication (appealing characteristics) [$F(1,299)=11.28$, $p=0.001$, $\eta^2=0.036$], while males seemed more reluctant to use social networks than females [$F(1,299)=6.34$, $p=0.012$, $\eta^2=0.021$]. Age, as a covariate, was a negative predictor of *Beliefs & Preferences* (B=-0.039, p=0.004, 95% CI=-0.069 to -0.016) and of *Usefulness* (perceiving networks as useful alternatives) (B=-0.025, p=0.014, 95% CI=-0.049 to -0.006), indicating that as age increased, participants connected less and found social networks less attractive and worthwhile for academic or personal reasons. Age was not a significant predictor of *Barriers* (B=0.008, p=0.435, 95% CI=-0.015 to 0.026).

Table 3. Follow-up ANOVAs with Bonferroni correction for gender on social networks beliefs and preferences, usefulness, and barriers (adjusted for age; Bootstrap 1000).

Factors	Gender (n)	M	SD	95% CI	Univariate F	p	Partial η^2
Beliefs & Preferences	Male (142)	3.36	0.58	3.28-3.45	0.06	0.806	<0.001
	Female (160)	3.35	0.51	3.27-3.43			
Usefulness	Male	4.18	0.67	4.08-4.27	11.28	0.001	0.036
	Female	4.40	0.49	4.31-4.49			
Barriers	Male	2.67	0.64	2.56-2.78	6.34	0.012	0.021
	Female	2.47	0.70	2.37-2.58			

Note: (n) = sample size, Partial η^2 = the ratio of variance associated with an effect.

The Box-M test of equality of covariance for the second MANCOVA for the most commonly used device to view social networks [personal computer (PC), tablet, or smartphone] as an independent variable on three factors of the questionnaire, including hours spent daily viewing social networks as covariate, was not statistically significant (Box's M=15.39, p=.397) and the normality assumption was met. The Hotelling's Trace test, which is considered to be a solid support for handling unequal sample sizes, was implemented. The MANCOVA results Table 4 indicated no statistically significant differences on the three questionnaire factors between students who used PCs, tablets, or smartphones to access social networks, [Hotelling's Trace=.02, F(6,590)=.84, p=.541, η^2=.008]. Further, the amount of hours spent daily viewing social networks was a significant predictor of the dependent variables [Hotelling's Trace=0.04, F(3,296)=4.18, p=0.006, η^2=0.041], with small effect size.

Hours spent daily viewing social networks, as a covariate, was a positive predictor of *Beliefs & Preferences* (B=.034, p=0.013, 95% CI=0.007 to 0.063) and *Usefulness* (B=.42, p=0.002, 95% CI=0.016 to .068), indicating that as hours spent daily viewing social networks increased, participants' perceptions of social networks' utility to connect with others also increased. Hours spent daily viewing social networks was not a significant predictor of *Barriers* (B=0.010, p=0.509, 95% CI=-0.018 to .038).

Table 4. Follow-up ANOVAs with Bonferroni correction for the most commonly used device on social networks beliefs and preferences, usefulness, and barriers (adjusted for age; Bootstrap 1000).

Factors	Device (n)	M	SD	95% CI	Univariate F	p	partial η^2
Beliefs & Preferences	PC (34)	3.31	0.56	3.13-3.48	0.08	0.920	0.001
	Tablet (12)	3.48	0.32	3.01-3.94			
	Smartphone (256)	3.36	0.54	3.29-3.42			
Usefulness	PC	4.07	0.60	3.87-4.26	2.22	0.110	0.015
	Tablet	4.52	0.52	4.01-5.03			
	Smartphone	4.32	0.58	4.25-4.39			
	PC	2.58	0.73	2.35-2.81	0.11	0.900	0.001
Barriers	Tablet	2.42	0.92	1.82-3.02			
	Smartphone	2.57	0.67	2.48-2.65			

Note: (n) = sample size, Partial η2 = the ratio of variance associated with an effect.

4. DISCUSSION

The aim of this study was to suggest and provide initial validity evidence for the PPM-PE questionnaire, an instrument used for evaluating the factors influencing undergraduate PE students' use of social networks for online learning purposes. The PPM framework (Moon, 1995) was used as a sensitizing concept to investigate the factors affecting university students' willingness to adopt social networking habits/behaviors as part of their academic studies. Following a two-phase procedure, a 17-item instrument with three factors, namely *Beliefs & Preferences*, *Usefulness*, and *Barriers*, was generated. The statistical fit was tested with the use of EFA and convergent and discriminant validity tests, as well as Cronbach *a* coefficients and inter-construct correlations. All factor indices were acceptable, apart from the AVE values, which were below .50. However, the CR of the three factors was well above the recommended level, and thus the convergent validity of the proposed model was deemed acceptable. Taken

together, our analyses supported the overall validity and reliability of this instrument for assessing PE undergraduates' social networking behaviors. It is suggested that future studies should re-examine the validity and factorial structure of this instrument, to provide further evidence of validity and reliability in different contexts and/or populations.

As findings showed, the majority of participants in this study had access to social networks through smartphones, irrespective of their gender; however, female students were the ones that perceived digital affordances more beneficial for their academic interaction. Particulalry, female students in this study found the dialogue-oriented formats of online interaction more useful than males. As noted by Boyd (2014), digital functionalities allow online expressions that are visible (e.g., there is an audience that can bear witness), persistable, spreadable and searchable (e.g., content is durable and can be shared or found easily). Thus, they are more likely to attract females, who seem to be more willing than males to open up during their online presence (pull factor) (Mayer, 2003). It seemed that interaction was established as an effect construct of female students' attraction to online presence, since the latter might have facilitated their need for dialogue and community belongingness.

On the other hand, males were less satisfied than females with the offered types of digital interaction. Male dissatisfaction was related to factors such as content management, self-disclosure and e-course obligations, all of which acted as factors that possibly pushed them away from the online experience. This may be a result of gender role stereotypes and past experiences (Eagly, 1987). Previous research has shown that men use social network services mainly with a focus on agentic goal achievement (e.g., focus on independence), while women are expected to be more communal when establishing social interaction bonds (Guadagno, Muscanell, Okdie, Burk, & Ward, 2011; Kimbrough et al., 2013). This becomes more evident within PE contexts, where students learn to accommodate to their professional role, as they reproduce gendered habitus of presenting themselves and enacting teaching/learning behaviors and practices (Preece & Bullingham, 2020). In our case, male students reported that social network sites did not provide them with opportunities for control and ownership, both of which seem to relate closely to gender expectations in PE and sport (Brown & Evans, 2004; With-Nielsen & Pfister, 2011). The lack of similar opportunities may have acted as a contextually dependent mooring factor that further inhibited their willingness to switch to online interaction for academic purposes.

Our results also showed significant gender differences in participants' willingness to connect online, a finding also reported in other studies (Muscanell & Guadagno, 2012). Connectedness is a construct that is ultimately shaped by situational and contextual constraints (e.g., costs, norms and attitudes, past experiences, etc.), all of which are formative in facilitating or inhibiting social network use. In the present study, the constraints placed by the university program on student learning (e.g., traditional hands-on curriculum, shortage of supportive online infrastructures, lack of a blended-learning course tradition, university teachers' reluctance to employ with blended forms of learning, etc.), differently moderated the effect of the push and pull aspects of social networking for each gender. Although everyone was willing to connect, female students were the ones that connected more, most probably because male students found online presence an interference (push factor) to the way that they were used to present themselves in onsite PE and sport settings.

Concerning hours spent online, our study showed that this was a positive predictor of preference for involvement and perceived media usefulness (mooring factor). Drawing from research in cognate areas such as sport and teacher education, we can infer that young people's high exposure to social networks may relate to addiction behaviors (Romero-Rodríguez, Rodríguez-Jiménez, Ramos Navas-Parejo, Marín-Marín, & Gómez-García, 2020) or feelings of pressure to share aspects of their private life (Geurin, 2017). However, even though social media overuse has often been related with poor course engagement (Junco, 2012), there are studies to portray that digital networking can

enhance independent student work (Clements, 2015), and freedom to explore content or communicate with colleagues (Brewer, Begleiter, Anderson, & Isaacs, 2015).

Literature further shows that it is not the hours spent online that make social media appealing, but the meaningful engagement with peers in course assignments, and the guidance provided by educators, especially thise who promote interpersonal connections (Sato, Ellison, & Tsuda, 2019). During university studies, factors such as free Internet access (on and off campus), together with the high amount of onsite unstructured time and the challenges related to academic life (e.g., exams, course assignments, etc.), all contribute to increased online presence. It would be relevant therefore, to develop online university modules that give undergraduates more opportunities to collaborate with peers online, always in accordance to their onsite educational needs (Khan, Kend, & Robertson, 2016). The initiation of broader campus-wide initiatives that allow opportunities for online collaboration and resource sharing (e.g., expertise, instructional support, etc.) Bulger, Braga, DiGiacinto, and Jones (2016) would be indicative examples to this direction.

In the present study, a lack of association was found between hours spent online and participants' perceived barriers in the use of social networks for online learning purposes. This finding may suggest that access to a digital affordance, no matter how appealing or innovative it might be, is not enough to guarantee satisfaction or adoption of its services. An assumption already reported in studies that adopt the PPM framework to examine online behaviors is that interaction and connectivity are established as effect and not as formative constructs of social use (Chang, Liu, & Chen, 2014). In our case, participants' online academic interaction came as the result either of media novelty (pull/push factor), or of already established patterns of media use (mooring factors). According to Van den Beemt, Akkerman, and Simons (2011), contemporary students may use social media for interacting, performing, interchanging, or authoring, showing a diversity in their use preferences (i.e., Traditionalists, Gamers, Networkers, and Producers). This diversity, combined with age and gender preferences, implies caution in drawing conclusions about the academic benefits or drawbacks of social network use. With similar instances identified, we realize that the design of online university programs should foremost promote linkages between content and personally relevant digital identities and/or roles. We further believe that our newly developed, valid, and reliable questionnaire could act as a proxy measure for the effects of PPM factors constraining/moderating PE undergraduate students' social network use.

5. CONCLUSIONS

The factor structure, reliability, and validity of the instrument presented in this study, is an important preliminary step in the advancement of research related to students' preferences concerning social networks in relation to learning and academic purposes. Although a three-factor solution was tenable with rotation, this structure should be considered preliminary at this point, pending further confirmatory work. However, researchers in the field of PE teaching can use it to evaluate students' use of social networks in relation to the PPM framework. This work has implications for those who seek to redesign or update university PE programs, based on the experiences gained from the pandemic. As asserted by Kainz (2011), social media services are contemporary paradigms for communicating and personalizing learning, in ways that extend the digital affordance themselves. Therefore, increased understanding of the factors influencing students' decisions to interact in online settings is important in enabling new ways of effectively organizing and coordinating human and digital work and action.

While this study significantly contributes to the international literature, there are some limitations. Initially, PE students were recruited from only one university setting, with a convenience sampling procedure, leaving other institutions unexamined. While we anticipate that the instrument will be relevant in other PE contexts, future work is needed to this direction. Furthermore, due to the dynamic change of the functionalities afforded by social networks

over time, future implementations of this instrument are needed to ascertain the temporal stability of the current findings. From an educational perspective, future work should strive to develop a better description of social networks, in terms of up-to-date patterns of personal and socio-cultural ways of participation and use. An integrated view of relevant literature published during the pandemic, could offer fruitful lines of enquiry to shape emerging research in the field of higher education teaching and learning. The PPM factors reported in this study can serve as appropriate points of reference towards this direction.

REFERENCES

Adamakis, A., & Zounhia, K. (2013). Greek undergraduate physical education students' basic computer skills. *The Physical Educator*, *7*(2), 135-154.

Balakrishnan, V. (2014). Using social networks to enhance teaching and learning experiences in higher learning institutions. *Innovations in Education and Teaching International*, *51*(6), 595-606.Available at: https://doi.org/10.1080/14703297.2013.863735.

Basto, M., & Pereira, J. M. (2012). An SPSS R-menu for ordinal factor analysis. *Journal of Statistical Software*, *46*(4), 1-29.

Boyd, D. (2014). *It's complicated: The social lives of networked teens*. New Haven, CT: Yale University Pres.

Brewer, P. R., Begleiter, R. J., Anderson, K., & Isaacs, M. (2015). Using tablet devices and social media in a course about the 2012 US election campaign. *PS: Political Science & Politics*, *48*(1), 171-175.Available at: https://doi.org/10.1017/S1049096514001735.

Brown, D., & Evans, J. (2004). Reproducing gender? Intergenerational links and the male PE teacher as a cultural conduit in teaching physical education. *Journal of teaching in Physical Education*, *23*(1), 48-70.Available at: https://doi.org/10.1123/jtpe.23.1.48.

Bulger, S. M., Braga, L., DiGiacinto, K., & Jones, E. M. (2016). Student recruitment and retention efforts in PETE: Cloudy skies or silver linings. *Journal of Physical Education, Recreation & Dance*, *87*(8), 34-41.Available at: https://doi.org/10.1080/07303084.2016.1216485.

Carpenter, J. P., & Krutka, D. G. (2015). Social media in teacher education. In: Niess ML and Gillow-Wiles H (eds) Handbook of Research on Teacher Education in the Digital Age (pp. 28-54). Hershey, PA: IGI Global.

Chang, I. C., Liu, C. C., & Chen, K. (2014). The push, pull and mooring effects in virtual migration for social networking sites. *Information Systems Journal*, *24*(4), 323-346.Available at: https://doi.org/10.1111/isj.12030.

Chugh, R., & Ruhi, U. (2018). Social media in higher education: A literature review of Facebook. *Education and Information Technologies*, *23*(2), 605-616.Available at: https://doi.org/10.1007/s10639-017-9621-2.

Cigognini, M. E., Pettenati, M. C., & Edirisingha, P. (2012). *Personal knowledge management skills in Web 2.0-based learning. In: Khosrow-Pour M (ed) Organizational Learning and Knowledge: Concepts, Methodologies, Tools and Applications*. Hershey, PA: IGI Global.

Clements, J. C. (2015). Using Facebook to enhance independent student engagement: A case study of first-year undergraduates. *Higher Education Studies*, *5*(4), 131-146.Available at: https://doi.org/10.5539/hes.v5n4p131.

Conway, J. M., & Huffcutt, A. I. (2003). A review and evaluation of exploratory factor analysis practices in organizational research. *Organizational Research Methods*, *6*(2), 147-168.Available at: https://doi.org/10.1177/1094428103251541.

Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and higher education*, *15*(1), 3-8.Available at: https://doi.org/10.1016/j.iheduc.2011.06.002.

Dahlstrom, E., De Boor, T., Grunwald, P., & Vockley, M. (2011). *The ECAR national study of undergraduate students and information technology*. Boulder, CO: EDUCAUSE Center for Applied Research.

Deng, L., & Tavares, N. J. (2013). From moodle to facebook: Exploring students' motivation and experiences in online communities. *Computers & Education, 68*, 167-176.Available at: https://doi.org/10.1016/j.compedu.2013.04.028.

Eagly, A. H. (1987). *Sex differences in social behavior: A social-role analysis*. Hillsdale, NJ: Erlbaum.

Fornell, C., & Larker, D. F. (1981). Structural equation models with unobservable variable and measurement error: Algebra and statistics. *Journal of Marketing Research, 18*(3), 382-388.Available at: https://doi.org/10.2307/3150980.

Gaskin, C. J., & Happell, B. (2014). On exploratory factor analysis: A review of recent evidence, an assessment of current practice, and recommendations for future use. *International Journal of Nursing Studies, 51*(3), 511-521.Available at: https://doi.org/10.1016/j.ijnurstu.2013.10.005.

Gettman, H. J., & Cortijo, V. (2015). Leave Me and My Facebook Alone!" Understanding college students' relationship with Facebook and its use for academic purposes. *International Journal for the Scholarship of Teaching and Learning, 9*(1), n1.Available at: https://doi.org/10.20429/ijsotl.2015.090108.

Geurin, A. N. (2017). Elite female athletes' perceptions of new media use relating to their careers: A qualitative analysis. *Journal of Sport Management, 31*(4), 345-359.Available at: https://doi.org/10.1123/jsm.2016-0157.

Guadagno, R. E., Muscanell, N. L., Okdie, B. M., Burk, N. M., & Ward, T. B. (2011). Even in virtual environments women shop and men build: A social role perspective on Second Life. *Computers in Human Behavior, 27*(1), 304-308.Available at: https://doi.org/10.1016/j.chb.2010.08.008.

Gurjar, N. (2020). Leveraging social networks for authentic learning in distance learning teacher education. *TechTrends, 64*(4), 666-677.Available at: https://doi.org/10.1007/s11528-020-00510-7.

Hair, J., Black, W., Babin, B., & Anderson, R. (2010). *Multivariate data analysis*. Upper Saddle River, NJ: Prentice-Hall, Inc.

Harvey, S., Carpenter, J. P., & Hyndman, B. P. (2020). Introduction to social media for professional development and learning in physical education and sport pedagogy. *Journal of teaching in Physical Education, 39*(4), 425-433.Available at: https://doi.org/10.1123/jtpe.2020-0004

Hayton, J. C., Allen, D. G., & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. *Organizational Research Methods, 7*(2), 191-205.Available at: https://doi.org/10.1177/1094428104263675.

Houser, J. (2008). Precision, reliability, and validity: Essential elements of measurement in nursing research. *Journal for Specialists in Pediatric Nursing, 13*(4), 297-299.Available at: https://doi.org/10.1111/j.1744-6155.2008.00171.x.

Hyndman, B., & Harvey, S. (2019). Health and physical education teacher education 2.0: Pre-service teachers' perceptions on developing digital twitter skills. *Australian Journal of Teacher Education (Online), 44*(2), 34-50.Available at: https://doi.org/10.14221/ajte.2018v44n2.3.

Hyndman, B. P., & Harvey, S. (2020). Preservice teachers' perceptions of Twitter for health and physical education teacher education: A self-determination theoretical approach. *Journal of teaching in Physical Education, 39*(4), 472-480.Available at: https://doi.org/10.1123/jtpe.2019-0278.

Ito, M., Baumer, S., Bittanti, M., Boyd, D., & Cody, R. (2010). *Hanging out, messing around, and geeking out: Kids living and learning with new media*. Cambridge, MA: The MIT Press.

Jacobsen, W. C., & Forste, R. (2011). The wired generation: Academic and social outcomes of electronic media use among university students. *Cyberpsychology, Behavior, and Social Networking, 14*(5), 275-280.Available at: https://doi.org/10.1089/cyber.2010.0135.

Jones, S., Johnson-Yale, C., Millermaier, S., & Pérez, F. S. (2009). US college students' Internet use: Race, gender and digital divides. *Journal of Computer-Mediated Communication, 14*(2), 244-264.Available at: https://doi.org/10.1111/j.1083-6101.2009.01439.x.

Junco, R., Heiberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning, 27*(2), 119-132.Available at: https://doi.org/10.1111/j.1365-2729.2010.00387.x.

Junco, R. (2012). The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement. *Computers & Education, 58*(1), 162-171.Available at: https://doi.org/10.1016/j.compedu.2011.08.004.

Kainz, C. (2011). Mobile agility and the anytime, anywhere impact on IT. In Campus Technology. Retrieved from: https://campustechnology.com/whitepapers/list/whitepapers.aspx.

Khan, T., Kend, M., & Robertson, S. (2016). Use of social media by university accounting students and its impact on learning outcomes. *Accounting Education, 25*(6), 534-567.Available at: https://doi.org/10.1080/09639284.2016.1230880.

Kimbrough, A. M., Guadagno, R. E., Muscanell, N. L., & Dill, J. (2013). Gender differences in mediated communication: Women connect more than do men. *Computers in Human Behavior, 29*(3), 896-900.Available at: https://doi.org/10.1016/j.chb.2012.12.005.

Kita, E., & Luria, G. (2020). Differences between males and females in the prediction of smartphone use while driving: Mindfulness and income. *Accident Analysis & Prevention, 140*, 105514.Available at: https://doi.org/10.1016/j.aap.2020.105514.

Marín, V. I., Carpenter, J. P., & Tur, G. (2021). Pre-service teachers' perceptions of social media data privacy policies. *British Journal of Educational Technology, 52*(2), 519-535.Available at: https://doi.org/10.1111/bjet.13035.

Mayer, V. (2003). Living telenovelas/telenovelizing life: Mexican American girls' identities and transnational telenovelas. *Journal of Communication, 53*(3), 479-495.Available at: https://doi.org/10.1111/j.1460-2466.2003.tb02603.x.

Moon, B. (1995). Paradigms in migration research: Exploring'moorings' as a schema. *Progress in Human Geography, 19*(4), 504-524.Available at: https://doi.org/10.1177/030913259501900404.

Muscanell, N. L., & Guadagno, R. E. (2012). Make new friends or keep the old: Gender and personality differences in social networking use. *Computers in Human Behavior, 28*(1), 107-112.Available at: https://doi.org/10.1016/j.chb.2011.08.016.

O'Brien, W., Adamakis, M., O'Brien, N., Onofre, M., Martins, J., Dania, A., . . . Costa, J. (2020). Implications for European physical education teacher education during the COVID-19 pandemic: A cross-institutional SWOT analysis. *European Journal of Teacher Education, 43*(4), 503-522.Available at: https://doi.org/10.1080/02619768.2020.1823963.

Padilla-Walker, L. M., Nelson, L. J., Carroll, J. S., & Jensen, A. C. (2010). More than a just a game: Video game and internet use during emerging adulthood. *Journal of Youth and Adolescence, 39*(2), 103-113.Available at: https://doi.org/10.1007/s10964-008-9390-8.

Park, J. H. (2010). Differences among university students and faculties in social networking site perception and use *The Electronic Library, 28*(3), 417-431.Available at: https://doi.org/10.1108/02640471011051990.

Preece, S., & Bullingham, R., . . (2020). Gender stereotypes: The impact upon perceived roles and practice of in-service teachers in physical education. *Sport, Education and Society, 27*(3), 1-13.Available at: https://doi.org/10.1080/13573322.2020.1848813.

Prendes, P., Castañeda, L., Gutiérrez, I., & Sánchez, M. M. (2016). Personal learning environments in future professionals: Nor natives or residents, just survivors. *International Journal of Information and Education Technology, 7*(3), 172-178.Available at: https://doi.org/10.18178/ijiet.2017.7.3.861.

Romero-Rodríguez, J.-M., Rodríguez-Jiménez, C., Ramos Navas-Parejo, M., Marín-Marín, J.-A., & Gómez-García, G. (2020). Use of Instagram by pre-service teacher education: Smartphone habits and dependency factors. *International Journal of Environmental Research and Public Health, 17*(11), 1-10.Available at: https://doi.org/10.3390/ijerph17114097

Sato, T., Ellison, D. W., & Tsuda, E. (2019). Study habits and learning experiences of undergraduate students in a physical education major online kinesiology course. *Physical Educator, 76*(2), 440-466.Available at: https://doi.org/10.18666/tpe-2019-v76-i2-8837.

Steinfeld, N. (2016). "I agree to the terms and conditions":(How) do users read privacy policies online? An eye-tracking experiment. *Computers in Human Behavior, 55*, 992-1000.Available at: https://doi.org/10.1016/j.chb.2015.09.038.

Stoicescu, M., & Stănescu, M. (2018). Social media as a learning tool in physical education and sports area. *E-Learning & Software for Education, 3*, 346-353.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Boston, MA: Pearson.

Thomas, L., Orme, E., & Kerrigan, F. (2020). Student loneliness: The role of social media through life transitions. *Computers & Education, 146*, 103754.Available at: https://doi.org/10.1016/j.compedu.2019.103754.

Van den Beemt, A., Akkerman, S., & Simons, P. R.-J. (2011). Patterns of interactive media use among contemporary youth. *Journal of Computer Assisted Learning, 27*(2), 103-118.Available at: https://doi.org/10.1111/j.1365-2729.2010.00384.x.

Varea, V., González-Calvo, G., & García-Monge, A. (2022). Exploring the changes of physical education in the age of Covid-19. *Physical Education and Sport Pedagogy, 27*(1), 32-42.Available at: https://doi.org/10.1080/17408989.2020.1861233.

Walsh, J. L., Fielder, R. L., Carey, K. B., & Carey, M. P. (2013). Female college students' media use and academic outcomes: Results from a longitudinal cohort study. *Emerging Adulthood, 1*(3), 219-232.Available at: https://doi.org/10.1177/2167696813479780.

Warner, R. M. (2013). *Applied statistics: From bivariate through multivariate techniques* (2nd ed.). Thousand Oaks, California: Sage Publications, Inc.

With-Nielsen, N., & Pfister, G. (2011). Gender constructions and negotiations in physical education: Case studies. *Sport, Education and Society, 16*(5), 645-664.Available at: https://doi.org/10.1080/13573322.2011.601145.

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist, 34*(6), 806-838.