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Evaluating Use and Attitudes Towards Social Media and ICT for Portuguese youth: the MTUAS-PY scale

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Abstract

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Measures on usage and attitudes towards ICT and social media are very diverse hindering the comparability of data. Due to its heavy use by young Portuguese, it is relevant to have comprehensive and accurate measurement tools.

The main aims were to translate and adapt The Media and Technology Usage and Attitudes Scale (Rosen, Whaling, Carrier and Rokkum, 2013a) for the young Portuguese and to analyze the psychometric characteristics of the resulting scale: The Media and Technology Usage and Attitudes Scale for Portuguese Youth (MTUAS-PY).

This psychometric study included an EFA conducted on a sample of 322 subjects aged between 12 and 18 years old (Mean age=14.78; SD= 2.04), being 59.3% girls. It also included a CFA on a sample of 479 subjects also aged between 12 and 18 years old (Mean age= 14.94; SD= 2.01), being 53% girls. The subjects were invited to participate voluntarily and the confidentiality of the data was assured.

In EFA, for Usage, the PCA with a varimax rotation originated a solution with 10 factors explaining 73% of the total variance and for Attitudes a PCA forced to four factors with oblimin rotation resulted in 61% of total variation explained. The CFA presented acceptable adjustments to fit indices in Usage and Attitudes sub-scales.

The MTUAS-PY scale has adequate psychometric qualities for assessing use and attitudes towards ICT and social media in Portuguese youth. Studies on different profiles throughout the youth and the comparison with behavioral data will further our understanding on a reality in constant technological change.

Keywords:ICT use, MTUAS-PY, Portuguese, youth, internet.

1. Introduction

1.1. Attitudes and Usage towards Social Media and Information and Communication Technologies

The use of Information and Communication Technologies (ICT) such as the internet and mobile phones has increased dramatically worldwide. According to recent data, around 3,4 billions of people use the internet (source: Internet World Stats, 2015a), with Asia placed in the first place concerning the partial amount of internet users (48,2%) and followed by Europe (18,0%). English is the first language and Portuguese the fifth in the Top Ten Languages in Internet (source: Internet World Stats, 2015b).

If we look at the communication purpose of ICT, a special reference must be made to social networking sites such as Facebook which attract millions of users (Kemp, 2016) and are very popular among young people. Some authors (Mitchell & Ybarra, 2009) consider that they represent a new facet of young people's environments, also giving the opportunity of exploring identities and communicating with friends. The use of instant SMS text messaging is another technology-related domain that has grown quickly and is particularly high among young people (Robertson et al., 2012).

Regarding recent youth ICT usage figures collected in Portugal between 2005 and 2008, almost all boys and girls, from 10 to 15 years old, use computers (97%), internet (93%) and mobile phones (85%). From 2005 to 2008 there was an important increase (74% to 93%) on internet use of subjects belonging to this age range (INE, 2009). Interestingly, even more recent data show that Portuguese youth (16-19 years old) reveal a superior intensity of ICT use when compared to young people of other countries from European Union-EU28 (INE, 2015). A study from Viveiro, Marques, Passadouro & Moleiro (2014) with 638 Portuguese adolescents between 12 and 18 years old (57% girls) showed that all participants were internet users, 82% for more than two years, and that the main purpose of accessing the internet was to socialize. In line of this result, another Portuguese study shows that about 68% of Portuguese adolescents actively use social networks (Microsoft, 2010). Given that adolescents have grown up with ICTs, this generation is often called the Net Generation (Tapscott, 1998, 2009) or digital natives, having different ways of expressing themselves and different learning preferences (Prenksy, 2001, 2011; Wang, Hsu, Campbell, Coster, & Longhurst, 2014). Thus, this is a very interesting group regarding the study of ICT usage.

Considering the importance or impact of information technologies usage in the Portuguese context, a study considers that this usage makes our society more complete and able to evolve, since it contributes to increase people's quality of life, as well as the competitiveness and productivity of enterprises (Gonçalves, Martins, Pereira, Oliveira, & Ferreira, 2012). Portuguese research also demonstrate that positive impact of ICT usage can be found even if we refer to older people (Ferreira, Torres, Mealha, & Veloso, 2015). In fact, results showed that involvement with ICT was related to positive effects on older adults' social behavior and their self-perception of physical and environment facets of quality of life. On the other hand, some harmful consequences resulting from the excessive the Internet use have been referred in Portuguese studies (Pontes, Patrão, & Griffiths, 2014; Pontes, & Griffiths, 2016) as it happened in the international context (Griffiths, 1999, 2000; Griffiths, Kuss, Billieux, & Pontes, 2016; Young, 1996, 2015). In the same direction, one investigation involving more than six hundred Portuguese adolescents (Viveiro, Marques, Passadouro, & Moleiro, 2014) suggested that participants presented high-risk of online behaviors and worrying internet usage patterns, with an important proportion of borderline behaviour use, thus asking for preventive measures. Yet, besides positive impacts of internet use on children's and adolescents' social adjustment, it is possible to

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consider other data that maintains alive the debate about whether ICTs impacts positively or negatively. So, another study (Bonetti, Campbell, & Gilmore, 2010) with 626 participants (10 to 16 years old), aiming to understand the differences in usage of online communication patterns of children and adolescents with and without self-reported loneliness and social anxiety, revealed that subjects who self-reported being lonely communicated online significantly more frequently about personal and intimate topics than did those who did not considered themselves as being lonely. Authors suggest that the internet allows them to fulfil needs of social interactions, self-disclosure, and identity exploration (Bonetti, et al., 2010; Gross, 2004). Thus, from a positive or negative perspective, ICTs represent a clear influence to personal and social daily life, requiring continuous research, once technologies are always and rapidly evolving.

Recent reviews on the field of Psychology of Technology (e.g., Rosen, Cheever, & Carrier, 2015) embrace various issues, such as social networking, internet addiction and dependency, multitasking, and audience reactions to media. Also, recent approaches to ICT use go beyond the more documented study of psychology and the internet, to include diverse analysis of a variety of technologies, such as smart phones, tablet computing, video games, and television, etc.

Among previous international research that includes Portuguese data about children and adolescent's ICT use, the EU Kids Online study must be referred. The EU Kids Online network has been funded by the European Commission's Safer Internet Program in three successive phases of work from 2006 to 2014 (Ólafsson, Livingstone, & Haddon, 2014). Including researchers from 33 countries in Europe and beyond, the main objective was to improve knowledge of children's (under the age of 18 years old) and parents' experiences and practices regarding risky and safer use of the internet and new online technologies. According to recent conclusions from this study, although the amount of research has increased very substantially, certain key research gaps first identified in 2009 continue to deserve attention. Among them, the authors refer: the overwhelming focus on the fixed internet to the neglect of mobile, convergent and emerging technologies; too little knowledge of children's online activities and how they may obtain the benefits. In conclusion, even having conducted a major pan-European survey, the research methods and knowledge of investigators need further improvement. As it was already pointed by other authors (Rosen, et al., 2013a), one of the fields that calls for more investigation is the assessment of ICT usage, since the diversity and insufficiency of outcome measures showed that there are still many open research problems.

1.2. Assessment of media and technology usage

In a previous period, before the easy accessibility to mobile computer technologies, the media and technology usage was usually measured by monitoring time spent in computers activities, playing video games or watching television (e.g., Subrahmanyam, Kraut, Greenfield, & Gross, 2000; Phillips, Rolls, Rouse, & Griffiths, 1995; Stanger, 1998, cit. in Rosen et al., 2013a). The advent of mobile or portable technology, permitting the increased availability of ICTs' activities, has changed the picture and turned more complex to measure with accuracy the hours and minutes that people spend involved in activities in traditional but also in diverse small devices, such as smartphones.

As referred by Rosen et al. (2013a), in present days, four methods for assessing technology usage can be identified. Firstly, as in the initial studies, authors measure time (in hours or minutes) per day or

per usage (e.g., Becker, Alzahabi, & Hopwood, 2012; Rosen, et al., 2013b). Secondly, investigators consider the frequency (number uses) in a particular time period (e.g., Thompson, 2013). Also, studies assess technology usage through attitudinal Likert-type scales, from strongly agree to strongly disagree (e.g., Jenkins-Guarnieri, Wright, & Johnson, 2013). Finally, some authors choose experience sampling, questioning use at a specific point in time (e.g., Moreno, Jelenchick, Koff, & Eikoff, 2012a). Even if the first method is interesting, to measure actual time is a difficult problem. In fact, some studies (Junco, 2013) using monitoring software, showed that self-reported time did not correspond to actual time spent in ICTs' activities, revealing that time estimation by users is not precise.

Given the increase and importance of social media activities, some instruments have been created to measure the usage of some social networking sites, mostly Facebook. In 2007, the appearance of the Facebook Intensity Scale (Ellison, Steinfield, & Lampe, 2007) represented a first attempt that has been improved, demanding Likert-type scale answers, and used in several studies (e.g., Steinfield, Ellison, & Lampe, 2008; Kapidzic, 2013; Lou, Yan, Nickerson, & McMorris, 2012; Tazghini & Siedlecki, 2013; cit. in Rosen et al., 2013). Other forms to measure Facebook use include assessment of Facebook activities and friends (e.g., Deters & Mehl, 2013; Moore & McElroy, 2012), number of times logging per day (e.g., Rosen et al., 2013b) and evaluation of time spent in the site per day (e.g., Karpinski, Kirschner, Ozer, Mellott, & Ochwo, 2013).

A current issue associated with technology usage is multitasking or task switching (Moreno et al., 2012b; Rosen et al., 2013b). Given that in previous research this activity seems to relate to technology usage, it is useful to assess people's attitude toward either completing one task before moving to another or working on one task and then switching to another before its completion.

Taking in account the limitations of the methods above identified and the relevance of certain current issues relating to social media and technology usage, one of the most comprehensive methods for assessing ICT use was recently developed by Rosen et al. (2013a). The new instrument "incorporates prior models for assessing self-reported frequency of media and technology use as well as attitudes toward technology use, rather than relying on inaccurate self-reports of time spent using a variety of technologies" (Rosen et al., 2013a, p. 2502). This tool measures "self-reported frequency of use rather than self-reported time of use"; it doesn't rely only on computer use, including "activities performed on computers as well as those on mobile phones and those on dedicated devices such as televisions, music players, and video game players"; and it includes "attitudinal scales to capture beliefs about the use of technology" (Rosen et al., 2013a, p. 2502). This measurement tool seems to represent an important step to the progress of this research field because of its comprehensiveness in terms of technology domains and evaluation of behaviors and attitudes towards ICT use and social media.

2. Problem statement, research question and purpose of the current study

Measures on using ICT are very diverse (cf. Rosen et al., 2013a) hindering the comparability of data. Also, instruments assessing attitudes towards ICT are rare. Due to ICTs' heavy use by young Portuguese, it is relevant to have comprehensive and appropriate evaluating tools. Given that all adolescents today are digital natives (Prenksy, 2001, 2011) or belong to the Net Generation (Tapscott,

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1998, 2009), the necessity to assess behaviors and attitudes in ICT usage assumes an even more important place in this age range.

The contemporary developments of ICT usage have fueled a popular concern that young internet users are experiencing Internet addiction (Young, 1996, 2015) due to excessive Internet use. In order to measure this type of usage in Portugal and also other activities as internet gaming, two instruments were recently displayed: Portuguese versions of the Internet Addiction Test - IAT (Pontes, Patrão, & Griffiths, 2014) and of the Internet Gaming Disorder Scale-Short-Form - IGDS9-SF (Pontes & Griffiths, 2016). Also recently available is the Portuguese version of the Generalized Problematic Internet Use Scale 2 - GPIUS2 (Assunção & Matos, 2016) relying in the concept of problematic Internet use (PIU), as it is presented in Caplan investigation (Caplan, 2002, 2005, 2010). As in another recent Portuguese study with adolescents (Viveiro, Marques, Passadouro, & Moleiro, 2014), this line of research emphasizes a pathological approach of internet use. Although those instruments embrace important themes of research on ICT usage, relevant aspects such as attitudes towards ICT still cannot be measured within this particular cultural background. In fact, research coordinating Use and Attitudes towards ICT in Portugal has been inexistent or minimal and this may be due to the lack of a psychometrically validated tool to assess these constructs at the same time.

To the authors' knowledge, no study of Usage and Attitudes towards social media and ICT in adolescence, involving in the same measure the two constructs, has ever been carried out in Portugal. The validation of such comprehensive instrument for a Portuguese adolescent sample can represent a potentially major step in advancing this research field in Portugal, also allowing cross-cultural comparisons. So, the main aims of the present study were to present the adaptation of the Media and Technology Usage and Attitudes Scale (Rosen, Whaling, Carrier, Cheever, & Rokkum, 2013a) for the Portuguese youth and to analyze some psychometric characteristics of the resulting scale (Media and Technology Usage and Attitudes Scale for Portuguese Youth, MTUAS-PY. An Exploratory Factor Analysis (EFA) and a Confirmatory Factor Analysis (CFA) were performed in two steps in order to characterize and confirm the factorial structure of the scale (Tabachnick & Fidell, 2013).

3. Research methods

4. 3.1 Participants

Sample 1: The EFA was conducted in a sample that comprised 322 students (58.91% female) between 12-18 years old, with an average of 14.78 years (SD= 2.04), within the 6th grade and the 12th grade. Males (M= 14.62, SD= 2.09) and females (M= 14.72, SD= 2.12) did not differ in age [F(1, 330)= 0.200, p= .655]. Regarding educational level, three levels were considered: 6th grade (second cycle of studies in Portuguese educational system), between 7th and 9th (third cycle of studies) and between 10th and 12th (high school). There were no differences in the frequency of the three educational levels [$\chi^2(2)= 2.168$, p= .338]. The differences between educational groups regarding gender were statistically significant [$\chi^2(2)= 12.945$, p= .002] in high school (75% of girls). In the post hoc procedures for Chi-Square (Sharp, 2015), the number of boys in high school was significantly lower than the number of girls ($p< .05$).

Sample 2: The CFA was computed in a sample of 479 subjects (53% of girls) aged between 12 and

18 years old with an average age of 14.94 (SD= 2.01) within the 6th and 12th grade. Males (M= 14.96, SD= 2.01) and females (M= 14.91, SD= 2.00) did not differ in age [F(1, 478)= 0.065, p= .798] for the three educational levels considered: 6th, between 7th and 9th and between 10th and 12th grade. Differences for gender were also non significant ($\chi^2(1)=1.522$, p=.217). There were differences in the frequency of the three educational levels [$\chi^2(2)= 42.242$, p= .000]. There were no differences between educational groups regarding gender [$\chi^2(2)= 2.658$, p= .265].

3.2 Instrument: MTUAS-PY

The scale MTUAS-PY is a translation and adaptation to Portuguese youth, between 12 and 18 years old, of the Media and Technology Usage and Attitudes Scale (Rosen, Whaling, Carrier & Rokkum, 2013a, MTUAS) originally designed for adults. Regarding the translation process, in a first step the scale was translated to Portuguese. Subsequently, a retroversion was made by a different translator and compared with original version. Finally, the discrepancies were corrected.

The original scale (MTUAS) is a self-report instrument that assesses information technology and social media usage (44 items) as well as attitudes toward technology (16 items) of adults. The first 40 items, regarding technology and media usage, are rated by frequency of use in a 10 point Likert Scale (1= "Never" to 10= "All the time") and items 41 to 44 are assessed with 9 point Likert Scale to evaluate the number of online friendships (1= “0” to 8= “751 or more”). The usage dimension includes 11 sub-scales: Smartphone Usage (9 items), General Social Media Usage (9 items), Internet Searching (4 items), E-Mailing (4 items), Media Sharing (4 items), Text Messaging (4 items), Video Gaming (3 items), Online Friendships (2 items), Facebook Friendships (2 items), Phone Calling (2 items) and TV Viewing (2 items). The items 41 to 44 describe the use of social media, especially Facebook. The attitudes dimension includes four sub-scales: Positive attitudes toward technology (6 items), Anxiety of being without technology or dependence of technology (3 items), Negative attitudes toward technology (3 items) and Preference for task switching (4 items).

In the original study, the authors found Cronbach's alpha values between .97 and .61 for usage sub-scales and .85 and .80 for the attitudes sub-scales. Related to the usage sub-scales, a varimax-rotated factor analysis with a factor loading cutoff of .55 and an eigenvalue of 1.0 originated the 11 factors previously described and the solution with 44 items from the 50 considered originally. Regarding attitudes sub-scales, an orthogonal factor analysis with a varimax rotation resulted in four factors and 16 items (from the initial 18).

3.3 Methodological Procedure

The two samples collection took place in 2016 and the questionnaires were administered individually using paper-and-pencil. The participants and their parents (for underage children) signed an informed consent and were assured that their answers were anonymous and confidential.

3.4 Statistical Procedure

The EFA was used in a sample that comprised 322 students and later a CFA was performed in a sample of 479 subjects. The factors’ extraction was made with a forced Principal Component Analysis (PCA) with oblimin rotation due to the supposed correlation between factors. The statistical

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assumptions to perform the EFA were evaluated: the existence of at least five observations for each variable (in our case, at least 300 observations) (Hair, Black, Babin, and Anderson (2009); communalities for each item above .40 (Field, 2009) and eigenvalues above 1 (Kaiser criterion). We also took into account the Kaiser-Meyer-Olkin (KMO), the Bartlett's Sphericity test. The reliability of the scale was evaluated with Cronbach's alpha. The EFA was conducted with the computer program SPSS (Statistical Package for the Social Sciences – version 22.0 for Windows (SPSS Inc, Chicago, IL).

With the second sample, a CFA was performed using the SPSS Analysis of Moments Structures (AMOS), version 22 for Windows (IMB Corp, Meadville, PA, USA). The objective of the data analysis was the confirmation of the structure suggested by the EFA. Before performing the CFA, the values of kurtosis and the presence of outliers were evaluated. Then modification indexes were analyzed and adjustment indexes were calculated. Marôco (2010) suggests that the fit indexes are acceptable if: $\chi 2/gl$ is]2; 5]; RMSEA is].05; .10] ; and CFI and TLI is [.8; .9[. Factorial validation of the items was analyzed through the standardized values of the loadings ($\lambda \geq 0.5$) and individual reliability ($R^2 \geq .25$) (Marôco, 2010).

5. Findings

4.1 Exploratory Factor Analysis of the structure of the MTUAS-PY scale

4.1.1 The Media Usage sub-scales

The Usage sub-scales of the Media and Technology Usage and Attitudes Scale, Portuguese version for Youth (MTUAS-PY) were studied with a forced Principal Component Analysis (PCA). As the option of the authors of the scale had been to perform an oblimin rotation, with 11 factors, assuming the existence of correlations between the various factors, in a first step, we performed the same analysis. However the PCA with oblimin rotation forced to the 11 factors did not converged, so a varimax rotation was made.

Table 1. Eigenvalues and explained variance of Principal Components Analysis for Usage factors

Component	Eigenvalues	% of Variance	Cumulative %
1	13.319	30.270	30.270
2	4.272	9.709	39.979
3	3.729	8.475	48.453
4	2.125	4.830	53.283
5	1.759	3.998	57.282
6	1.664	3.783	61.064
7	1.456	3.309	64.373
8	1.401	3.185	67.558
9	1.198	2.722	70.281
10	1.111	2.524	72.805

The KMO was .889 and Bartlett's test of sphericity was significant ($\chi^2(946)= 11008.81$; $p< .000$), indicating that the sample and correlation matrix were adequate for factorization. Communalities ranged between .49 and .87 with an average of .75.

In this study only ten factors obtained eigenvalues greater than 1 with a total explained variance was 73% (Table 1).

Table 2. Items loadings for the Media Usage factors

	Media Usage factors									
Items	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
1. Click "Like" to a social media posting, photo, etc.	.936									
2. Read social media postings	.909									
3. Browse social media profiles and photos	.897									
4. Check Facebook page or other social networks	.847									
5. Comment on social media postings, status updates, photos, etc.	.843									
6. Check Facebook page from smartphone	.793									
7. Post social media status updates	.731									
8. Check Facebook at work or school	.696									
9. Post social media photos	.691									
10. Friends you have on Facebook	.624									
11. Facebook friends you know in person	.482									
12. Check your personal e-mail		.942								
13. Send or receive files via e-mail		.908								
14. Check your work or school e-mail		.904								
15. Send, receive and read e-mails (not including spam or junk mail)		.903								
16. Read e-mail on a mobile phone		.664								
17. Download media files from other people on a computer			.716							
18. Watch video clips on a computer			.692							
19. Watch TV shows, movies, etc. on a computer			.668							
20. Search the Internet for information on any device			.635							
21. Share your own media files on a computer			.630							
22. Search the Internet for news on any device			.480							
23. Send and receive text messages on a mobile phone				-.727						
24. Use apps (for any purpose) on a mobile phone				-.717						
25. Browse the web on a mobile phone				-.687						
26. Check for text messages on a mobile phone				-.573						
27. Listen to music on a mobile phone				-.529						
R Use your mobile phone during class or work time				-.304						
28. Record video on a mobile phone					.753					
29. Take pictures using a mobile phone					.635					
30. Play games on a computer, video game console or smartphone with other people in the same room						.891				
31 Play games on a computer, video game console or smartphone by yourself						.824				
32. Play games on a computer, video game console or smartphone with other people online						.784				
33. Check the news on a mobile phone							.700			
34. Get directions or use GPS on a mobile phone							.700			
35. Search for information with a mobile phone							.567			
R Check for voice calls on a mobile phone							.367			
36. Watch TV shows, movies, etc. on a TV set								.850		
37. Watch video clips on a TV set								.846		
38. Search the Internet for videos on any device									-.496	
39. Search the Internet for images or photos on any device									-.468	
R Make and receive mobile phone calls									.399	

40. Number of people you regularly interact with online that you have never met in person	.831
41 People have you met online that you have never met in person (8)	.782

Items name preceded by **R** were removed due to factor loading<.40. Factor's designation: Factor 1: Facebook usage; Factor 2: E-mailing; Factor 3: Media sharing/Internet searching; Factor 4: Smartphone usage; Factor 5: Picture and video recording; Factor 6: Video gaming; Factor 7: Information searching; Factor 8: Watching TV; Factor 9: Media searching; Factor 10: Online friendship.

Table 3. Factor number and name, number of items, % of variance explained, items in MTUAS-PY and in MTUAS original factors (Rosen, et al., 2013a)

Factorial structure of MTUAS-PY (Portuguese version)	Items	Original factors (Rosen, et al., 2013a)
F1: Facebook usage (11 items, 30%)	1 - 9	General social media usage
	10, 11	Social media friendships
F2: E-mailing (5 items, 10%)	12-15	E-mailing
	16	Smartphone usage
F3: Media sharing and internet searching (6 items, 8%)	17-19, 21	Media sharing
	20, 22	Internet searching
F4: Smartphone usage (5 items, 5%)	23, 26	Text messaging
	24, 25, 27	Smartphone usage
F5: Picture and video recording (2 items, 4%)	28 - 29	Smartphone usage
F6: Video gaming (3 items, 4%)	30 - 32	Video gaming
F7: Information searching (3 items, 3%)	33 - 35	Smartphone usage
F8: Television viewing (2 items, 3%)	36 - 37	Television viewing
F9: Media searching (2 items, 3%)	38 - 39	Internet searching
F10: Online friendship (2 items, 3%)	40 - 41	Online friendships

The 10 factors structure was interpretable. Using a factor loading cut-off of .40 (Stevens, 1992) a total of 41 items emerged and three items were removed (Table 2).

Comparing the item distribution between MTUAS-PY and MTUAS original study (Rosen, et al., 2013a) data showed that, for the majority of the factors, the content was very similar (e.g., F6, F8 and F10). For some factors, there was a reorganization of items and a broadening of the content (e.g., F1-Facebook usage includes general social media use and social media friendships) (Table 3).

Table 4. Cronbach's alfa, and descriptive data for Usage sub-scales by factor

Factor	Cronbach's alpha	Min.	Max.	M	SD	Standardized Skewness	Standardized Kurtosis
F1: Facebook usage	.952	1.00	9.73	5.72	2.37	-5.02	-1.29
F2: E-mailing	.923	1.00	10.00	4.26	2.08	2.13	-2.40
F3: Media sharing and internet searching	.805	1.00	10.00	4.91	1.81	1.74	-1.05
F4: Smartphone usage	.824	1.80	10.00	7.67	1.83	-5.28	-.46
F5: Picture and video recording	.587[a]	1.00	10.00	4.15	1.68	2.81	-1.23
F6: Video gaming	.810	1.00	10.00	4.55	2.48	3.35	-2.03
F7: Information searching	.672	1.00	10.00	3.75	1.86	1.40	-2.44
F8: Television viewing	.539[a]	1.00	10.00	5.06	2.07	2.93	-.73
F9: Media searching	.774 [a]	1.00	10.00	5.72	2.14	1.28	-1.21
F10: Online friendship	.625 [a]	1.00	9.00	2.37	1.70	9.17	1.84

[a] Correlations between two items.

Regarding Cronbach's alpha, values were above the critical value of .70 (Nunnally, 1978) for the F1, F2, F3, F4, and F6. The lowest value was found for F7 (.672). Concerning the factors with two items, an inter-item correlation was computed. The factors F5, F8, F9, and F10 obtained correlations between .539 and .774 (Table 4).

Highest mean values were found for Smartphone usage (M= 7.70, SD= 1.83), Facebook usage (M= 5.72, SD= 2.37) and television viewing (M= 5.06, SD= 2.07). Lowest values were found for online friendship (M= 2.37, DP= 1.70) and information searching (M= 3.75, SD= 1.86).

Table 5. Correlations between factors for the Usage sub-scale

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
F1	1									
F2	.307**	1								
F3	.431**	.433**	1							
F4	.526**	.258**	.426**	1						
F5	.347**	.667**	.471**	.397**	1					
F6	.168**	-.111*	.239**	.257**	.056	1				
F7	.346**	.481**	.501**	.421**	.467**	.008	1			
F8	.144**	.084	.332**	.257**	.087	.173**	.217**	1		
F9	.355**	.241**	.601**	.459**	.310**	.295**	.318**	.340**	1	
F10	.448**	.214**	.279**	.224**	.288**	.204**	.169**	-.003	.194**	1

*p< .05; **p< .01.

Corrected correlations (without the item) between item and factor were also computed. In Factor 1 values varied between .493 and .897; for Factor 2 they ranged between .680 and .869; for Factor 3 they were between .493 and .897; in Factor 4 they ranged between .487 and .663; in Factor 6 values varied from .629 to .721 and in Factor 7 they were between .380 and .563.

Correlations between factors of MTUAS-PY Usage sub-scale presented a maximum value of .667 (p< .01) for Factor 5 (Picture and video recording) and Factor 2 (E-mailing). The lowest value (.111, p< .05) was found in the association between Factor 2 and Factor 6 (Video gaming) (Table 5).

4.1.2 The Attitudes sub-scales

The MTUAS-PY includes sub-scales about use and attitudes towards social media and ICT. After describing data regarding the use, we present psychometric information about attitudes sub-scales.

The 16 items of the attitudes sub-scales of MTUAS-PY were analyzed with an PCA forced to four factors with oblimin rotation, as was performed the author's scale. The KMO was .782 and Bartlett's test of sphericity was significant ($\chi^2(120)= 1813.02$, p< .000), which indicated that the sample and the correlation matrix were adequate to factorization.

Considering a factor loading cut-off of .40 and an eigenvalue of 1, four factors emerged in a total of 15 items and one item was removed (Table 6).

Table 6. Eigenvalues and explained variance of Principal Components Analysis for attitude factors

Component	Eigenvalues	% of Variance	Cumulative %
1	4,074	25,461	25,461
2	2,359	14,741	40,203
3	1,967	12,292	52,495
4	1,349	8,428	60,923

The 4 factors of the attitudes scale explained 61% of the variance. Factors included anxiety and dependence (6 items, 25% of the variance), preference for task switching (3 items, 15%), positive attitudes (3 items, 12%) and negative attitudes (3 items, 8%) (Table 6).

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Table 7. Items loadings for Attitudes factors

	Media attitude factors			
Items	F1	F2	F3	F4
I get anxious when I don't have the Internet available to me	.792			
I am dependent on my technology	.774			
I get anxious when I don't have my cell phone	.758			
I feel that I get more accomplished because of technology	.755			
With technology anything is possible	.669			
Technology will provide solutions to many of our problems	.612			
When doing a number of assignments, I like to switch back and forth between them rather than do one at a time		.848		
I prefer to work on several projects in a day, rather than completing one project and then switching to another		.828		
I like to finish one task completely before focusing on anything else		-.761		
R When I have a task to complete, I like to break it up by switching to other tasks intermittently		.311		
I feel it is important to be able to access the Internet any time I want			.803	
I feel it is important to be able to find any information whenever I want online			.723	
I think it is important to keep up with the latest trends in technology			.647	
New technology makes people waste too much time				.825
New technology makes people more isolated				.810
New technology makes life more complicated				.686

Item preceded by **R** was removed due to factor loading< .40. Factor's name: Factor 1: Anxiety/dependence; Factor 2: Preference for task switching; Factor 3: Positive attitude; Factor 4: Negative attitude.

The distribution of items in the factors for Attitudes sub-scales in the MTUAS-PY has some similarity to the one of the original study (Rosen, et al., 2013a) but Factor 1 received three additional items from Factor 3 (positive attitude) (Table 7).

Table 8. Cronbach's alpha and descriptive data for attitudes subscales by factor

Factors	Cronbach's Alpha	Min.	Max.	M	SD	Standardized Skewness	Standardized Kurtosis
F1: Anxiety and dependence	.843	1.17	5.00	3.41	0.80	-1.03	-1.93
F2: Preference for task switching	.770	1.00	5.00	2.42	0.85	1.36	-3.76
F3: Positive attitude	.678	1.00	5.00	4.25	0.57	-1.49	-2.86
F4: Negative attitude	.698	1.00	5.00	3.11	0.82	0.37	-1.48

Cronbach's alpha values were above .70 for anxiety/dependence (.843) and preference for task switching (.770), but marginally below for positive attitude (.678) and negative attitude (.698). Higher mean values were found for positive attitude (M= 4.25, SD= .57) and the lowest were for negative attitude (M= 3.11, SD= .82) (Table 8).Table 9. Correlations between factors for attitude sub-scales

Table 9. Correlations between factors for attitude sub-scales

	F1	F2	F3	F4
F1	1			
F2	.167**	1		
F3	.391**	.014	1	
F4	-.032	.001	-.132*	1

*p<.05; **p<01.

Corrected correlations between each item and the factor were calculated. For Factor 1 (Anxiety/dependence) the values were between .524 and .723; for Factor 2 (Preference for task switching) values ranged from .514 to .670; for Factor 3 (Positive attitude) values were between .438 and .566 and, finally, for Factor 4 (Negative attitude) values ranged from .443 to .561.

Correlations between the factors of attitudes sub-scales of MTUAS-PY had low values. The highest value (.391, p< .01) was between Factor 3 (Positive attitude) and Factor 1 (Anxiety/dependence) and the lowest was between Factor 4 (Negative attitude) and Factor 3 (Positive attitude) (-.132, p< .05) (Table 9).

4.2 Confirmatory Factorial Analysis of the structure of the MTUAS-PY scale

4.2.1 The Media Usage sub-scales

Items 10 and 44 obtained very high flatness values, resulting in Mardia's estimate of normalized kurtosis values of 38.70 and 30.53. We chose to keep these items because they belong to factors with only two items and also because of the large sample size. Model 1 presented χ^2/gl= 4.69; RMSEA= .088 for IC_{90}= .085-.091, CFI= .813 and TLI= .790.

Fourteen subjects with Mahalanobis distance outlier values (d^2) greater than 90 were identified. These subjects were excluded from the analysis in model 2. This exclusion had no impact on the adjustment rates. Therefore, the modification indexes were studied. They were high between the errors of the items 21 and 22 (183.68); 41 and 42 (155.66); 32 and 33 (154.59); 5 and 7 (150.26); and 35 and 36 (114.27). Because the items belonged to the same factors they were correlated.

Table 10. Item loading, standard error, standardized loading and R2 for Usage sub-scales of MTUAS-PY

Items	Factor	Loading	Std. Err.	Std. Loading	R^2
Check your Facebook page or other social networks	F1	1.000	-	.857	.697
Check your Facebook page from your smartphone	F1	1.084	.029	.835	.734
Check Facebook at work or school	F1	1.105	.050	.800	.766
Post status updates	F1	.925	.045	.765	.833
Post photos	F1	.837	.042	.748	.833
Browse profiles and photos	F1	1.082	.038	.913	.560
Read postings	F1	1.101	.039	.913	.586
Comment on postings, status updates, photos, etc	F1	1.065	.041	.875	.640
Click "Like" to a posting, photo, etc.	F1	1.108	.039	.916	.538
How many friends do you have on Facebook?	F1	.724	.044	.653	.714
How many of your Facebook friends do you know in person?	F1	.362	.040	.396	.708
Send, receive and read e-mails (not including spam or junk mail)	F2	1.000	-	.836	.803
Check your personal e-mail	F2	1.057	.043	.896	.698
Check your work or school e-mail	F2	1.037	.046	.842	.157
Send or receive files via e-mail	F2	.984	.044	.845	.426
Read e-mail on a mobile phone	F2	1.014	.055	.733	.839
Watch TV shows, movies, etc. on a computer	F3	1.000	-	.502	.252
Watch video clips on a computer	F3	.986	.069	.514	.264
Share your own media files on a computer	F3	1.004	.119	.502	.252
Search the Internet for news on any device	F3	1.575	.144	.806	.649
Search the Internet for information on any device	F3	1.652	.146	.882	.777
Use apps (for any purpose) on a mobile phone	F4	1.000	-	.774	.599
Listen to music on a mobile phone	F4	.865	.055	.718	.516
Browse the web on a mobile phone	F4	1.182	.062	.860	.739
Check for text messages on a mobile phone	F4	.751	.056	.620	.384
Send and receive text messages on a mobile phone	F4	.801	.057	.651	.424
Record video on a mobile phone	F5	1.000	-	.650	.423
Take pictures using a mobile phone	F5	1.426	.123	.887	.786
Play games on a computer, video game console or smartphone with other people online	F6	1.000	-	.738	.545
Play games on a computer, video game console or smartphone with other people in the same room	F6	1.022	.070	.823	.677
Play games on a computer, video game console or smartphone by yourself	F6	.913	.064	.739	.547
Search for information with a mobile phone	F7	1.000	-	.850	.722
Check the news on a mobile phone	F7	.813	.052	.705	.498
Get directions or use GPS on a mobile phone	F7	.256	.033	.370	.137

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Watch video clips on a TV set	F8	1.000	-	.899	.809
Watch TV shows, movies, etc. on a TV set	F8	.633	.075	.655	.430
Search the Internet for images or photos on any device	F9	1.000	-	.876	.768
Search the Internet for videos on any device	F9	.930	.045	.831	.690
How many people do you regularly interact with online that you have never met in person?	F10	1.000	-	.730	.534
How many people have you met online that you have never met in person?	F10	1.621	.183	.839	.704

Model 2 obtained acceptable adjustments for fit indices: χ^2/gl= 3.44; RMSEA= .071, IC_{90}= .068-.075; CFI= .877 and TLI= .861. Standardized loadings ranged from .37 to .92 and individual reliabilities between .14 and .84. Two items showed standardized low loadings: Get directions or use GPS on a mobile phone (Factor 7) and How many of your Facebook friends do you know in person? (Factor 1). Five items obtained low values for R^2 (< .25): Check your work or school e-mail (Factor 2); Watch TV shows, movies, etc. on a computer, Watch video clips on a computer and Share your own media files on a computer (Factor 3) and Get directions or use GPS on a mobile phone (Factor 7) (Table 10).

The items with low loadings were retained to maintain the similarity to the structure of the original scale and due to the reduced number of item by factor.

4.2.1 AFC of MTUAS-PY attitudes sub-scales

The absolute values of kurtosis ranged between .110 and 2.39. Items 45 and 46 exceeded the Mardia's CR with 10.69 and 10.33. Multivariate kurtosis was high, but we continued with the calculations because of the large sample size. There were no multivariate outliers. The model obtained an acceptable fit (χ^2/gl= 4.34; RMSEA= .084, IC_{90}= .075-.092; CFI= .877 and TLI= .847).

Table 11. Item loading, standard error, standardized loading and R2 for Attitudes sub-scales of MTUAS-PY

Item	Factor	Loading	Std. Err.	Std. Loading	R^2
I get anxious when I don't have my cell phone	F1	1.000	-	.773	.597
I get anxious when I don't have the Internet available to me	F1	1.052	.056	.868	.753
I am dependent on my technology	F1	.880	.055	.735	.541
Technology will provide solutions to many of our problems	F1	.459	.043	.503	.253
With technology anything is possible	F1	.576	.052	.518	.268
I feel that I get more accomplished because of technology	F1	.634	.049	.606	.368
I prefer to work on several projects in a day, rather than completing one project and then switching to another	F2	1.000	-	.749	.560
When doing a number of assignments, I like to switch back and forth between them rather than do one at a time	F2	1.251	.093	.899	.809
I like to finish one task completely before focusing on anything else	F2	-.738	.061	-.588	.346
I feel it is important to be able to find any information whenever I want online	F3	1.000		.511	.261
I feel it is important to be able to access the Internet any time I want	F3	1.562	.178	.737	.543
I think it is important to keep up with the latest trends in technology	F3	1.681	.192	.705	.497
New technology makes people waste too much time	F4	1.000	-	.694	.481
New technology makes life more complicated	F4	.616	.083	.464	.215
New technology makes people more isolated	F4	1.096	.148	.739	.547

On the attitudes sub-scales of MTUAS-PY, standardized loadings ranged from -.50 to .90 and the individual reliabilities between .22 and .81. Values for R^2 lower than .25 were found only for one item: New technology makes life more complicated (Factor 4) (Table 11). However, this item was retained due to the reduced number of items of the factor, only three.

Conclusions

ICT and social usage has increased worldwide in the last decades. As that this use has important implications in individual and social terms, accurate evaluations are required. However, measures on this domain are very diverse hindering the comparability of data and neglect the measurement of attitudes. Furthermore, in the Portuguese context the available instruments emphasize the problematic internet use. The current study could fill these gaps as it adapts a comprehensive instrument that covers several domains of the ICT technologies and evaluates, at the same time, youth frequency of usage, positive and negative attitudes, anxiety/dependency and preference for multitasking. The present research also allows cross-cultural comparisons.

The MTUAS-PY for Portuguese youth is an adaptation from a scale originally conceived for adults. The study of the MTUAS-PY scale included an EFA (performed with 322 subjects, 60% of girls) and a CFA (with 479 subjects, 53% of girls) with subjects from the 6th to the 12th grade and aged between 12 and 18 years old. Other psychometric characteristics were also studied, like internal consistency, namely Cronbach's alpha, and item-total correlations, and inter-factor correlations.

An EFA suggested that a solution with 10 factors and 41 items was acceptable for the Usage sub-scales. The number of factors of the Usage sub-scales was similar to the original study (Rosen, et al., 2013a) but the *phone calling* factor disappeared in our sample. For the younger people it seems that the basic function of this device, to do phone calls, nowadays is in extinction. The item distribution was also different and three items were suppressed due to a factor loading< .40. Interestingly, the smartphone usage items were pulverized into four factors (E-mailing, Smartphone usage, Picture and video recording, and Information searching), suggesting that adolescents associate the use of smartphone with these activities, using it as a convergent device.

In the Attitudes sub-scales, the results supported a four-factor structure with 15 items. The allocation of items replicated the structure obtained by the authors scale regarding to the factors preference for task switching and negative attitude but it was different in the factors anxiety and dependence, and positive attitudes.

A CFA was also performed. For the Usage sub-scales acceptable adjustments fit indices were obtained and standardized loadings were acceptable for 39 items. The individual reliabilities were adequate for 36 items. In the Attitudes sub-scales an acceptable fit was obtained and to 14 items the standardized values of the loadings and individual reliability were acceptable. The most problematic items, in the CFA, were not removed to maintain the similarity to the structure of the original scale and due to the reduced number of item by factor.

Regarding descriptive data, we found that among adolescents, Smartphone usage was the most frequent ICT activity reported and, contrary to what was expected, on line friendship was the less frequent one. Among adults, Rose et al (2013a) found a similar pattern. Adolescents also clearly demonstrated clearly a favorable attitude towards ICT. The same happened with adults. However, the lowest mean values for youngsters were in multitasking and among adults were in anxiety/dependence.

The MTUAS-PY revealed good internal consistency regarding Cronbach's alpha (values were above .70 for all the factors but one), and inter-correlation values factors with two items, for the Usage sub-scale. In what concerns the Attitudes sub-scale, the Cronbach's alphas were above or marginally

below .70. Corrected correlations items-factor, in Usage and Attitudes, were are all above .30, as suggested by Field (2009).

Correlations between factors revealed different patterns of associations. Those who used more frequently emailing tended also to take pictures and record videos (the strongest association found). Interestingly, video gaming showed a low association with emailing (the lowest found) and in general with other dimensions of use. We can hypothesize that Video gaming implies an intense and prolonged focus, difficult to conciliate with other ICT activities. Identifying profiles of use associated with other variables, such as socio-demographic ones (e.g., gender, age, education) and characterizing groups, like internet addicts and smartphone users, should be performed in future studies, with adolescents. Recently, in a sample of Portuguese adolescents, we characterized the adolescents that showed high, moderate and low internet anxiety/dependency levels considering several dimensions of ICT usage and attitudes (Matos, Costa, Pinheiro, Salvador, Luz-Dias & Zenha-Rela, 2016). For the Attitudes sub-scales correlations between factors were low.

The present study comprises large samples, for EFA and CFA, with more girls than boys. Future researches should use more balanced samples regarding gender, analyze other psychometric characteristics, such as concurrent validity, and replicate the factorial structure of the scale.

The validation of the MTUAS-PY in an adolescent sample represents a major step in research in Portugal. A comprehensive instrument that measures both ICT usage and attitudes will be available for researchers to study several domains in new technologies.

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