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PORTO

DIGITAL MEDIA USE AND IMPACT QUESTIONNAIRE: CONTRIBUTIONS TOWARDS ITS DEVELOPMENT

Dissertação apresentada à Universidade Católica Portuguesa

para obtenção do grau de mestre em Psicologia

- Especialização em Psicologia Clínica e da Saúde-

Carla Sofia Fernandes Martins

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Trabalho efetuado sob a orientação de

Prof.ª Doutora Luísa Campos e Prof.ª Doutora Lurdes Veríssimo

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Abstract

The present study is part of the Media Activity and Mental Health project and aimed to contribute to the development of the Digital Media Use and Impact questionnaire (DMUIq). The three specific aims were: 1) to characterise the use of digital media (DM) in a sample of Portuguese adolescents; 2) to contribute to the development of the Portuguese version of the Media Multitasking Scale (MMS); and 3) to study the psychometric properties of the DMUIq. This study involved a sample of 171 youths aged between 11 and 16 (*M* age = 13.67; *SD*= 1.07), from two schools in the north of Portugal. Results demonstrated that youths spent more hours on (DM) on a typical weekend day than on a typical weekday, social media was the activity most performed on a typical weekday. The Portuguese version of the MMS demonstrated being a reliable and consistent instrument to investigate how youths use DM. The experimental version of DMUIq also demonstrated being a practical, valid, and reliable screening tool to assess the impact that DM has upon youths.

Keywords: Digital media use; media multitasking; psychometric characteristics; youths.

Resumo

O presente estudo faz parte do projeto "Media Activity and Mental Health" e teve como objetivo contribuir para o desenvolvimento do *Digital Media Use and Impact questionnaire* (DMUIq). Os três objetivos específicos foram: 1) caracterizar a utilização de meios de comunicação eletrónicos (MCE) numa amostra de adolescentes portugueses; 2) contribuir para o desenvolvimento da versão portuguesa da *Media Multitasking Scale* (MMS); e 3) estudar as propriedades psicométricas do DMUIq. Este estudo envolveu uma amostra de 171 jovens com idades compreendidas entre os 11 e os 16 anos (idade $M = 13,67$; $DP= 1,07$), de duas escolas do norte de Portugal. Os resultados demonstraram que os jovens passam mais horas nos MCE num dia típico de fim de semana comparado a um dia típico de semana, a rede social foi a atividade mais realizada num dia típico de semana. A versão em português do MMS demonstrou ser um instrumento confiável e consistente para investigar como os jovens usam os MCE. A versão experimental do DMUIq também demonstrou ser uma ferramenta de *screening* prática, válida e confiável para avaliar o impacto que os MCE têm sobre os jovens.

Palavras-chave: Uso de meios de comunicação eletrónicos; *media multitasking*; características psicométricas; jovens.

List of acronyms

DM- Digital Media

DMUIq- Digital Media Use and Impact questionnaire

MMS- Media Multitasking Scale

MAM- Multitasking Across Media

MMNM- Multitasking with a Media and a Non-Media

CWM- Concentration Without Media

Table Index

1.   Introduction

1.1. Digital Media Use

The 21st century has been a pivotal period in catalysing the development of technology which has triggered globalisation and communication between countries, this being very important in society today (e.g., Castro, 2006). In more recent years with these advancements in technology, there has been a marked increase in the use of digital media (DM), significantly influenced by the COVID-19 pandemic as media became a vital asset to an individual's life (e.g., Wang et al., 2020). This increase in DM is one of the most notorious in school-age students, the COVID-19 pandemic contributed to a more diverse utilisation of DM, including the implementation of online learning as a teaching technique, subsequently increasing youths' exposure to DM (e.g., Blažević & Klein, 2022).

The study of DM and the DM use and its literature should be carried out with caution. The analysis of the literature on this topic is complex by the variability of definitions related to DM, this is what is considered DM and, consequently, what is called "DM use". Literature does not define "DM use" in a standardised way as some authors refer to DM use as screentime, whilst others refer to DM as smartphone use, internet, or applications. What is meant by DM and the use of DM is changing over time. In this research, we consider that DM incorporates, for instance, screentime, the internet, smartwatches, smartphones, and applications.

DM is an essential tool for communication and makes use of various devices such as televisions, tablets, mobile phones, and smart watches (Mascheroni & Holloway, 2017). According to Livingston and Border (2004), DM is also a vital source of both entertainment and learning, and therefore can contribute to a change in individuals' emotions, thoughts, and behaviour as a mean of socialisation. Pereira and Silva (2009), at the beginning of the 21st century, described telephones, television and the internet as being the most essential devices for communication. A decade later, Ponte and Batista (2019) developed a study focused on the use of DM by youths. 1974 Portuguese youths were involved, equally distributed by gender, and aged between 9 and 17 years old (62% of the sample consisted of 13 to 17-year-olds). The results indicated that smartphones are the DM device most utilised everyday (87%), followed by the computer (41%) and then the tablet (25%), highlighting the role DM has on youths' daily routines. To our

knowledge, there is not recent literature focusing on DM use amongst the Portuguese population after the COVID-19 pandemic.

The use of DM amongst the youth is widespread as well as regular, for instance (before the COVID-19 pandemic) in technologically advanced countries such as the United Kingdom approximately 99% of 12-to-15-year-olds have access to DM on average around 20 hours per week demonstrated by statistics as being double the rate of ten years ago (Ofcom, 2019). Similarly, research conducted after the COVID-19 pandemic in Denmark indicated that 15 to 24-year-olds make use of the internet on their mobile phone roughly around 316 minutes per week (Brautsch et al., 2022). In addition, youths have begun to use DM at an even younger age, evidence demonstrates that in 1970 they began watching television regularly at the age of four, although currently there are babies as young as four months old beginning to use such digital devices (Geurts et al., 2022).

Research into children´s screen time and problematic media use, perceived by the parents, before and during the COVID-19 pandemic was conducted by Eales et al. (2021), in the United States, focusing on children between the ages of 2-13 years. Results demonstrated a significant increase in screen media use during the pandemic compared to previously, suggesting that the COVID-19 period influenced this use alongside other factors such as online learning (Eales et al., 2021).

1.1.1. *DM use and sociodemographic characteristics*

Regarding the study of differences in use and sociodemographic characteristics. Regarding age groups, there are marked differences in DM use, for instance youths exhibit greater use of DM in comparison to other age groups. On one hand, Smahel et al. (2020) concluded that 14- to 16-year-olds report spending double the time on DM devices on a wider range of online activities when compared to 9- to 10-year-olds. Additionally, this supports the evidence reached by Ponte and Batista (2019), in Portugal, who found that younger children between the age of 9 and 10, on average, use the internet two hours a day, whilst youths between the age of 15 and 17 spent an average of four hours a day on DM (prior to the COVID-19 pandemic). To our knowledge, there are relatively fewer studies aimed at the DM use amid youths (Domoff et al., 2020), even though the notion of DM for instance, via the internet, starts early childhood (Holloway et al., 2013), since they are actively using the internet both for academic purposes and for social interaction, gaming and entertainment (Wu et al., 2021).

In respect to gender differences, literature has indicated that females seem to be more inclined to problematic smartphone use compared to males (e.g., Busch & McCarthy, 2021; De-SolaGutiérrez et al., 2016). Earlier studies proposed that females are more prone to use communication tools as well as social interaction applications, whereas males are more probable to use gaming applications, watch videos, as well as to listen to music (e.g., Chen et al., 2017; De-Sola Gutiérrez et al., 2016).

1.1.2. Media Multitasking: a type of DM use

The rapid technological developments seen in the 21st century have enabled people to adopt a more modern life meaning that there is an increase in distractions an individual encounters through multitasking, since individuals are engaging in more than one DM at a time (Oviedo et al., 2015).

Media multitasking can be considered as a type of DM use, which is characterised by the utilisation of more than one DM at the same time for instance, connecting to websites such as Facebook, Twitter and Instagram whilst also focusing on other activities (Junco, 2015; Rideout et al., 2010). The notion of media multitasking is the highest amongst the youth due to the easy access they have to computers, smartphones, and tablets (Mohammed et al., 2021). Numerous school children believe that multitasking enhances their abilities to carry out various tasks efficiently both in the classroom or outside of the classroom environment (Carrier et al., 2015). Moreover, students engage in media multitasking as it can be seen as a method which saves time (Dindar & Akbulut, 2016), for instance they can engage in learning and listening to music or texting at the same time (Chang, 2017). Despite multitasking not being a recent phenomenon, the frequency by which youth actively multitask has increased substantially due to the popularity of DM, contributing to a greater use amongst the youth (Wood & Zivcakova, 2015).

Media multitasking can be distinguished into two types. The first type of media multitasking encompasses the simultaneous use of two distinct types of media (for instance watching the television and using a smartphone at the same time) or engaging in various activities on one DM such as using the laptop to watch movies and do online shopping (Yeykelis et al., 2014). Furthermore, the second type of media multitasking includes the use of DM whilst participating in non-media activities. For instance, doing homework on a DM and having face-to-face interactions, this type of multitasking is most common amongst youths and young adults due to academic activities. Approximately 31% of youths between the ages of 8 and 18 stated they

engage in multitasking ''most of the time'' whilst studying (Rideout et al., 2010). Current literature in the domain of media multitasking demonstrates that whilst using DM devices, individuals also tend to listen to music, watch videos, socialise with their family and friends, as well as spend time on social networks demonstrating the ability to multitask (Ponte & Batista, 2019; Matos & Equipa Aventura Social, 2018). Rideout et al. (2010) researched into the notion of multitasking whereby they concluded that young individuals between the ages of 8 to 18 years spend roughly 29% of the time on DM multitasking compared to 10 years ago, which was only 16% highlighting the significant increase of DM multitasking amongst the youth. The studies aforementioned investigated media multitasking prior to the COVID-19 pandemic and it is important to acknowledge that this type of multitasking differs after the COVID-19 pandemic.

1.2. Impact of Digital Media Use

Over the years, research has focused on both the negative and positive of impact of digital media use, and different dimensions – physical, social, and psychological well-being.

Regarding *physical well-being impact*, research has focused, for example, on the study of the relationship between sleep and the DM use, showing both negative and positive results. In a study developed by Burnell et al. (2022) both social media and other internet-based devices are a prevalent asset in current society by which the greatest users are the youth, 60% of which reveal using screens within an hour before bedtime. Research demonstrates that individuals who spend more time on DM had a shorter sleep duration increased sleep onset latency as well as excessive sleepiness or insomnia concluding that the use of screen media was likewise associated with clinically related sleep problems (Hisler et al., 2020). Nonetheless, over the coming years numerous sleep exercises or therapy strategies have been developed, consisting of several cognitive behavioural therapies for insomnia CBT-I-based interventions provide support for children to calm down and thus decreases night-related anxieties and other potential complications hindering them to fall asleep (e.g., Schlarb et al., 2021). However, these interventions are not easily accessible face-to-face hence online treatments are very useful for parents as they are time-saving and easy to access and have been shown to be as effective as in-person treatment for parents of young children (Schlarb et al., 2021).

Another area that researchers have focused on is the relationship between DM use and sedentary behaviour. Literature demonstrates that this use can contribute towards the development of

unhealthy behaviours as cross-sectional studies reveal that sedentary behaviour, mostly measured as screen time and mainly watching television, is associated with unhealthy dietary behaviours across all ages (Pearson & Biddle, 2011). For instance, Tsitsika et al. (2016) conducted a cross-sectional school-based questionnaire amongst 10, 287 14- to 17-year-olds in seven different European countries (Germany, Greece, Iceland, the Netherlands, Poland, Romania, and Spain). Results demonstrated an association of being overweight with problematic internet use (Tsitsika et al., 2016) highlighting once again how important it is to investigate the impact of DM use. Nevertheless, DM use can contribute towards healthy behaviours instead of sedentary behaviours, authors have investigated the domain of physical activity as the developments of exercising apps have played an active role in the lifestyle of numerous individuals. For instance, a meta-analysis revealed that e-health interventions have a significant impact on increasing the physical activity of individuals, more precisely the total physical activity, moderate to vigorous physical activity and light physical (Peng et al., 2022). This reinforces the notion that DM contributes to a positive change in individuals' lifestyle as evidence over the recent years show many health and fitness apps promoting a more active and healthier lifestyle (Wong et al., 2020)

Regarding *interpersonal relationships*, DM use can have both a positive and negative impact. Research into the impact DM has on interpersonal is divided since evidence suggests that smartphones facilitate interpersonal relationships at a distance and thus, is an asset, yet some authors argue that the uncontrolled use of smartphones by adolescents contributes to a reduced face-to-face communication (Deol & Meenakshi, 2021). The use of DM can facilitate individuals to maintain friendships as well as explore romantic relationships (Deol & Meenakshi, 2021). According to Ling and Haddon (2008) smartphones are resourceful tools as they enable the easy communication between youths and their peers to make plans and are also seen as the most effective DM to maintain their social groups bonds (Campbell, 2007). Regarding the notion of family quality time and DM use, evidence has demonstrated that smartphone use negatively impacts interpersonal interaction between parents and children. For instance, Ranjan et al. (2020) researched into the impact of smartphone use upon interpersonal relationships amongst school students whereby they concluded that using smartphones influenced both the relationship and the bond between the youth and their family members since the participants were more invested in spending time on their smartphones rather than to socialise with their family. Whereas other authors argue that apps can facilitate this interaction across countries to maintain long-distance relationships (Campbell, 2007).

Moreover, DM use can impact other dimensions of an adolescent´s life such as their *academic performance*. According to Deol and Meenakshi (2021), both teachers and parents´ view smartphone use as a factor contributing to behavioural issues as they reduce in person interaction, and consequently decreases academic performance which can be seen through the student´s grade.

Nonetheless, it is crucial to note the significant role DM had upon the COVID-19 pandemic lockdown since most countries introduced home-based quarantine restrictions, and thus, most schools had to find an alternative method for teaching such as DM for online learning (Toquero, 2020). For instance, social distancing and school lockdown at the start of the COVID-19 pandemic affected learning (Pokhrel & Chhetri, 2021) and as a result during lockdown, students had to carry out all learning assignments at home through the internet. DM applications such as Zoom became a vital and easy tool to use as an attempt in facilitating communication between individuals (i.e., webinars, online meetings, and online classes), due to the options of screen-sharing making these DM a suitable tool for online learning (Hermanto et al., 2021). The use of DM helps students' study, communicate as well as exchange learning resources (Mathew & Ebelelloanya, 2016) becoming most evident during the pandemic as most online applications helped create a virtual educational environment (Singh & Thurman, 2019). Additionally, messaging applications such as WeChat and WhatsApp can maintain long-distance communication between students and teachers more effortlessly than before the COVID-19 pandemic since teachers are also adhering more to these DM.

Finally, with respect to *mental health* can have both a positive and negative impact. On one hand, excessive use of DM can have a detrimental impact on mental health as it has been related to psychosocial problems such as hyperactivity, anxiety and depression, sleep problems, and self-harm (Khan et al., 2021). Khan et al. (2021) researched excessive recreational internet use and mental health in adolescents and concluded that there was an association between this use and poor mental health. Results revealed that this association between recreational internet use and poor mental health was considerably higher for females compared to males; including feelings of stress and sadness, highlighting potential gender differences in DM use (Khan et al., 2021). These results suggest that excessive internet use can considerably reduce opportunities for face-to-face interaction as well as promote increased screen time which consequently contributes to detrimental impacts on adolescents ´well-being. On the other hand, according to Guinta and John (2018,) healthy social media use can be seen as a chance to provide increased opportunities for cooperation, socialisationn as well as self-esteem empowerment. For instance,

digital mental health interventions can improve both the effectiveness and availability of mental health services for young people, with the potential to reach socioeconomically and digitally ostracised youths with mental health needs who normally cannot access help in other circumstances (Piers et al., 2023). In a similar vein, digital media health interventions play an important role in intervening with younger populations.

1.3. Digital Media Use Assessment

In recent decades, different instruments have been developed focused on the characterisation of the use of DM. The instruments mentioned in table 1 assess the type of DM use amongst youths, using a Likert scale as a form of responding. Some of the instruments mentioned characterise the use of multitasking and others assess multitasking as a use of DM (see table 1 for more information).

Table 1

Instruments Utilised to Characterise DM Use and Measure the Extent to which Individuals Multitask

Author	Sample	Variable	Item	Response Scale
Hisler et al. (2020)	9-to-10-year-olds	Screen media use	12 items (6 - use on a "typical day" and the other 6 - use "on a typical weekend)	Likert scale: "none" (0), "<30 minutes" (0.25), "30 minutes" (0.5), "1 hour" (1), "2 hours" (2), "3 hours" (3), and "4+ hours" (4)
Cardoso-Leite et al. (2021)	8- to 12-year-olds	Digital technology use	Depends on the response given by the children (names of the video games provided by the children were then entered into various online databases)	Likert scale: how frequently ("often," "sometimes," "rarely")

Author	Sample	Variable	Item	Response Scale
Burnell et al. (2022)	*M age* = 13.37 (*SD* = 1.14)		Reported digital use for that day by responding to items assessing the total amount of texts or online messages sent (messages sent) Open-ended items also asked, "How many hours did you spend online or on your phone." with questions specifically regarding schoolwork (academic hours).	N/A
Baumgartner et al. (2018)	11-to-15-year-olds	Media multitasking	9-items assessing 4 different media use activities -: watching TV, sending messages via phone or computer, listening to music, and using social network sites	4-point Likert scale varying from 1(never) to 4 (very often). Higher values suggested an increased level of multitasking.
Lim and Shim (2016)	11-to-16-year-olds	Media multitasking	3 dimensions of media multitasking: a smartphone with non-media activities (such as driving, doing chores, and eating), a smartphone alongside media activities (for instance, television, games, audios) and within a single device (such as a smartphone)	7-point likert scale on their use, in which the final scores were utilised to obtain an average.
Luo et al. (2018)	14-to-17-year-olds	Media multitasking	14 items: 3 main subtypes, multitasking whilst using two media (five items), multitasking with media and non-media (four items) and concentration without multitasking (reverse-coded, five items)	5-point likert scale varying from 1=never to 5= always.

Of all these instruments, the MMS (Luo et al., 2018) is the scale which mostly assesses the extent to which youths´ multitask considering various perspectives, being these multitasking between media activities and activities without media. Although this scale incorporates multitasking in different dimensions, it was developed prior to the COVID-19 pandemic.

1.4. Digital Media Impact Assessment

The impact of such use has been assessed through questionnaires that are more directed towards a more pathological, negative, and restrictive perspective of the possible impact of DM use. The following instruments investigate the pathological aspect of DM use using yes/no questions and the Likert response scale. Table 2 provides a more detailed description of the instruments used in measuring the impact of DM use.

Table 2

Instruments Utilised to Measure the Impact of DM Use

Name	Author	Sample	Variable	Item	Response Scale
Social Media Disorder Scale	(Eijnden et al. 2016)[1]	11,13 and 15-year-olds.	Problematic social media use	9 items: assess the same criteria used to measure internet gaming disorder in the DSM-V yet adapted to social media use for instance, uneasiness, tolerance, and withdrawal concerning social media use.	Yes or No answers-answered "yes" to five or more items that indicates that the individual may experience social media addiction.
Problematic internet use questionnaire	Lin and Kim (2020)	15-to-17-year-olds (M = 16.4years)	Problematic internet use	18-item scale that includes three subscales: Obsession (6 items), Neglect (6 items), and Control Disorder (6 items).	Responses were scored using a 5-point Likert-scale. (1 = never; 5 = always/almost always) to indicate how much each statement was characteristic of the respondent

Name	Author	Sample	Variable	Item	Response Scale
The media activity form (MAF)	Achenbach, 2018	Youths and parents.	The use and the perceived impact of the use, of media in youth	1st section: socio-demographic data. 2nd section: media activity use, composed of 13 items regarding different activities within media (e.g., social networking on Facebook, Instagram, etc.).	2nd section: Participants state how long (in hours and minutes) they spend, or their children spend, on each of the activities on a typical weekday, on a typical Saturday, and on a typical Sunday.
				3rd section: examines the negative impact of media activity, 11 items (e.g., "I would rather be on media than do things with my family" for the youth self-report; "My child would feel better if they spent less time on media" for the parent report)	3rd section: Likert scale: participants score 0 if the statement is not true; 1 if the statement is somewhat or sometimes true; 2 if the statement is very true or often true

[1] The results presented of Social Media Disorder Scale are related to the study of Boer et al. (2022).

As aforementioned, research has revealed on the one hand that the use is not linear and, on the other that there are positive and negative results from the DM use. Therefore, it is important to carefully evaluate this use and impact, allowing the possibility in the impact assessment, the existence of no impact, and the responses that ranges from a negative to a positive impact. In addition, the profile of DM use has been changing over the past few decades, making this issue even more evident after the COVID-19 pandemic. Therefore, the concomitant use of several DM and the use at the same time as other non-media activities are carried out, require an evaluation that considers all these "different uses".

From the analysis of the existing instruments both use and the impact of DM, it is considered that it is necessary to develop an instrument that allows the evaluation of DM use by young people, as well as the impact of this use, considering both the current profile of the type of use and the different possibilities of impact. Thus, the present study aims to contribute towards the development of the Digital Media Use and Impact questionnaire (DMUIq). This questionnaire is being developed in the Project "Media Activity and Mental Health" which is being conducted by the "Research Centre for Human Development".

To our knowledge the existing instruments predominately focus on the negative impact of this DM use rather than allowing individuals to perceive this impact that matches their reality more closely.

2. Methods

2.1 Objectives

This study has the following specific objectives:

- To characterise the use of DM in a sample of Portuguese adolescents.
- To contribute to the development of the Portuguese version of the Media Multitasking Scale (MMS) (Luo et al., 2018).
- To study the psychometrics characteristics of the Digital Media Use and Impact questionnaire (Campos et al, research form).

2.2 Participants

A total of 171 youth aged between 11 and 16 (*M* age = 13.67, *SD*= 1.07), from two schools in the north of Portugal, participated in this study. Most of the youth were females attending the 9th grade. Table 3 summarises the participants' sociodemographic characteristics.

Table 3

Participants' Sociodemographic Characteristics

Sociodemographic Variables	*n*	Valid %
Gender		
Female	91	53.2
Male	77	45.0
Non-Binary	1	.6
Prefer not to say	2	1.2
Academic Year		
7th Grade	47	28.2
8th Grade	28	16.8
9th Grade	92	55.1

2.3 Materials

The study included a sociodemographic section, comprising self-reported questions about gender, age, and academic year, the *Media Multitasking Scale* (MMS) and the *Digital Media Use and Impact Questionnaire* (DMUIq).

2.3.1 Media Multitasking Scale (MMS)

The *Media Multitasking Scale* (Luo et al., 2018) was used for collecting data regarding one of the dimensions of digital media use- multitasking use. The MMS is composed of 14 items, organised in a 5-point Likert response scale (1= never, 2= seldom, 3= sometimes, 4= often and 5=always), concerning three categories.

The first category focuses on *Multitasking Across Two Medias* (5 items), with statements such as "While watching TV/video, I check or send (voice) messages" and "While watching TV/video, I play on digital devices (e.g., surf the Internet, check social media accounts, play with interesting apps, etc.) (α=. 82).

The second category measures *Multitasking with a Media and a Non-Media* (4 items) for instance, "While eating, I watch TV/video." and "While talking to someone face-to-face (e.g., friends, family), I play with a smartphone or other digital devices (e.g., check or send (voice) messages, make phone calls, have fun, etc.)." (α=. 64).

Furthermore, the third measuring the domain of multitasking, *Measures Concentration Without Multitasking* (5 items), with reversed statements such as "I can focus on eating without getting distracted by media.", "I can focus on talking face-to-face with my friends and families without getting distracted by media." and "I can focus on walking without getting distracted by media (e.g., smartphone)" (α=. 81). The total score of MMS was α=. 82.

The MMS was translated to Portuguese as part of a larger project. The translation process included a back-translation conducted by a native English-speaker. The Portuguese Version includes 3 new items (items 6, 9, 12) because these items are relevant in current DM use and were not previously considered in the original version. These items cover other domains such as sleep and multitasking with different activities (e.g., studying whilst watching movies and being on social media whilst listening to music). Furthermore, items 1, 2, 3, 4, 5, 7 and 10 were adapted, considering cultural aspects that were applicable to the Portuguese population after an extensive literature review.

2.3.2 Digital Media Use and Impact Questionnaire (DMUIq; research form)

The development of the DMUIq began by generating an item pool based on 1) a literature review; 2) content analysis of the discourse emerging from 1 focus group session held with 4 students in the 7[2] grade; and 3) a review of measures for assessing use and impact of DM.

The first version of the questionnaire resulting from the process presented above is composed by two sections: 1) first section - Characterisation of DM use; and 2) second section - Impact of Using DM.

The first section - *Characterisation of DM use* - consists of an adaptation of the "*Media Activity Form – Youth Self- Report"* (Achenbach, 2018) was used to collect data regarding the amount of time individuals spend on DM. This instrument was adapted since the original version does not represent the current use of DM, as it does not incorporate media multitasking as a type of DM use, and thus represents an "outdated" of this use. The adapted version has a simpler form of answering the questions (e.g., regarding how to report the time spent on DM) as well as some activities as a result of the literature review.

Participants were asked the total of hours they spend on DM on a normal weekday (Monday to Friday) and a weekend (Saturday or Sunday).

Then they were asked to divide the total number of hours according to how long they spent on each DM activity: using social media (e.g., Instagram, Tik Tok, YouTube), communicating via telephone with family and friends (e.g., calling, send messages), watch films and series (e.g., Netflix), listen to music (e.g., Spotify), play electronic games (e.g., on the computer, smartphone, PlayStation), study or do homework in school platforms and finally, talk to friends or colleagues through video calls (e.g., WhatsApp, Instagram). Participants had the chance to write down any additional media activity they do, which was not previously included.

The second section – *Impact of Using DM* – is composed by 14 items, organized in a 5-point Likert response scale (1= very bad impact, 2= bad impact, 3= neither good nor bad impact, 4= good impact, and 5= very good impact), evaluates the extent to which DM use has an impact

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[2] These phases were developed as part of the work of Dias (2022) and Nobre et al. (2022).

perceived by youths. These items cover domains of the youth's life such as physical, social, and psychological well-being (e.g., *"The way I use DM influences the amount of time I spend with my family and that has an impact…" "The way I use DM influences the number of hours I sleep and that has an impact…"*).

2.4 Procedures

Authorisation from Comissão de Ética em Tecnologia, Ciências Sociais e Humanidades da Universidade Católica Portuguesa (n. CETCH2023-40), Monitorização de Inquéritos em Meio Escolar (MIME, [n. 0128800013]), and the schools' boards of directors, were obtained, by all the ethical requirements for research. Informed consent was obtained from participants and their parents/children's legal guardians. In the informed consent form, a brief description of the purpose of the study was presented, as well as the questionnaires that were requested to be completed. This document also ensured the anonymity and confidentiality of the data, as well as the right to withdraw at any time. To complete the questionnaire, a QR code was displayed in their classroom projector for the participants to scan and be directed to the questionnaire on the Qualtrics online platform, data was collected as a group in a classroom setting. In case a participant had difficulties accessing the online platform Qualtrics, paper copies of the questionnaire were provided. On the online platform Qualtrics, items were randomised to overcome order bias. Data were collected in May and June 2023 by the research team.

The analysis was performed using the statistical analysis program IBM SPSS Statistics® v.28.0. The descriptive statistics feature of SPSS enabled us to analyse the samples´ characteristics such as their age, gender, and academic year. Descriptive Statistics incorporates various measures such as frequency, percentage, mean, and standard deviation (Howell, 2010).

To assess the psychometric characteristics of the MMS and the DMUIq an exploratory factor analysis (EFA), using Principal Components Analysis (PCA) with Promax rotation, was conducted to evaluate the factorial structure of the items. Cronbach´s Alpha test was used to assess the internal consistency of the subdimensions as well as the scale. A Pearson's Correlation Coefficient test was also used since in the MMS structure two factors only have two items.

3. Results

3.1. Characterisation of Digital Media Use

Regarding the amount of time spent on DM, the youths reported spending, on average, more time on typical weekend day (M = 5.17 hours, SD = 3.21 hours), when compared to a typical weekday (M = 3.35 hours, SD = 2.35 hours).

Social media was the activity most performed on a typical weekday (M = 2.22, SD = 2.25), and communicating through a mobile phone with family and friends was the least activity done (M = 1.54, SD = 2.09). Yet on a typical weekend day "other activities", which were not on the original list were the most performed (M = 3.58, SD = 2.49), and studying/ doing work on school platforms (or other platforms) was the activity least done (M = 1.78, SD = 1.41) (see table 4).

Table 4

Time Spent on Activities Performed on DM on a Typical Weekday vs Typical Weekend Day

Activities performed on DM	n	On a typical weekday (hours)		On a typical weekend day (hours)	
		M	SD	M	SD
Use social media	159	2.22h	2.25h	3.50h	2.98h
Communicate through mobile phone with family and friends	149	1.54h	2.09h	1.92h	2.10h
Watch movies and series	118	1.10h	1.14h	2.17h	1.61h
Listen to music	140	1.96h	2.02h	2.80h	3.62h
Play electronic games	116	1.16h	1.17h	2.57h	2.23h
Study or do work on school platforms or other platforms	121	1.33h	1.03h	1.78h	1.41h
Talk to friends/colleagues through video call	111	1.54h	2.12h	2.10h	2.80h
Other activities	13	1.65h	.88h	3.58h	2.49h

The "other activities" referred to in Table 4 are sports, studying, reading, taking pictures, and watching football games. "Reading" was the activity most performed (4.2%) yet "sports" (.6%) and "taking pictures" (.6%) were the activities least performed.

3.2. Psychometrics characteristics of the MMS

Initially, an exploratory factor analysis retaining all factors with an eigenvalue above one was used to examine if this structure was coherent with the original structure (Luo et al., 2018). The factorial solution failed to meet the conceptual organization of the instrument. Therefore, a new exploratory factor analysis extracting three factors was conducted. This solution was responsible for 45% of the variance. The factorial solution failed to meet the conceptual organization of the instrument, and for this reason, the extraction of three factors was repeated, eliminating items 8, 11, and 15, which did not load in the expected factors. This solution explained 53% of the variance, although three items did not load in the expected factor. Finally, a new analysis was performed using 11 items (excluding items 1, 2, and 6) by extracting three factors. The three factors were 1) M*ultitasking across two media activities* (MAM); 2) *Multitasking with media and non-media activities* (MMNM), and 3) *Concentration without multitasking* (CWM). The three factors explained 52.71% of the total variance in DM multitasking scores. MAM explained 23.70%, MMNM explained 17.78%, and CWM explained 11.28%. Factor analysis suggests that MAM is comprised of 3 items (3, 4, and 5; α=. 78); MMNM includes four items (7, 9, 10, and 12; α=.55); and CWM is composed of 4 items (13, 14, 16, 17; α=.62). Table 5 presents the factorial structure of MMS including the 11 items that were maintained.

Table 5

Exploratory Factor Analysis of the MMS Questionnaire: Item Description and Factor Loadings

MMS Items	Factors		
	1 Multitasking across two media activities (MAM)	2 Multitasking with media and non-media activities (MMNM)	3 Concentration without multitasking (CWM)
*Item 5_ While talking through a video call with family and friends, I also play on DM (e.g., computer, smartphone, PlayStation).	**.829**		
*Item 3_ While playing games on DM (e.g., computer, smartphone, PlayStation), I am speaking on the phone to family or friends.	**.818**		
*Item 4_ While speaking on the phone with family and friends (e.g., calling, sending messages), I am also playing on DM (e.g., computer, smartphone, PlayStation) or using social media (e.g., Instagram, TikTok).	**.794**		
Item 16_ I can focus on talking to my family and friends face-to-face without distracting myself on DM.		**.790**	
Item 17_ I can focus on walking without getting distracted by DM (e.g., smartphone).		**.758**	
Item 14_ I can focus on eating without getting distracted by DM.		**.733**	
Item 13_ I can focus on talking with a person through call/video call without doing other things.		**.444**	
**Item 9_ While studying (e.g., doing homework, reading), I am also on DM (e.g., watching films/series, being on social media, on a (video)call).			**.741**
*Item 10_ While talking to someone face-to-face (e.g., family or friends), I am also watching television/ videos or on social media.			**.684**
*Item 7 _ While eating, I am also on DM (e.g., watching movies/ series, on social media, on a (video call).			**.614**
**Item 12_ While trying to fall asleep, I am also on DM (e.g., watching movies/ series, on social media, on a call).			**.591**

*Item was changed.
** New item.

3.3 Psychometrics characteristics of the DMUIq

The first exploratory factor analysis, retaining all factors with an eigenvalue higher than 1.0 failed to meet the conceptual organization of the instrument. Therefore, based on the conceptual option, a new exploratory factor analysis extracting three factors was conducted. This solution was responsible for 55% of the variance, although failed to meet the conceptual organization of the instrument. The loading of some items that were related to two different conceptual dimensions in the same factor suggested a new exploratory analysis, extracting four factors. This solution was responsible for 64% of the variance, although some items did not load in the expected factor.

Finally, a new analysis was performed using 10 items (excluding 9, 10, 11, and 13 items). The factor structure included: Factor 1) *Impact on sleep;* Factor 2) *Impact in relationships beyond family;* Factor 3) *Impact on family*; and Factor 4) *Impact in School*. This solution explained 66.39% of the total variance in DM impact scores, with factor 1 explaining 29.58%, factor 2 explaining 14.97%, factor 3 explaining 11.41%, and factor 4 explaining 10.43%.

Since two of the dimensions included only two items - Factor 1 (items 3 and 4) and Factor 3 (items 1 and 2) - a Pearson correlation test was conducted to examine the inter-item correlation since it was not possible to conduct Cronbach's Alpha. Results indicate a significative positive correlation of .76 ($p < .001$) and .56 ($p < .001$), respectively. For Factor 2 (items 5, 8, 14), and Factor 4 (items 6, 7, and 12), the Alpha value was α = .84. and α = .61, respectively. Finally, the Cronbach's Alpha value for the total score was α = .80. Table 6 presents the factorial structure of DMUIq including the 10 items that were maintained.

Table 6

Exploratory Factor Analysis of the DMUIq: Item Description and Factor Loadings

Impact items	Factors			
		2		
	1	*Impact on*	3	4
	Impact	*relationships*	*Impact*	*Impact in*
	on sleep	*beyond family*	*on family*	*School*
Item 3_*The way I use DM influences the quality of my sleep.*	**.865**			
Item 4_*The way I use DM influences the number of hours I sleep.*	**.864**			
Item 5_*The way I use DM influences the relationship I have with my boyfriend/girlfriend.*		**.808**		
Item 14_*The way I use DM influences the way I interact with people who are physically distant.*		**.667**		
Item 8_*The way I use DM influences the relationship I have with teachers.*	**.447**	**.627**		
Item 1_*The way I use DM influences the amount of time I spend with my family.*			**.857**	
Item 2_*The way I use DM influences the quality of the time I spend with my famil*y			**.826**	
Item 12_*The way I use DM influences my knowledge about the world.*				**.757**
Item 7_*The way I use DM influences my learning at school.*	**.329**			**.654**
Item 6_*The way I use DM influences the relationship I have with friends.*		**.386**		**.645**

4. Discussion

In recent years, the use of DM has undergone changes (Wang et al., 2020), making it possible to find literature centred either on the positive impact or on the negative impact of their use in terms of their physical, social, and psychological well-being of young people (e.g., Deol & Meenakshi, 2021; Wong et al., 2020). This investigation integrates the broader project Media Activity and Media Health and intended to contribute towards the development of the *Digital Media Use and Impact questionnaire* (DMUIq).

The first specific aim of this study was to characterise the use of DM in a sample of Portuguese adolescents. An analysis of the sociodemographic characteristics of the sample was conducted, most of the participants were females attending the 9th grade. The current study´s findings demonstrated that participants spend more hours on average using DM on a typical weekend day rather than a typical weekday. A study conducted by Eales et al. (2021) investigated children´s screentime before and during the COVID-19 pandemic, results demonstrated a significant increase in screen media use during the pandemic compared to previously. This is coherent with the existing literature, post the COVID-19 pandemic, as You et al. (2023) investigated the use of social media and concluded that 13-year-olds have greater use of this type of DM on a weekend day (59.6%) compared to a weekday (37.7%). It is important to note that DM use (smartphone, television, and gaming) and social media use (Facebook, Instagram, and TikTok) increased during the COVID-19 pandemic compared to pre-pandemic times (Helbach & Stahlmann, 2021) which also supports the current study´s results as social media was the DM activity most performed on a typical weekday. Regarding the most performed activity on a typical weekend day, participants reported it being "reading". Since COVID-19 there has been an increase in reading on DM, Ćirić and Ćirić (2021) concluded that on average individuals accessed more online libraries in January–August 2020 compared to February–December 2019, average individuals spent more time using the digital library and read a lot more. Considering the increase in online reading during COVID-19, our results suggest that youths continue to read frequently.

The second specific aim focused on the contribution to the development of the Portuguese version of the MMS, through the analysis of psychometrics characteristics. This study was conducted on 171 youths, meeting the guidelines proposed by Hair et al (2006), that the sample should be greater than 50 participants, and have a minimum of 100 participants to ensure more

vigorous results. They also mention that, for the development of a factorial analysis, should have a minimum of 5 responses per item. Although construct validity, assessed by exploratory factor analysis, revealed a three-dimension factorial structure of the MMS, consistent with the original scale, the arrangement of the items was different. The original MMS (Luo et al., 2018) consisted of 14 items and three categories (MAM, MMNM and CWM) yet the current study´s MMS includes 11 items and three factors (MAM, MMNM and CWM). The factorial structure found is adequate due to the good internal consistency within these factors. Internal consistency, assessed with Cronbach's Alpha, showed acceptable reliability scores for the dimensions of MAM and MMNM and demonstrated a good reliability score for CWM (Cortina, 1993). This concluded the existence of good psychometric characteristics and demonstrates the strength of the factors. Collectively, the three factors accounted for over half of the variance in media multitasking among youths indicating that media multitasking can describe how youths use DM.

Finally, the third specific aim centred on the study of the psychometrics characteristics of the DMUIq (Campos et al, research form*).* The experimental version of the DMUIq was applied to a sample of 171 participants. As aforementioned, the number of participants meets the guidelines proposed by Hair et al (2006). Construct validity, assessed by exploratory factor analysis, revealed a four-dimension factorial structure, which can account for 66.39% of the explained variance., meaning that this value is explained by the perceived impact of DM use. Internal consistency, assessed with Cronbach's Alpha, showed both acceptable (*Impact in School*) and good (*Impact on relationships beyond the family*) reliability scores (Cortina, 1993) for the two factors retrieved, as the other two factors only had two items and a Pearson´s correlation test was used. Factor 1 demonstrated having a good alpha score and both factors 2 and 3 had significant associations. The lower alpha of the "*Impact in school*" subscale (α = 0.61) could be explained by the scale's low number of items (Cortina, 1993). Nonetheless, the item-total correlation of its three items, and the fact that item deletion procedures would not lead to a higher internal consistency value, upheld the decision to keep this subscale in this first version of the DMUIq.

5. Conclusions

Despite media multitasking not being a recent phenomenon, the frequency by which youth actively multitask has rapidly increased due to both the popularity of DM in recent years and

the ease of access youths now have to multiple media. The present study is a contribute towards the development of the Digital Media Use and Impact questionnaire DMUIq. Considering the literature review carried out, there does not seem to be any measure that allows the evaluation of the impact perceived by youths in a "neutral manner", highlighting the importance of this study.

Regarding the first aim of the study, it is suggested that youths do not use DM as they previously did, as results are coherent with existing literature due to the fact that there has been a changed in DM use since the COVID-19 pandemic. Moreover, regarding the second aim of the study, results suggest that the MMS is a reliable and consistent instrument to investigate how youths use DM. With respect to the third aim of this study findings indicate that the DMUIq is a practical, valid, and reliable screening tool to assess the impact that DM use has upon youths.

It is considered that, throughout the study, and according to Freire and Almeida (2001), good practices for construction and validation of instruments were followed as there is a flexibility in the number of items, as instruments are not intended to have too few items, to not jeopardise the representativeness of the construct evaluated, nor an instrument that is too long, to not produce demotivation and lack of seriousness in the answers (Freire & Almeida, 2001).

A potential limitation could be the fact that it was administered in a classroom setting and participants were together, and this could have influenced their concentration when participating, as well as in some classes the DMUIq was administered at the end of the day which could have also influenced their concentration. Thus, these results should be interpreted carefully regardless the DMUIq having good consistency values.

Moreover, future research should include more sophisticated psychometric analyses, such as the confirmatory factor analysis, to verify that the factorial structure is adequately adapted. The current research used an exploratory factor analysis as the relationship between the items was not known, however now it is possible to use a confirmatory factor analysis as the relationship between items are known and a further analysis would enable a more comprehensive understanding of the factorial structure.

Finally, the present study is a fundamental step in the development of the DMUIq, highlighting the fact that it is a questionnaire that is based on a construct that intends to capture both perspectives – positive and negative – from DM use. This study contributes towards the

understanding of the perceived impact of DM use upon the physical, social, and psychological wellbeing, which is relevant to psychologists, who can explore the wellbeing aspect more deeply. Additionally, in the future the DMUIq could be administered in schools and clinical settings, allowing a rapid, valid, and reliable needs assessment, as well as planning and assessing the impact of interventions with youths.

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