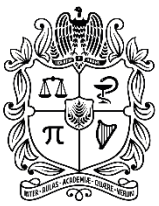

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Digital Consumer Behavior: dependence, relative reinforcing value and literacy in the context of social media apps and mobile advertising

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A mis padres, mi hermana y mi sobrino por estar siempre a mi lado durante este arduo proceso.

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Resumen

Comportamiento del consumidor digital: dependencia, valor del refuerzo relativo y alfabetización en el contexto de las aplicaciones de redes sociales y la publicidad móvil

El incremento en la adopción y uso de los dispositivos móviles por parte de los niños, adolescentes y adultos jóvenes ha conllevado a un interés en la investigación sobre los efectos que pueden tener en estas poblaciones las apps de redes sociales y los nuevos formatos de publicidad digital. El objetivo de esta investigación consistió, en primer lugar, en establecer si existe una relación entre el nivel de uso del smartphone y las apps y un patrón de elección impulsivo. Segundo, identificar el valor relativo de refuerzo de una recompensa monetaria frente a diferentes períodos de uso de las redes sociales, y tercero, establecer el nivel de alfabetización publicitaria en dispositivos móviles. Para desarrollar este trabajo se aplicaron diferentes metodologías que incluyeron la aplicación de cuestionarios online, pruebas de elección intertemporal y registros de tiempo de uso de las apps móviles a partir de un panel de usuarios. Los resultados muestran, en primer lugar, que el tiempo de uso de las apps no permite predecir las elecciones en la tarea intertemporal, en tanto que el nivel de dependencia al smartphone percibido tuvo una relación significativa con el promedio de elecciones impulsivas. Segundo, que los niveles de alfabetización digital móvil son bajos, así como el nivel de consciencia que tienen los padres sobre su rol en el proceso de socialización de sus hijos frente a estas nuevas formas de publicidad. Y tercero, que el valor relativo de un refuerzo monetario resulta efectivo para modificar la preferencia de los participantes por el uso de las redes sociales. Estos resultados permiten formular conclusiones y recomendaciones para la gestión organizacional a nivel de responsabilidad social, autorregulación, bienestar del talento humano y políticas de gestión de las relaciones con los usuarios.

Palabras clave: descuento temporal, economía conductual, alfabetización publicitaria, redes sociales, publicidad móvil, interculturalidad.

Abstract

Digital Consumer Behavior: dependence, relative reinforcing value and literacy in the context of social media apps and mobile advertising

The increased adoption and use of mobile devices by children, adolescents and young adults has led to research interest in the effects that social media apps and new digital advertising formats may have on these populations. The aim of this research was, first, to establish whether there is a relationship between the level of smartphone and app usage and a pattern of impulsive choice. Secondly, to identify the relative reinforcement value of a monetary reward versus different periods of social media use, and thirdly, to establish the level of advertising literacy on mobile devices. To develop this work, different methodologies were implemented, including the application of online questionnaires, inter-temporal choice tasks and records of time spent using mobile apps from a panel of users. The results show, first, that app usage time does not predict choices in the intertemporal task, while perceived level of smartphone dependence was significantly related to average impulsive choices. Second, that levels of mobile digital literacy are low, as is parents' awareness of their role in the socialisation process of their children in the face of these new forms of advertising. And third, that the relative value of a monetary reinforcement is effective in modifying participants' preference for using social media apps. These results allow us to formulate conclusions and recommendations for organisational management at the level of social responsibility, self-regulation, human talent wellbeing and user relationship management policies.

Keywords: temporal discounting, behavioral economics, advertising literacy, social media, mobile advertising, cross-cultural.

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Introduction

The smartphone has become not only the ultimate device for keeping in touch with friends, family and colleagues, but also the window to entertainment, information and interactions with brands and companies. According to Statista (2021a), the number of smartphone users worldwide is estimated to reach 4.96 billion by 2022, and 5.57 billion by 2025. Among the most used mobile applications are video clips (YouTube and TikTok), games, and mainly social networking services (SNS) (Wacks & Weinstein, 2021). In 2019, the average time of daily internet use at global level was of 6 hours and 43 minutes (Kemp, 2020), with mobile devices accounting for more than half of this consumption, estimated at 3 hours and 40 minutes, and mobile applications (apps) representing more than 90% of the total mobile activity time (App Annie Intelligence, 2020).

In addition, smartphone is now the global dominant platform in terms of total minutes. This phenomenon is more evident for emerging and developing countries, such as India, Brazil, Mexico, and Argentina. In India, for instance, 89% of the total minutes spent in digital media are in the mobile channel. Of the total mobile minutes, globally it is observed that 80% is concentrated on the use of apps, compared to web browsing. This level of use is slightly higher in the markets of Latin America, where it reaches percentages above 90%. For the United States, the mobile digital media time spent has grown 7,4% between 2015 and 2017, driven mostly by mobile apps and, to a lesser extent, mobile web. It is also remarkable the fact that audiences that only use the mobile channel exclusively have increased globally and especially in Latin America, with increases between 2016 and 2017 of 9,1% for Brazil, 9% in Mexico and 7,2% in Argentina (ComScore Inc, 2018). The consulting firm App Annie Intelligence (2017) describes this phenomenon stating that mobile

channel is becoming the first screen for consumers, which means, the device that the majority of consumers prefer with respect to other platforms. This preference is also reflected in the significant number of apps available in the market. By the first quarter of 2022, the Google Play store and the iOS App Store had 3.29 million and 2.11 million apps available, respectively (Statista, 2022).

It is important then to study the mechanisms of use of mobile technologies, since unlike the desktop computer, and even the laptop, mobile devices are considered as personal elements of private use, which suggests that consumers have very particular attitudes towards mobile communication compared to traditional media such as print and radio and television (Fritz et al., 2017). According to these authors, television was the first screen that marketers relied on to provide information to consumers. After that, the internet appeared as a second screen through which it was tried to satisfy this need. The rise of e-commerce facilitated the emergence of a third screen, mobile phones, which now allows users to access an almost unlimited amount of information on brands and entertainment at any time and place mainly through smartphone devices.

In this context, the age group of children and teenagers requires special attention. First, from a broad context, household internet access for the 3 to 17 age group in Latin America and the Caribbean reached 51% by 2020 (UNICEF & ITU, 2020), highlighting the steep increase in the use of smartphones in this segment throughout this decade in both developing and emerging countries. In addition, this increase in access to mobile devices has also been accompanied by negative experiences on digital platforms, particularly in countries such as Uruguay, Costa Rica, Brazil and Chile, including contact with strangers (between 13% and 44%), cyberbullying (between 5% and 10%) and exposure to disturbing content (30%) (Ghai et al., 2022).

Considering the above-mentioned reasons, the use of social media networks among children, adolescents and young adults requires further study, given the

importance of this behaviour from a time allocation perspective (Kizgin et al., 2018). For instance, by January 2022, there were more than 4.62 billion active social media users around the world—58.4% of the world's population. In addition, social media sites were the top type of website visited by global Internet users. The average daily time a user spent on social media networks was 2 hours and 27 minutes (Chaffey, 2022). Among the most popular social media sites were Facebook—with over 2.9 billion users—followed by YouTube with 2.2 billion, and Instagram—with 2 billion (Lua, 2022). In terms of the accelerated adoption and growing use of social networks, young people make up one of the most frequent user groups on social media platforms. To illustrate, in the U.S, around 89% of teenagers between the ages of 13 and 17 have access to a smartphone, and they report constant use of social media sites (Abi-Jaoude et al., 2020).

In order to properly address this phenomenon, the characteristics of mobile communication must be taken into account. These are largely derived from the features of the Internet with which consumers have been familiarizing themselves since the mid-1990s. These include ease of contact with users, the ability to send personalized content and the ability to generate interactive experiences, which are more efficient than unidirectional (traditional) messages to improve the understanding of the advertising content that is intended to communicate (Macias, 2003; Risden et al., 1998). These characteristics become more relevant in a context of mobile communication because of the individualization properties that have not been available in other means of contact. In this new context, each user has their own identification number and usually carries the device with them most of the time. From this, advertisers can obtain specific data about the location of their consumers in real time in order to increase the effectiveness of communication (Tähtinen, 2006; Yuan & Tsao, 2003). Table 1 shows a comparison of the main means of communication in marketing with respect to a set of characteristics that affect the experience of the consumers.

Table 0-1: Comparison of the main media in marketing.

Feature / Media	Magazines/Newspapers	TV	WWW	Mobile
Chromatism	Colour / Grayscale. Static	Colour / Animated	Colour	Colour
Mode	Visual / Tactile	Audio / Visual	Audio / Visual	Audio / Visual / Tactile / Haptic
Presentation	Pull	Push	Pull (banner)	Push (e-mail) / Pull (banner)
Involvement	High	Low	Middle High	High
Context	Very focused	Diverse	Focused	Average distraction
Information	Detailed	Limited	Detailed	Limited
Targeting	Medium	Low	High	High
Type of advertisement	Exposure	Exposure	Interactive / Exposure	Interactive / Exposure

Source: Adapted from Park et al. (2008).

For more than a decade, the potential benefits of mobile brand communications have become evident, through the development of promotions, the marketing of events or experiential marketing, the sending of relevant content, and relational marketing actions (Shankar, 2016). All based on real-time connectivity properties and the various forms of interaction that mobile platforms allow (Zoller, 2003). However, since that time also mentioned some potential risks that mobile marketing should face during its development. These refer mainly to the sending of unwanted messages, known as *spam*, and to the handling of personal information and other aspects related to users' privacy (Tsang et al., 2004). Throughout this process, mobile marketing has been built for companies in a two-way or multi-way communication tool, in order to generate closer connections with their customers. The increased penetration of mobile devices along with the rapid growth of the application market has made companies want to accelerate incorporating these tools into their mix of marketing tactics, thereby seeking to maintain a high level of competitiveness (Shankar & Balasubramanian, 2009; Shankar & Malthouse, 2006;

Sultan et al., 2009). This quest has been based on the characteristics of the devices that offer new opportunities to innovate in brand communications actions. These characteristics are:

- *Ubiquity:* It refers to the ability of users to receive information and carry out transactions wherever they are and at any time they require it (Clarke III, 2008). This capability is feasible due to the fact that these devices are turned on almost at all times, in addition users usually take it with them wherever they go and check it quite frequently (Balasubramanian et al., 2002).
- *Personalization:* The mobile phone is a very personal device and is rarely used by someone other than its possessor. It also provides personal information through its subscriber identification module (SIM), which is very valuable for marketing teams (Junglas & Watson, 2003). In addition, the device becomes a mechanism of self-expression not only by its brand, design and technological attributes, but also because it can also be object of aesthetic personalization through tones or melodies selected by users, as well as external protectors available in various Designs that reflect different personality types (Walsh & White, 2007).
- *Two-way communication*: This is a key feature for potential applications in marketing. These devices allow more than any other tool, the possibility of establishing permanent connectivity with users (Schierholz et al., 2007). This property allows a greater level of use to be given to other devices that require a permanent physical connection, thus creating greater opportunities to generate meaningful communication experiences around brands (Neslin & Shankar, 2009).
- *Location:* It consists of the ability to identify a user's geographical location through the location of their device (Clarke III, 2008). This feature is based on the use of geographic localization technologies, among which is the global positioning system known as GPS. With the application of this technology, marketers are now able to geographically focus products or services on a segment of potential customers. It is very likely that more applications of

location-based marketing are currently being developed with technologies such as Bluetooth and Radio Frequency Identification (RFID), as was raised by authors such as Bruner & Kumar (2007).

Based on these characteristics, a parallel can be established between mass marketing (one based on the use of mass media such as the print media, radio, and television) and mobile marketing, which appears in the Table 2.

Table 0-2: Differences between mass marketing and mobile marketing.

Dimension	Mass Marketing	Mobile Marketing
Focus on the audience	All users of the product, existing and potential.	Existing and potential product users who have mobile devices and who agree to receive brand communication.
Potential types of communication	Text, voice and video in rich formats.	Text, voice and video in relatively small visual spaces (Smartphone), with increasing transmission speeds.
Communication direction	From the brand towards the consumer	Interactive between the consumer and the brand, and between consumers with respect to the brand.
Capacity to send communications from geolocation	Low	High
Capacity to measure and track consumer response	Low	High
Individualization of consumers	Low	Medium
Cost per audience reach	High	Low

Source: Adapted from Shankar & Balasubramanian (2009).

One of the main mobile marketing tactics applied by companies to influence their consumers is social media marketing. As mentioned above, children, teenagers and young adults are population groups that are particularly targeted to consume content on these platforms on a permanent basis and with a high level of cognitive engagement. (Abbasi, 2019; Moreno et al., 2022). Although it has been argued that social networks have positive effects on users' social interactions and self-expression (Baccarella et al., 2018), there is a growing body of research that aims to investigate the potential negative effects of excessive use of these platforms, especially in younger users. This phenomenon has been referred to as the "dark side" of social media. Although we start from a neutral notion of social networks as digital communication tools between users, and between brands and their followers, we are addressing here those situations in which problematic use is associated with harmful effects on the well-being of the individual and on their work, academic and personal relationships (Zhao et al., 2022).

Therefore, social media have received more attention from researchers recently given the number of users who have downloaded these apps and the time and frequency dedicated to interacting with these mobile platforms. Within the academic literature, some of these studies indicate the existence of an addiction to social media networks and even categorize it as a nonchemical and behavioural addiction, with the respective negative consequences on user´s behaviour, including loss of control, abstinence and mood modification (Esmaeili Rad & Ahmadi, 2018). One of the interpretations for this increase in the time and frequency of use of these apps is the potential of social media networks to help build and communicate the user's self-image to their contacts’ network. For instance, a study found that social media users more likely share experiences that help show their "experiential CV" to other users. This CV is composed of unusual, extreme, and even aversive experiences, but because they are rare, they will differentiate them and generate an emotional impact on their digital audiences. In fact, the same study found that, when given the choice between a pleasant experience and a memorable one (that could be shared on social networks), the participants showed a tendency for the latter (Keinan &

Kivetz, 2011). On the other hand, the second category of apps that have the greatest potential to generate a problematic use are mobile games. In fact, smartphone gaming represents 42% of the total video game market worldwide (Newzoo, 2017). However, a study conducted in Belgium and Finland did not find a significant relationship between the use of mobile games and the problematic use of the smartphone (Lopez-Fernandez et al., 2018).

Another important aspect concerns the growing interest of many authors to develop different measuring instruments to establish the prevalence of a possible addiction or problematic use of smartphone. And it is precisely the lack of unity with respect to a conceptual definition that has led to a dispersion of studies in different territories trying to validate different scales and inventories that allow to establish an incidence in the different populations studied (Panova & Carbonell, 2018). Some of the scales applied include the Mobile Phone Addiction Index (MPAI) (Liu et al., 2018), the Smartphone Addiction Inventory (SPAI) (Simó-Sanz et al., 2018), the Test of Mobile Dependence (TMD) (Fransson et al., 2018), the Smartphone Addiction Scale (SAS) (Rozgonjuk et al., 2018; Sun et al., 2019) and the Mobile Phone Problematic Use Scale (MPPUS) (Nahas et al., 2018). These scales, by definition, are based on the self-report of the interviewee to establish not only the incidence of problematic use but also the personality characteristics that may be associated with such behaviour.

Therefore, the mainstream of research on the subject, has focused on the search for relationships between personality factors and the level of use reported by the participants. However, some recent studies have been incorporating techniques for measuring the use of the smartphone that allow access to objective data, from the use of apps designed to measure the time of use of the device as well as the number of screen unblocks occurred during the day (Esmaeili Rad & Ahmadi, 2018; Rozgonjuk et al., 2018; Wilcockson et al., 2018), but even more important is the recent finding that there is a significant difference between the self-report made by the users and the usage data collected automatically by these applications (M. Lee et al., 2018). Therefore, the present project seeks to contribute methodologically,

with respect to a technique for obtaining data on smartphone and mobile app usage time, and what implications this has with respect to the concepts of addiction, problematic use and the theories that can account for this phenomenon.

Considering the limitations that studies on the subject have had up to now, some authors have suggested alternatives to focus future research. The first relates to the use of cross-sectional survey design, which allows to establish correlations between variables, but has a very limited capacity to find causal relationships in a more rigorous way. Therefore, the application of longitudinal or experimental designs has been suggested to find causal relationships that provide a broader interpretation of the phenomenon (Liu et al., 2018). On the other hand, considering how stable and consistent over time can be the problematic use of the smartphone, Panova & Carbonell (2018) points out that there are no longitudinal studies that confirm the stability and durability of the phenomenon.

This situation for the use of the smartphone and social media networks shares similarities with the study of addiction to substances, as pointed out by Akers (1991), by indicating that both, the definitions and the diagnostic criteria used in the study of addiction or dependence are mainly descriptive instead of providing interpretations or explanations of such phenomena. In other words, the fact of assigning the participants in a category of addiction or problematic use from their self-report, can have a descriptive value, but that does not allow to establish that this person has that condition due to his or her addiction. Akers (1991) refers to this as the tautology of this definition of addiction. This is simply a label that is assigned to those people who meet the diagnostic criteria, but this does not explain how or why these behaviours occur. The label is assigned to people who have lost the ability to control their use of the smartphone, but if you were to ask about why this situation occurred, the only possible answer with the information available in these studies is that it occurs because the person is addicted. That is, the addiction is due to the addiction that the user presents. The problem to be addressed, according to Ross, Sharp, Vuchinich, & Spurrett (2008), should consider whether the people who

show this type of behaviour do so because of something more than the choice that is evident in the fulfilment of the diagnostic criteria. That is, if it is possible that there are contextual and biological factors, or factors associated with the nature of the substance, the activity, or even the technological device that is mediating the user's experience, the price of the substance or access to the use in case of a service or a device, among other aspects.

This more contextual approach, typical of behavioural economics, is an alternative to be considered against the psychiatric approach, characterized by posing a conception of addiction as an internal state, that is, leaving the person in a condition of inability to choose, given the disorder he suffers. On the other hand, if this addiction or dependence is really a pattern of choosing a behaviour over others available at a time in a particular context, then it is possible to influence it through the rewards and costs associated with each behavioural alternative. Thus, if a person shows a behaviour pattern of excessive consumption, this may be due to the fact that this activity is associated with a type of reinforcement or utility that surpasses those offered by other behavioural alternatives present in the environment at a given time (Rachlin, 1997). In summary, a person's dependence behaviour is influenced by prior consumption or engagement with a substance or an activity, but at that moment as well as now, it is the individual who has chosen that consumption pattern.

Within the categories of problematic behaviours, smartphone and social media networks use is of interest to researchers in behavioural economics, as it is not based on the consumption of a substance, but on the contrary, corresponds to a behaviour of use of a service. These excessive behaviours are characterized by a marked preference for an immediate reward even though this may have very negative consequences in the future, coupled with a desire to finish or at least keep this behaviour under control, thus showing an inconsistency between this desire and a series of relapses over time (G R Foxall, 2016). However, for the present project, problematic behaviour is being considered as a kind of behaviour

maintained by the consequences with which it is associated. It is not then a qualitatively different category, but an extreme condition within a single dimension or continuous behaviour, with occasional review of notifications at one end and permanent and uncontrollable access to notifications at the other. Within this line of research, the definition of these excessive behaviours is based on the high preference of users for a behaviour that generates immediate consequences with a high utility but that in the long term is associated with very harmful effects on a personal, social, and even financial level. Therefore, it is stated that these individuals show a high rate of temporal discounting related to the future consequences associated with alternative behaviours, which is evident in that, despite trying to change their behaviour and feel guilt and remorse for it, when the opportunity presents itself, the person falls back on the consumption behaviour that generates an immediate positive consequence but that in the long term will bring important inconveniences in the levels mentioned above. Thus, it is argued that these people have a strong tendency to devalue the consequences of their behaviour in the long term. Therefore, these kinds of situations correspond to the concept of delay discounting, which is defined as the devaluation of the future consequences of behaviour. As the consequence moves away in the future, the less influence it has on the present decision (Madden & Johnson, 2010).

The high discount on the subjective value of future consequences is associated with impulsive choice, which consists in the preference for a small but immediate instead of a larger but more distant outcome (Ross et al., 2008). There is evidence that steep delay discounting is associated with different problems that have a high social impact, at the level of both substance abuse and behavioural addictions (MacKillop et al., 2011), obesity (Davis et al., 2010) and other healthy prevention behaviours (Daugherty & Brase, 2010). This type of evidence indicates that there is a reliable relationship between steep delay discounting and a set of behaviours that result in adverse effects on health in the long term, thus becoming a process that occurs transversally to these problematic behaviour patterns (Rung et al., 2018). It is therefore relevant to apply the principles of behavioural economics to these

everyday choice behaviours that shape short- and long-term consequences for adolescent and young adult users. It has been suggested that during this period of development, individuals face significant physical and emotional changes, as well as being exposed to potentially risky behavioural choices, such as unsafe sexual behaviour and substance use. These impulsive behaviours can have important effects on their long-term well-being (Klein et al., 2020). Although behavioural economics concepts have so far been applied to the identification and improvement of behaviours in adolescents and young adults in three main areas: overweight and obesity, substance abuse and medication adherence, there is great potential to be applied to impulsive choices in the use of information technologies, such as the use of social media networks (Huynh & Wisk, 2022).

While teenagers and young adults face both positive and negative consequences of their social media consumption behaviour, children represent another population group that is also vulnerable to the dark side of another mobile marketing technique: digital advertising. Alongside their parents and caregivers, children have been one of the largest adopters of information technologies, particularly through devices such as tablets and smartphones (Reijmersdal & Rozendaal, 2020). Through these they have been able to access, whether supervised or unsupervised, thousands of possible sources of entertainment, games, and information. Added to this is the fact that, being of a personal use nature and easily accessible due to their portability, children are also a target for organisations seeking to personalise their experiences and through these, digital advertising and entertainment content with embedded persuasive messages (Steffi De Jans & Hudders, 2020).

As users of these mobile platforms, children are exposed to significant amounts of advertising, in terms of frequency and duration. An exploratory study in this area found that children consume services such as Instagram, YouTube, and games on a daily basis, with a mobile advertising exposure time of 14 minutes every hour, a value that exceeds exposure to advertising in traditional media such as television (Feijoo-Fernández et al., 2020). This high exposure to persuasive content by brands

has turned mobile advertising to children and teenagers into a multibillion-dollar revenue stream for the big tech platforms. These new formats include sponsored content posted by influencers, massive data collection, persuasive design, and behavioural marketing, powered by the recent development of machine learning algorithms. In this highly vulnerable context, parents and caregivers must have the knowledge and tools to best mediate this interaction between mobile advertising and children. Evidence suggests that high exposure to this type of marketing communication is associated with unhealthy behaviours such as the consumption of high-calorie and low-nutrient foods, sugary drinks, tobacco and e-cigarette use, and even alcohol and psychoactive substance use (Radesky et al., 2020).

This context becomes even more complex as new digital brand communication formats have been incorporating more persuasive messages embedded in entertaining content, particularly in the posts made by influencers on social media. This has made it increasingly difficult to draw the line between what is considered advertising and what is entertainment content. Therefore, the challenge for parents is ever greater, as they must overcome their own limitations in terms of knowledge of technological platforms, to which must be added knowledge about these new forms of persuasive communication aimed at children and adolescents. The mediation challenge for parents is further increased by the fact that children have access to mobile devices at a younger age (UNICEF & ITU, 2020).

A central concept to address this phenomenon is that of advertising literacy (AL), which consists of the knowledge and attitudes that consumers have regarding the motives, mechanisms and tactics used by brands through advertising communication pieces (De Pauw et al., 2019). The theoretical model most developed in recent years proposes three dimensions for AL. Firstly, the conceptual or cognitive dimension consists of the ability to identify the presence of an advertising message, along with the commercial motivation of the sender to persuade the consumer to create or modify his or her attitude towards a specific brand. Secondly, the moral dimension refers to whether the advertising is

considered appropriate for the target audience and whether the message is considered relevant or valid for obtaining information from the brand. Thirdly, there is the attitudinal or affective dimension, which refers to the consumer's capability to face persuasive communication with a critical sense and scepticism, which allows them to assume a position in favour or against the brand's message (Van Dam & Van Reijmersdal, 2019).

It is therefore relevant to study the level of advertising literacy of parents, particularly in emerging countries, since research in this area has focused on children and adolescents, who are directly addressed by these new marketing communication formats. However, addressing this construct in parents can provide information that can better guide public policies aimed at IT and digital content skills training, as well as the self-regulation policies of large media conglomerates and digital platforms. The possible relationship between advertising literacy and parenting styles has also been identified as a gap in the literature, so a contribution in this sense would provide relevant information to identify whether certain parenting styles are associated with higher or lower levels of AL, thus allowing the formulation of recommendations to address each subgroup of parents with different strengthening mechanisms in the dimensions of AL.

As has been mentioned above, there is still the need to perform more research from a theoretical perspective about digital consumer behaviour issues, in order to support decision-making in organisational and management science, specifically those related to the marketing function. In particular, this thesis seeks to contribute to the study of some of the priority topics proposed by the Marketing Science Institute (MSI, 2022), for the period 2022-2024. These include, firstly, "Data challenges from business disruption and missing information", given that in recent years marketing has been incorporating the use of big data and analytics, and more recently with major changes in the regulatory environment, organisations now face several challenges in their policies and actions related to data capture and privacy levels of their users. On the other hand, the second chapter addresses a topic that

is related to the priority "Regulatory and public policy issues affecting member companies", since organizations today face the challenge of changes in regulations regarding the use of cookies and third-party data adopted by tech giants Google and Apple. For this purpose, three relevant issues have been identified in this context.

Firstly, we sought to identify the relationship between the time spent using mobile apps and the level of impulsivity of young adult users, in the context of an intertemporal choice task. This gap in the literature was addressed by identifying the relationship -through different techniques- between the level of use of smartphones and apps and a pattern of impulsive choice, characterized by favouring positive yet immediate consequences. To achieve this, measurement techniques were considered to determine the level of use of these mobile digital services, as well as the methods to establish a choice pattern (self-controlled or impulsive). Although this approach can be considered exploratory, it may offer relevant information on the impact of the use of this technology in other types of choice behaviours.

Secondly, and based on the increase in the use of mobile platforms by children and adolescents, we sought to identify the level of parental advertising literacy with respect to this new context of digital interaction between brands and their children. This gap is magnified by a lack of adequate mediation from parents, their poor advertising literacy skills, and the increased penetration of digital devices among the children’s population. Some authors have highlighted the key role of parents in ensuring the safe use of information technologies by their children. This socialization process occurs through modeling behavior, as children observe their parents' use of these technologies (Jayakumar & Janaki, 2018; Plowman, 2015). Therefore, this objective attempt to collect empirical information regarding parents’ literacy on advertising, particularly concerning mobile devices, as this field has hardly been explored in emerging countries.

And thirdly, it sought to contribute to the literature on possible intervention mechanisms to moderate the time spent using social media networks, based on the application of behavioural economics principles, which allow for the establishment of alternative incentives that reinforce a decrease in the time spent using these digital platforms. In particular, applying the concept of temporal discounting to the study of the phenomenon, we sought to establish the relationship between dependence and time of use and a tendency toward impulsivity, measured through scales or intertemporal choice task procedures (Peng et al., 2022; West et al., 2021). Few studies seek to explore alternatives for reducing dependence or time spent on digital platforms based on these principles. Also, limited research has explored how to establish the relative reinforcement value of a monetary reward over the option to use social media networks. Therefore, the aim was to contribute to the growing literature on interventions based on the principles of behavioural economics (Gilroy & Kaplan, 2020; Gilroy & Picardo, 2022).

Based on the literature review and the formulation of the problems described above, the doctoral thesis was prepared with a structure by compilation of research papers. This is followed by the three research questions, the general objective, and the specific objectives, as well as a description of the methodologies applied and the literature review of the three studies that constitute the thesis document.

1. IDENTIFICATION OF THE RESEARCH PROBLEM:

Based on the introduction outlined above, the present thesis is formulated to address three main questions:

1. Is there a relationship between the level of smartphone and app use and a pattern of impulsive choice, characterised by a preference for smaller but immediately accessible consequences?
2. What is the level of Mobile Advertising Literacy of parents with children between 5 and 16 years, in three Spanish-speaking countries: Mexico, Spain, and Colombia?

3. What is the relative reinforcement value of monetary rewards versus different time periods of social media networks use?

2. GENERAL AND SPECIFIC OBJECTIVES:

To answer these questions, the following general objective arises: To establish how the use of social media apps and mobile advertising relate to behaviours such as app dependence, level of mobile advertising literacy and the level of relative reinforcement versus a financial reward, across different stakeholder groups.

The following specific objectives are also proposed, according to each of the three questions outlined:

1. *Is there a relationship between the level of smartphone and app use and a pattern of impulsive choice, characterised by a preference for smaller but immediately accessible consequences?*
   - 1.1. To identify whether smartphone and app usage time is related to impulsive or self-controlled behaviour in an intertemporal choice task.
   - 1.2. To establish the relationship between smartphone and app usage time and users' perceived dependence.
   - 1.3. To determine the relationship between users' perceived level of dependence and impulsive or self-controlled choice behaviour in an intertemporal task.
2. *What is the level of Mobile Advertising Literacy of parents with children between 5 and 16 years, in three Spanish-speaking countries: Mexico, Spain, and Colombia?*
   - 2.1. To establish the level of Mobile Advertising Literacy (MAL) of parents in their role as mediators between children and mobile advertising.
   - 2.2. To identify the dimensions that compose the construct of mobile advertising literacy in a sample of parents of children between 5 and 16 years of age.

2.3. To determine the relationship between the conceptual, moral and attitudinal dimensions of mobile advertising literacy and parental control styles.

3. *What is the relative reinforcement value of monetary rewards versus different time periods of social media networks use?*

3.1. To establish the relative reinforcement value of a monetary reward (utilitarian reinforcement) compared to the use of social media networks (informational reinforcement).

3.2. To identify whether the choice between a monetary reward and the use of social media networks is sensitive to the delay in delivery time and the magnitude of the alternative reinforcer (monetary reward).

3.3. To determine the relationship between daily social media networks usage time and the level of dependence reported by users.

Based on the scope of the research questions posed, the following hypotheses are formulated:

1. *Is there a relationship between the level of smartphone and app use and a pattern of impulsive choice, characterised by a preference for smaller but immediately accessible consequences?*

H1. As the usage time of smartphones and apps increases, users will present greater impulsiveness in the intertemporal choice task.

H2. As the usage time of smartphones and apps increases, dependence on smartphones will become greater.

H3. As the dependence on smartphones becomes greater, the impulsiveness in the choice situation will be greater.

2. *What is the level of Mobile Advertising Literacy of parents with children between 5 and 16 years, in three Spanish-speaking countries: Mexico, Spain, and Colombia?*

H1. There are differences in the level of advertising literacy based on parental control style reported by parents with children aged between 5 and 16 in Spanish-speaking countries.

H2. There are differences in the level of parental advertising literacy depending on the country of origin.

3. *What is the relative reinforcement value of monetary rewards versus different time periods of social media networks use?*

H1. There is a significant effect of the delay in delivery and the magnitude of alternative (monetary) reinforcement on choice within the Multiple-Choice Procedure (MCP).

H2. There is a positive correlation between the amount of time spent daily using social media networks and the level of dependence on these applications reported by participants.

Based on the achievement of these objectives, the thesis contributed, on a conceptual level, to the understanding of the relationship between the use of mobile applications, particularly social media networks, and user behaviour at various levels. Firstly, on the level of self-control or impulsivity associated with usage time and the level of dependence reported by users. Secondly, on the level of mobile advertising literacy of parents of children and adolescents, a population that is vulnerable to the marketing tactics developed by brands in mobile apps. And finally, on the level of relative reinforcement of a monetary reward as an alternative to the use of social media networks, something that can provide information for the development of possible interventions that seek to reduce the daily usage time of these applications in young adults.

In terms of the disciplinary approach, the results of this thesis provide relevant information to incorporate into social responsibility, self-regulation, human resources wellbeing, and user relationship management policies, in terms of the impact of the use of these mobile applications, firstly, on the level of self-control or impulsivity in users choices, secondly, on the process of socialisation of mobile advertising between parents and children and on the role that alternative reinforcers can play in a possible intervention programme that seeks to reduce the time spent using social media networks. At the social level, the thesis will provide useful

information for governmental and consumer protection agencies to work together with companies in the IT sector, particularly those operating social media networks, to develop actions to inform users of possible negative effects on their behaviour and well-being, or to intervene in the relationship with users not only with regard to time of use but also with regard to awareness (literacy) of marketing tactics such as mobile advertising.

3. METHOD:

This chapter aims to indicate the methodological framework applied to obtain the information needed to answer the research questions posed. With respect to the first research question, which sought to identify the relationship between the level of smartphone and app usage and an impulsive choice pattern, the starting point was the need to incorporate an objective measurement of smartphone and app usage time, which led to the selection of an app that could accurately record these usage times. In turn, to establish the self-controlled or impulsive choice pattern of the participants, an intertemporal choice task was designed. This is a technique based on the principles of behavioural economics that, through a series of discrete choice behaviours, allows us to establish the level of preference for smaller consequences that are obtained immediately (impulsive choice), or for larger consequences that take time to obtain (self-controlled choice). In order to contrast the results with those reported in the literature from screening scales, we also applied a scale of dependence on smartphone use validated for the Spanish language. In this way, we contributed to the study of smartphone and app usage by incorporating an alternative objective measurement of usage time, which, together with an intertemporal choice task, allows for a novel approach to this problem.

For the second research question, which sought to identify the level of mobile advertising literacy, the dimensions of this construct for the context of mobile advertising, and the relationship of this with the types of parental control, a questionnaire was designed that included a set of items adapted from the literature on advertising literacy in traditional media or for the context of digital advertising in

Web environments, as well as items to measure parental style. The aim of this development was to contribute methodologically and conceptually to the study of the construct of advertising literacy, now for the context of mobile digital brand communication and with a population that has not been studied so far, the parents of children between 5 and 16 years old, who have an important mediating role in the effect of mobile advertising on their children.

Finally, for the third research question, which sought to identify the relative reinforcement value that different magnitudes of monetary remuneration may have on the choice of whether or not to use social networks for a certain period of time, another technique based on the principles of behavioural economics, called the Multiple Choice Procedure (MCP), was adapted to this area. This technique had previously been used to establish the relative reinforcement value of a monetary reward in exchange for not using psychoactive substances or not gambling. This contributes to the literature on possible mitigation mechanisms for excessive social media networks use in young adults.

In order to present in a summarised form the elements that make up the methodology of the three studies carried out, Table 3 presents the methodological congruence matrix.

Table 0-3: Methodological Congruence Matrix.

Theme: Digital Consumer Behavior: dependence, relative reinforcing value and literacy in the context of social media apps and mobile advertising.
General Objective: To establish how the use of social media apps and mobile advertising relate to behaviours such as app dependence, level of mobile advertising literacy and level of relative reinforcement versus financial reward, across different stakeholder groups.
Research Questions: 1. Is there a relationship between the level of smartphone and app use and a pattern of impulsive choice, characterised by a preference for smaller but immediately accessible consequences? 2. What is the level of Mobile Advertising Literacy of parents with children between 5 and 16 years, in three Spanish-speaking countries: Mexico, Spain, and Colombia? 3. What is the relative reinforcement value of monetary rewards versus different time periods of social media networks use?

SPECIFIC OBJECTIVES	WORKING HYPOTHESIS	RESEARCH QUESTIONS
1.1. To identify whether smartphone and app usage time is related to impulsive or self-controlled behaviour in an intertemporal choice task. 1.2. To establish the relationship between smartphone and app usage time and users' perceived dependence. 1.3. To determine the relationship between users' perceived level of dependence and impulsive or self-controlled choice behaviour in an intertemporal task.	H1. As the usage time of smartphones and apps increases, users will present greater impulsiveness in the intertemporal choice task. H2. As the usage time of smartphones and apps increases, dependence on smartphones will become greater. H3. As the dependence on smartphones becomes greater, the impulsiveness in the choice situation will be greater.	1. Is there a relationship between the level of smartphone and app use and a pattern of impulsive choice, characterised by a preference for smaller but immediately accessible consequences?
2.1. To establish the level of Mobile Advertising Literacy (MAL) of parents in their role as mediators between children and mobile advertising. 2.2. To identify the dimensions that compose the construct of mobile advertising literacy in a sample of parents of children between 5 and 16 years of age. 2.3. To determine the relationship between the conceptual, moral and attitudinal dimensions of mobile advertising literacy and parental control styles.	H1. There are differences in the level of advertising literacy based on parental control style reported by parents with children aged between 5 and 16 in Spanish-speaking countries. H2. There are differences in the level of parental advertising literacy depending on the country of origin.	2. What is the level of Mobile Advertising Literacy of parents with children between 5 and 16 years, in three Spanish-speaking countries: Mexico, Spain, and Colombia?
3.1. To establish the relative reinforcement value of a monetary reward (utilitarian reinforcement) compared to the use of social media networks (informational reinforcement). 3.2. To identify whether the choice between a monetary reward and the use of social media networks is sensitive to the delay in delivery time and the magnitude of the alternative reinforcer (monetary reward). 3.3. To determine the relationship between daily social media networks usage time and the level of dependence reported by users.	H1. There is a significant effect of the delay in delivery and the magnitude of alternative (monetary) reinforcement on choice within the Multiple-Choice Procedure (MCP). H2. There is a positive correlation between the amount of time spent daily using social media networks and the level of dependence on these applications reported by participants.	3. What is the relative reinforcement value of monetary rewards versus different time periods of social media networks use?

Source: Own elaboration based on the literature review.

Based on this, Table 4 shows the methodological design that was applied to address the three research problems of the thesis.

Table 0-4: Methodological Design.

Research Question	Philosophy	Theory Development	Methodological Scope	Research Scope	Strategies	Time Horizon	Sample	Techniques / Instruments
1. Is there a relationship between the level of smartphone and app use and a pattern of impulsive choice, characterised by a preference for smaller but immediately accessible consequences?	Pragmatism	Deduction	Multi-method Quantitative	Descripto-explanatory	Survey / Systematic Observation	Longitudinal / Cross-sectional	Small-N design. Collection of Smartphone usage time data throughout four weeks.	Consumer panel, computer-based choice test, smartphone addiction scale (SPAI).
2. What is the level of Mobile Advertising Literacy of parents with children between 5 and 16 years, in three Spanish-speaking countries: Mexico, Spain, and Colombia?	Pragmatism	Deduction	Mono Method Quantitative	Descripto-explanatory	Survey	Cross-sectional	Cross-country samples of varying sizes, with a predetermined quota of 200 participants for each country: Spain, Mexico and Colombia.	Online survey
3. What is the relative reinforcement value of monetary rewards versus different time periods of social media networks use?	Pragmatism	Deduction	Mono Method Quantitative	Descripto-explanatory	Survey	Cross-sectional	Young adult students between the ages of 18 and 25 years. Non probabilistic sampling procedure.	Online survey (Multiple Choice Procedure - MCP), The Social Media Addiction Scale (SMAS).

Source: Own elaboration.

8.7. Secondary Sources: Systematic Literature Review

To address the literature concerning smartphone and app usage and consumer digital behaviour, a Systematic Literature Review was conducted. The use of this method is justified in that it is a technique that contributes to facilitate the reproducibility of the results and to guarantee effectiveness in the identification of the literature more positioned and of scientific value, favouring efficiency in the research processes (Kitchenham, 2004).

Thus, in order to have a preliminary view of the volume and evolution of research on these topics, and to verify its relevance for the academic community, an analysis was made with the scientific database Scopus. As a result, the search equations presented in Table 5 were obtained.

Table 0-5: Information Search Equations used for the research development.

Research Question	Topic	Data Base	Search Date	Search Equation	Number of initial documents	Selection criteria	Number of final documents
1	Smartphones / Mobile Phones, Apps and Addiction	Scopus	29/10/2018	(TITLE-ABS-KEY ("smartphone" OR "smart phone" OR "mobile phone" OR "app" OR "apps") AND TITLE-ABS-KEY (addict*))	918	1. The document deals with problematic use, dependence or addiction to smartphones or apps. 2. The study does not have a psychiatric or pharmacological perspective. 3. The study is in the three year window of observation.	233
1	Temporal Discounting / Intertemporal Choice / Smartphones or Apps	Scopus	19/01/2019	(TITLE-ABS-KEY (internet OR digital OR smartphone OR mobile OR smart* OR tech* OR comput*) AND TITLE-ABS-KEY ("temporal discounting" OR "intertemporal choice"))	183	1. The document deals with temporal discounting or intertemporal choice applied to smartphones or apps. 2. The study does not have a psychiatric, pharmacological, or neuroscience perspective. 3. The study is in the three year window of observation.	32
2	Children / Mobile Marketing / Mobile Advertising / Digital Advertising	Scopus	15/08/2019	(TITLE-ABS-KEY (child* AND marketing OR advertising) AND TITLE-ABS-KEY (mobile OR digital)) AND (EXCLUDE (SUBJAREA , "MEDI"))	203	1. The document deals with mobile marketing or mobile advertising in the context of children as users of apps and websites. 2. The study does not have a psychiatric or neuroscience perspective. 3. The study is in the three year window of observation.	35
2	Advertising literacy / Smartphone / Mobile marketing	Scopus	20/082019	TITLE-ABS-KEY ("advertising literacy" AND internet OR online OR mobile OR smartphone)	18	1. The document includes children and/or parents as participants. 2. The document reports an empirical study. 3. The study is in the three year window of observation.	10

Research Question	Topic	Data Base	Search Date	Search Equation	Number of initial documents	Selection criteria	Number of final documents
3	Temporal Discounting / Behavioral Economics / Social Media / Apps	Scopus	4/10/2021	(TITLE-ABS-KEY ("temporal discounting" OR "behavioral economics" OR " behavioural economics" OR " hyperbolic") AND TITLE-ABS-KEY ("social media" OR app*) AND TITLE-ABS-KEY (marketing))	148	1. The document deals with temporal discounting or behavioural economics applied to marketing, advertising or social media issues. 2. The document reports an empirical study. 3. The study is in the three year window of observation.	23
3	Temporal Discounting / Behavioral Economics / Addiction / Problematic Use	Scopus	4/10/2021	(TITLE-ABS-KEY (temp* OR discount* or "behavioral economics" OR " behavioural economics" OR " hyperbolic") AND TITLE-ABS-KEY (addict* OR "problematic use" OR dependenc*)) AND (LIMIT-TO (SUBJAREA , "PSYC") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "BUSI"))	41	1. The document deals with temporal discounting or behavioural economics in the context of addiction or problematic use issues. 2. The document reports an empirical study. 3. The study is in the three year window of observation.	13

Source: Own elaboration based on the search executed in the scientific databases SCOPUS.

1. Does excessive use of smartphones and apps make us more impulsive? An approach from behavioural economics[1]

1.1 Introduction

The use of smartphones has increased significantly in recent years, allowing not only immediate communication with other people -phone calls, texting and social media- but also facilitating daily task-oriented activities, such as online banking or m-commerce (Kim et al., 2018). In 2019, the average time of daily internet use at global level was of 6 hours and 43 minutes (Kemp, 2020), with mobile devices accounting for more than half of this consumption, estimated at 3 hours and 40 minutes, and mobile applications (apps) representing more than 90% of the total mobile activity time (App Annie Intelligence, 2020). Studies conducted almost a decade ago showed that mobile phones were having a positive impact on users at level of social interaction, improvement of quality of life and inclusion of vulnerable populations with apps which enabled immediate communication, access to educational tools and content, betterment of physical activity, disease treatment (m-health), improved equity and accessibility in urban mobility, and global connectivity. However, studies published recently have focused on the possible negative effects

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of the use of smartphones, producing an increased amount of evidence in terms of the existence of a series of negative consequences related to excessive use of smartphones, including sleep disorders, anxiety, depression (S. Lee et al., 2018; Lian et al., 2016), nomophobia (Arora & Chakraborty, 2020), and negative consequences in the workplace, such as work-home interference and burnout symptoms, specifically among heavy users of smartphone after work hours (Derks & Bakker, 2014) and in academic settings, due to decreased academic performance associated with sleep issues, lack of concentration, stress and anxiety (Samaha & Hawi, 2016). On the other hand, a more recent research trend has inquired into the habits and frequency of use of smartphones in different countries. For instance, a study in Spain established that users check their smartphone an average of 150 times a day; in addition, 80% of the participants indicated that, when they sleep, the device remains next to the bed (Simó-Sanz *et al*., 2018). Another study in the United States measured the use of smartphones for a week and found -for a sample of adolescents- that the average daily use of smartphones was of 243 minutes, that is, a little more than four hours a day, and the number of screen unlocking actions was 88 times a day on average (Rozgonjuk et al., 2018). A different study found that 60% of users cannot spend an hour without checking the notifications on their smartphone, 54% use this device while lying in bed and 30% use it very often while having a meal with other people (Hussain *et al*., 2017).

In terms of the relationship between an excessive use of smartphones and the negative consequences mentioned before, some authors have identified symptoms in heavy users which are similar to those observed in patients who are addicted to different substances (Billieux, 2012). In fact, many studies have addressed problematic smartphone use from a psychiatric perspective, seeking to correlate the dependence levels measured through self-reports that have psychological variables (psychological traits) by applying scales that have been well established in the literature (Y.-K. Lee et al., 2014; Nahas et al., 2018). However, in the first place, these studies have only used data attained through cross-sectional designs and have failed to incorporate objective and longitudinal measurements

concerning the use of smartphones; in the second place, they have applied self-report scales to establish a possible addiction, disregarding alternative methodologies. In addition, there is a lack of consensus regarding whether the existence of an addiction or, more specifically, a behavioural addiction can be considered (Panova & Carbonell, 2018; Yu & Sussman, 2020). Furthermore, very few studies have addressed this issue from a behavioural perspective to establish if users who use smartphones for a longer time have low levels of self-control. This means that individuals who show problematic smartphone use may be characterized by a noticeable preference for a behaviour that generates immediate consequences with high utility (entertainment or social interactions) but that in the long term is associated with very harmful effects on personal, social and even financial levels (G R Foxall, 2016). These situations correspond to the concept of delay discounting, defined as the devaluation of future consequences of behaviour. As the consequence moves further into the future, it has less influence over the present decision (Madden & Johnson, 2010). The changes that occur in the subjective value of the alternatives at different moments of time are known as intertemporal choices. Through this process, a subjective value of the reward is established, combining its magnitude and the delay with which it will be delivered (Peters & Büchel, 2011). Therefore, this study seeks to address this gap in the literature, establishing a possible relationship -through different techniques- between the level of use of smartphones and apps and a pattern of impulsive choice, characterized by favouring positive yet immediate consequences. To achieve it, it is convenient to take into account the measurement techniques used to determine the levels of use of these mobile digital services, as well as the methods to establish a choice pattern (self-controlled or impulsive). Although this approach can be considered exploratory, it may offer relevant information on the impact of the use of this technology in other types of choice behaviours.

Regarding the identification of levels of use, and specifically those of the heavy users, recent studies have incorporated techniques for measuring the use of smartphones that allow access to objective data: from the use of apps designed to

measure the device's usage time to apps that count the number of screen unlocking actions occurring during the day (Esmaeili Rad and Ahmadi, 2018; Rozgonjuk *et al.*, 2018; Wilcockson *et al*., 2018). This type of measurement has been suggested as an alternative for comparing results with those of previous cross-sectional studies (Meng et al., 2020). More importantly, though, is the recent finding indicating that there is a significant difference between the users' self-reported data and the usage data automatically collected by these apps (Lee *et al*., 2018). Thus, this study sought to explore whether heavy smartphone users show a tendency to devalue the consequences of their behaviour in the long term by examining the relationship between the usage time of their smartphone and some categories of apps and data from a consumer choice task as a measure of self-control as well as data from a well-established screening test for problematic smartphone use. It is expected that it could contribute to an understanding of this phenomenon by contrasting a more contextual approach, typical of behavioural economics, with the psychiatric approach, characterized by posing the conception of addiction as an internal state.

1.2 Theoretical Background

Three relevant literature trends were identified for this study, the first is related to the conceptualization and theoretical frameworks applied to the study of smartphone addiction. The second deals with the background of behavioural economics in order to address phenomena of excessive consumption, particularly in the sphere of services, which, from the perspective of psychiatry and clinical psychology, correspond to behavioural addictions. And the third is related to the background in the study of the recent concept of problematic smartphone use. This review intends to establish the background in the study of the phenomenon, key aspects of each stance and the way in which the phenomena of problematic smartphone use can be related with a more impulsive choice behaviour pattern. The following are the three sections and their respective hypotheses.

1.2.1 Conceptualization and Theoretical Frameworks Applied to the Study of Smartphone Addiction

There are several definitions related to this category of behaviour within the academic literature, including, initially, the concept of mobile phone addiction, which consists of a lack of ability to control the desire to use the mobile phone (Walsh et al., 2010). Subsequently, the concept rapidly evolved towards smartphone addiction, which is defined as the inability to control the impulse to excessively use the smartphone, with consequent negative results for the user's quality of life (Sun et al., 2019). More recently, the term problematic mobile phone use (PMPU) emerged to account for this phenomenon. However, the definition does not differ much from that previously provided for mobile phone addiction. So, problematic use has been defined as the inability to regulate the use of the mobile phone, which generates negative consequences in the daily life of the individual (Billieux, 2012). Despite the variability in the phenomenon's characterization, some studies provide a theoretical foundation for the possible addiction to the smartphone. In the first place, the general strain theory proposes that problematic or excessive behaviours are due to the negative consequences caused by high levels of stress coming from different sources. The lack of achievement of goals, the inability to maintain stimuli that are positive for the person, as well as exposure to situations perceived as negative, constitute sources of stress that can trigger addictive behaviour (Agnew, 2001). It is important to note that this theory was initially developed for the interpretation of criminal behaviours and was later applied to the field of addictive behaviours (Jun & Choi, 2015). Therefore, according to it, excessive use of smartphones comes from high levels of stress perceived by users (Gao et al., 2018; Liu et al., 2018).

Secondly, the relationship between self-control and smartphone addiction has been proposed as a theoretical possibility in this field. Specifically, the theory of self-regulation states that the lack of self-regulation in the use of smartphones is due to low self-control, which makes users unable to counteract the craving to interact with the device, which, by the way, is almost always available to be used (Gökçearslan

et al., 2016). A third theoretical framework is the compensatory Internet use theory (CIUT) (Kardefelt-Winther, 2014), this theory states that addictive behaviours are generated by different motivations, among which the most important is stress. People who perceive high levels of stress can find a solution to alleviate that negative emotional state in the use of technology, in this case in digital services available on their smartphone. This can drive people who have high levels of depression or anxiety to increased use of the smartphones with the intention to relieve perceived stress and thus regulate their emotional states. Therefore, according to this theory, the use of smartphones would become an alternative to escape stress and its negative consequences (Rozgonjuk et al., 2018).

Other efforts have been channelled to the exploration of possible mediating variables for problematic smartphone use; those that have received most attention so far are sex and age. With respect to sex, it has been found that men tend to use smartphones for communication in a business or professional context, while women use it for general networking (Y.-K. Lee et al., 2014); as for university students, factors associated with smartphone addiction in men include the use of game apps, poor sleep quality and anxiety, and in women the use of multimedia and social media apps, depression and anxiety (B. Chen et al., 2017). However, recent review articles have suggested that the evidence of possible gender-based differences is not conclusive (Busch & McCarthy, 2021; Cho, 2020). Furthermore, regarding age, it has been suggested that the younger population has higher prevalence of problematic smartphone use. In fact, a considerable amount of studies have focused on adolescents and young adults (Aslam et al., 2018; C.-Y. Chen, 2018; Liu et al., 2018; Sun et al., 2019).

Despite increased literature on the topic, especially since 2017, there is no unifying theory given the phenomenon’s complexity (Yu & Sussman, 2020), which can be added to the methodological challenges to define valid measurements of the use of smartphones and apps. Addressing these aspects would allow identifying factors that could contribute to the interpretation of excessive use of smartphones from

alternative theoretical perspectives and measurement techniques that would go beyond survey-based self-reports (Busch & McCarthy, 2021; Wilmer et al., 2017). In that sense, advances in behavioural economics can contribute to understanding this major topic amidst this new technologically-advanced era.

1.2.2 The Behavioural Economics Approach to the Study of Excessive Consumption

The behavioural economics approach considers addiction or dependence as a pattern of choosing one behaviour over others available at a time in a particular context, so that it is possible to influence it through rewards and costs associated with each behavioural alternative (Ross et al., 2008). Therefore, it is possible that heavy smartphone users show a high rate of temporal discounting related to future consequences associated with alternative behaviours, which may be evident in the anxiety, sleep, work, and academic performance problems mentioned above.

Consumers face daily multiple-choice situations involving different rewards with different discounting intervals. In their simplest form, these situations entail choosing between an option that provides a small but sooner reward (SSR) and another that offers a larger but more delayed option (larger later reward or LLR) (K B Arfer & Luhmann, 2015). These situations can be routine decisions such as choosing between eating an ice cream (SSR) or staying on a diet (LLR), saving to pay for college tuition (LLR) or going out for an expensive meal with friends (SSR), taking a day off at the club or studying for an exam the next day.

In terms of methodology, research on temporal discounting has applied a procedure known as intertemporal choice task, in which participants must choose between two monetary rewards (hypothetical or real), one is immediately available (SSR) and the other, of greater magnitude, is available at a future time (LLR). This procedure implies that the SSR is modified successively in each trial while the LLR is kept constant. Results have allowed establishing the current subjective value of an SSR that is equivalent to the LLR, that is, it is indifferent to the person, over a

series of specific delay discounting values (Critchfield & Kollins, 2001). With respect to hypothetical or real rewards, evidence in the literature indicates that there are no significant differences in the choice patterns between these two conditions (Whelan & McHugh, 2010).

Results of research on temporal discounting indicate that high discount on the subjective value of future consequences is associated with an impulsive choice, which consists of the preference for a small but immediate result instead of a larger but more distant outcome (Daugherty & Brase, 2010; Davis et al., 2010; MacKillop et al., 2011; Ross et al., 2008). There is evidence that steep delay discounting is associated with different problems that have high social impact at the levels of substance abuse and behavioural addictions (MacKillop et al., 2011), obesity (Davis et al., 2010) and other healthy prevention behaviours (Daugherty & Brase, 2010). This type of evidence indicates a reliable relationship between steep delay discounting and a set of behaviours that result in adverse effects on health in the long term, thus becoming a process that occurs transversally to these problematic behaviour patterns (Rung et al., 2018). However, another behavioural trend, known as preference reversal, occurs along with temporal discounting. The two are closely related yet not identical. Preference reversal corresponds to the choice of the alternative that offers an immediate reward, reflecting rejection of the waiting time for the option that provides a bigger reward but one that is distant in time, while steep discounting implies an abrupt reduction of the subjective value of the LLR because it will not be available for a considerable time (G R Foxall & Sigurdsson, 2012). Therefore, it is relevant to establish whether the usage time of smartphones and apps may be related to more impulsive choice behaviours given that frequent use of devices may favour a pattern of behaviours that values the immediate experience of access to information, entertainment or socialization provided by apps to the detriment of other behaviours that offer greater long-term benefits. Therefore, we hypothesize that:

H1. As the usage time of smartphones and apps increases, users will present greater impulsiveness in the intertemporal choice task.

Accordingly, it is relevant to consider the advances in the study of addictions carried out in the research programme of behavioural economics, particularly from the theoretical and methodological perspectives in the study of temporal discounting (Peters & Büchel, 2011; Rung et al., 2018). This approach enabled the researcher to carry out longitudinal studies based on real use data for both smartphones and apps.

1.2.3 Problematic Smartphone Use

Although a problematic use of mobile phones was already under consideration at the beginning of this decade (Walsh *et al*., 2010), the concept rapidly evolved towards problematic smartphone use (PSU), defined as the inability to regulate the use of a smartphone, which generates negative consequences in the user's daily life, including aspects related to behaviours in certain contexts and to potential negative consequences of inappropriate or excessive use, which include negligent use (i.e., use while driving), use in prohibited places (e.g. theatres and libraries) and dependence on the use of the device, which leads to an excessive need for use that becomes evident, for example, in the constant checking of notifications (Billieux, 2012; Shankar, 2016; Lopez-Fernandez *et al.*, 2018; Barnes *et al*., 2019; Sun *et al*., 2019).

Another important aspect concerns the growing interest of many authors in developing different measurement instruments to establish the prevalence of a possible addiction or problematic smartphone use. Some of the scales applied in recent studies include the Mobile Phone Addiction Index (MPAI) (Liu et al., 2018), the Smartphone Addiction Inventory (SPAI) (Simó-Sanz *et al*., 2018), the Test of Mobile Dependence (TMD) (Fransson *et al*., 2018), the Smartphone Addiction Scale (SAS) (Laurence et al., 2020; Rozgonjuk et al., 2018; Sun et al., 2019), the Mobile Phone Problematic Use Scale (MPPUS) (Nahas et al., 2018), as well as scales designed to measure related constructs such as nomophobia (Yildirim & Correia, 2015). These scales, by definition, are based on the interviewee's self-reporting to establish not only the incidence of problematic use but also the personality traits that may be associated with such behaviour. Therefore, mainstream research on

the subject has focused on searching for relationships between personality factors and level of use reported by participants. Based on this background, some authors have raised the need for further research to objectively establish the usage time of smartphones and the implications that this has for the concepts of addiction and problematic use and the theories that can account for this phenomenon (Esmaeili Rad and Ahmadi, 2018; Wilcockson *et al*., 2018; Meng *et al.*, 2020). Therefore, it is essential to explore the relationship that may exist between usage time of smartphones and apps, measured objectively within a longitudinal time frame, and smartphone dependency levels, measured through a screening test. Thus, we propose the following hypothesis:

H2. As the usage time of smartphones and apps increases, dependence on smartphones will become greater.

A more recent line of research suggests that possible problematic use takes place not only in terms of the physical device as such but in relation to the content and the activities that the users perform in it. Therefore, the combination of smartphones' technological attributes, such as portability, connectivity and personal use, coupled with access to information, content, socialization and other multiple benefits offered by web browsing and apps, has led to a global increase in usage according to the aforementioned statistics. In that regard, authors such as Panova and Carbonell (2018) and (S J Barnes et al., 2019) have mentioned the need to start investigating whether what actually exists is problematic use of the device or, on the contrary, of the contents or apps to which users have access, as well as the relationship that exists between these two behaviours: use of the smartphone and use of the apps and web browsing. In a recent study, which maintained the conceptual stance of addiction, differences were sought between the level of addiction to smartphones and the level of addiction to social networking apps, finding that there is greater addiction to smartphones than to social networking apps, with significant differences according to the users' educational attainment (Barnes *et al*., 2019). This raises the possibility that a high level of dependence on

smartphones may be related to higher levels of impulsive responses, which is why we propose the following hypothesis:

> *H3*. As the dependence on smartphones becomes greater, the impulsiveness in the choice situation will be greater.

Taking the aforementioned background into account, this research aims to establish the relationship of smartphone and mobile apps usage behaviour with the consumer's choice behaviour in a situation of temporal discounting. Thus, the main objective of the study is aimed at establishing if there are differences with respect to the temporal discounting (impulsiveness) in a situation of choice for users who have different levels of use or dependence on smartphone or mobile apps. That is, it seeks to understand the way in which consumers' choice behaviour is influenced by the level of dependence on smartphones or apps. In order to follow this objective, the next section describes the applied methodological strategy, results obtained for each of the hypotheses, and discussion and conclusions, emphasizing on the implications at theoretical and methodological level.

1.3 Research Methodology

1.3.1 Design

This study adopted a pragmatic, deductive and quantitative approach, applying a cross-sectional survey design (Creswell, 2013) and a longitudinal measurement based on real use data for both smartphones and apps (Esmaeili Rad & Ahmadi, 2018; Grimaldi-Puyana et al., 2020; Rozgonjuk et al., 2018; Wilcockson et al., 2018). This, together with the possibility of applying a methodology that contains a delay discounting task (Tang et al., 2017), allowed the comparison of these results with those obtained through a screening scale (Simó-Sanz et al., 2018). To do so, a cross-sectional survey was conducted in the first place to measure smartphone dependence. It was followed by an intertemporal choice task to establish participants' level of self-control and impulsiveness. Then, a behavioural record of longitudinal nature was applied to obtain objective measurements of

usage time of the device and apps. Other methodological aspects of interest are described below.

1.3.2 Participants

The study was conducted in Bogota, Colombia and the sample consisted of twenty students from Politecnico Grancolombiano, a large private university (thirteen women, average age = 21.2 years, range = 19–26). They were recruited through a call to the main campus and received academic credits for their participation in the study. This sample size was deemed adequate for our analyses as extensive smartphone usage time data were collected for each participant throughout the four weeks of duration of the usage time record of smartphones and apps, which (as seen in the Measurement section) resulted in the collection of 560 data points, corresponding to the twenty participants in the 28-day period of continuous record. This can be considered a small-N design, since it attains a large number of observations of a relatively small number of participants (P. L. Smith & Little, 2018), which has been vindicated lately by psychological literature due to the fact that it allows a significant number of measurements that facilitate research of systematic and functional relationships between behavioural events manifested at the level of individual participants (Grice et al., 2017; Little & Smith, 2018; Normand, 2016). This sample design has been applied in contexts such as the use of mobile apps promoting physical activity (Rabin & Bock, 2011), the use of mobile touch-screen devices by people with developmental disabilities (Stephenson & Limbrick, 2015) and the effect of the use of smartphones on daily work–home interference (WHI) (Derks & Bakker, 2014).

1.3.3 Measurement

1.3.3.1 Intertemporal Choice Task

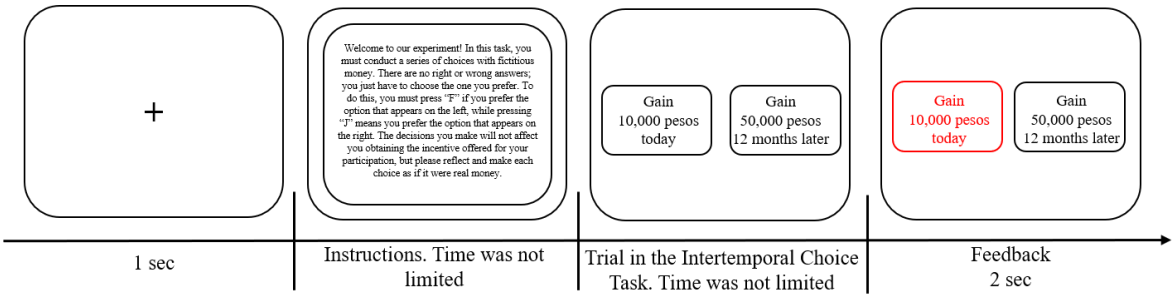
The participants were informed about the nature and procedure of the task. The instructions that they received were as follows:

Welcome to our experiment! In this task, you must conduct a series of choices with fictitious money. There are no right or wrong answers; you just have to choose the one you prefer. To do this, you must press "F" if you prefer the option that appears on the left, while pressing "J" means you prefer the option that appears on the right. The decisions you make will not affect you obtaining the incentive offered for your participation, but please reflect and make each choice as if it were real money.

The experiment was presented in E-Prime 3.0, and the task was presented in Spanish. Based on previous evidence indicating that there are no systematic differences in the degree of delay discounting estimated through the titrating sequence and fixed sequence procedures, the latter was used for the presentation of immediate rewards within each trial (Odum et al., 2006; Rodzon et al., 2011). The design of the experimental conditions used fictitious rewards, since previous evidence indicates that there are no significant differences in devaluation responses in delay discounting studies when using real or fictitious money (W K Bickel et al., 2009). As proposed by Tang *et al*. (2017), the computer-based task consisted of 63 trials, including two for participants to become familiar with the procedure. In the experimental trials, the presentation of the alternatives was counterbalanced between the left and the right of the screen and the following variables were manipulated: waiting time for small-sooner (SS) options (today, 3 and 6 months), waiting time for larger-later (LL) options (6, 9 or 12 months). The reward values for the SS options were of 5,000 pesos (about 1.5 dollars), 10,000 pesos, 15,000 pesos, 20,000 pesos, 25,000 pesos, 30,000 pesos, 35,000 pesos, 40,000 pesos, 45,000 pesos (about 13 dollars), and the reward value for the LL options was of 50,000 pesos (about 15 dollars). Through the trials, every amount from 5,000 to 45,000 pesos was repeated seven times, and the 50,000 pesos value was repeated 63 times. Thus, there were nine magnitude categories of Δ Amount (Δ represents the difference between the SS and LL reward values) and four categories of Δ Time (Δ represents the difference between waiting time for the SS and LL options). Regarding the intertemporal conditions, seven delay discounting categories were

established: 3 months vs. 6 months, 6 months vs. 9 months, 3 months vs. 9 months, 6 months vs. 12 months, today vs. 9 months, 3 months vs. 12 months and today vs. 12 months. Participants had to choose the preferred option, whichever it was it was coloured in red to indicate that the choice had been made. Figure 1 shows the sequence of visualization of the choice task displayed in the screen; in this trial, Δ Time was of 12 months and Δ Amount was of 40,000 pesos. Stimuli pairs were randomly displayed, for a total of 63 choice conditions (see Appendix I).

Figure 1-1: Procedure for a trial within the Intertemporal Choice Task.



1.3.3.2 Problematic Smartphone Use

The Spanish version of the Smartphone Addiction Inventory (SPAI), as validated by Simó-Sanz *et al*. (2018), was applied to measure the Problematic Smartphone Use reported by participants (See Appendix A). This version showed adequate levels of validity through goodness of fit indices as well as good reliability of the global inventory and each of its corresponding factors: compulsive behaviour, functional impairment, abstinence, and tolerance. The Cronbach's alpha coefficient for the SPAI was 0.94, and the Cronbach's alpha coefficient in our sample was 0.95. For the four subscales, the Cronbach's alpha coefficient in our sample was 0.87 (for compulsive behaviour), 0.87 (for functional impairment), 0.82 (for withdrawal) and 0.88 (for tolerance). The instrument consisted of 26 items, with responses given on a four-point Likert scale. Therefore, the possible scores for the inventory ranged from 26 to 104.

1.3.3.3 Measurement of Smartphone and App Usage Time

The StayFree® app (available for Android operating systems on the Google Play Store platform) was applied. This app measures daily usage time of installed apps and total smartphone usage time. It also generates valid measurements regarding the use of the smartphone (Sarun et al., 2019). Just like other apps used in similar studies (e.g. Moment®, for iOS operating systems; Rozgonjuk *et al.*, 2018), StayFree® registers the usage time for which the screen is active in each app. Each participant received personalised support for installing the app and information about how it operates in the device. Participants were told that the period of measurement would be of four weeks, thus doubling the period of measurement used by Wilcockson *et al*. (2018). Moreover, they received a demonstration on how to generate the report on the device's use, which is a file in Microsoft Excel®. The process had to be conducted once a week and the initial measurement day was the day after the app was installed. Follow-up e-mails were sent to the participants on a weekly basis as reminders of the timely delivery of reports on corresponding days. The app's report includes the days (Monday, Tuesday, etc.) in the columns, and the apps installed in the device can be found in the rows. Cells show the usage time for each app for the day in hours, minutes, and seconds. Total usage time for each app appears in the lower part of the columns, and the last row shows the device's total usage time per day. This is how the total usage time was calculated for each app and for the device in the four weeks that were recorded. All of the values were registered in seconds with the aim of having a unit of time that was amenable for the analysis.

1.3.4 Procedure

Participants who willingly became part of the study were summoned to an initial session in a computer room, during which the Intertemporal Choice Task was applied, followed by the SPAI-S. This procedure lasted for approximately 30 minutes per participant. When it ended, each person was scheduled for another session in which he or she was assisted with downloading and using the StayFree®

app and it was explained how to generate and forward the reports from the app regarding the use of the smartphone via e-mail.

1.3.5 Statistical Analysis

Statistical analyses were conducted with the SPSS 22.0 software. To test the effect of smartphone and app usage time on intertemporal choice, a logistic regression analysis was applied. This technique was used to identify the factors that allow predicting membership values of two possible groups (Hair Jr. et al., 2013). This case sought to establish whether there are factors that allow discrimination between impulsive responses (SSR) and self-controlled responses (LLR). To estimate the logistic regression equation, the logit function was calculated first; this consisted of the natural algorithm of the odds of having a positive response, in this case, self-controlled choices (LLR).

1.3.6 Ethics

The study protocol was approved by the institutional research ethics committee at Institucion Universitaria Politecnico Grancolombiano (2018-FMCAMI+286805), and all of the participants provided a written informed consent voluntarily and were able to view example data in advance.

1.4 Results

1.4.1 Descriptive Statistics

The consolidated record of all the participants showed a total of 619 different apps, with an average of 68.6 (standard deviation [SD] = 20.8) apps installed in each smartphone. The average daily hours of use were 4.1 (standard deviation [SD] = 1.79). Table I describes the top five apps with the highest usage time. These apps represent 71.2% of the total usage time of the smartphones, accounting for average daily use of 2.95 hours.

Table 1-1: Smartphone and App Usage Time.

App	Total Usage Time*	Share	Average Daily Hours of Use	Average Daily Minutes of Use
WhatsApp	2314509	27.7%	1.15	68.88
Instagram	1231187	14.7%	0.61	36.64
YouTube	1130289	13.5%	0.56	33.64
Facebook	656203	7.9%	0.33	19.53
Chrome	611541	7.3%	0.30	18.20
Total Usage Time of the Top Five Apps*	5943729	71.2%	2.95	176.90
Total Usage Time of other Apps*	2406575	28.8%	1.19	71.62
Total Usage Time of the Smartphone*	8350304	100.0%	4.14	248.52

* Usage times measured in seconds (sec.).

Source: own elaboration.

1.4.2 Effect of Smartphone and App Usage Time on Intertemporal Choice

The results described in Table I led to the identification of the apps with the highest usage time, which, along with the total usage time of the smartphone, were established as predictor variables. The data of these temporary variables were recorded in seconds to ease the analyses by providing a quantitative variable of a continuous type. On the other hand, choice was considered to be the criterion variable and had two possible responses (SSR and LLR) in each of the 63 choice situations within the intertemporal choice task. Therefore, each participant had 63 choice responses, which were coded as follows: a value of zero if the SSR alternative was chosen (impulsive response) and a value of one if the LLR alternative was chosen (self-controlled response). Age and gender were also considered as possible moderator variables. This analysis seeks to respond to H1. The data matrix consisted of 1,134 rows corresponding to the choice responses of eighteen participants, since two participants selected the SSR option (value of 0) in all of the conditions, which could affect the analysis. The results of the logistic regression are shown in Table II.

Table 1-2: Logistic Regression Results.

Factor	β	SE	Wald	df	Sig.	Exp. (β)
x1: Time on Instagram	0.000	0.000	4.866	1	0.027*	1.000
x2: Total time on the Smartphone	0.171	0.237	0.205	1	0.679	1.037
x3: Total time on the Apps of interest	0.269	0.115	0.815	1	0.604	1.165
x4: Time on Chrome	1.186	0.057	1.231	1	0.276	1.287
x5: Time on WhatsApp	0.155	0.368	0.973	1	0.693	1.004
x6: Time on YouTube	0.378	0.149	1.258	1	0.539	1.114
x7: Time on Facebook	0.282	0.233	1.116	1	0.596	1.058
x8: Age	0.089	0.032	7.61	1	0.006*	1.093
x9: Gender (female)	0.002	0.021	0.849	1	0.965	1.071
Constant	-2.119	0.720	8.664	1	0.003*	0.120
Goodness-of-fit tests	$\chi 2$		df		Sig.	
LR test	4.884		1		0.027	
Hosmer and Lemeshow test	22.785		8		0.004	
Pseudo R^2 measures						
Count R^2	0.025					
Cox and Snell R^2	0.008					
Nagelkerke R^2	0.011					
Classification Table	Predicted					
Observed	Impulsive (SSR)		Self-controlled (LLR)		Percentage correct	
Impulsive (SSR)	407		174		70.1	
Self-controlled (LLR)	349		204		36.9	
Total	756		378		53.9	

Notes: * Significant at 5 percent level.
Source: own elaboration.

The equation obtained was the following:

Ln (p / 1-p) = Log (odds in favour of self-controlled choice) = -2.119 + 0.000 Time on Instagram + 0.171 Total Time on the Smartphone + 0.269 Total Time on the Apps of Interest + 1.186 Time on Chrome + 0.155 Time on WhatsApp + 0.378 Time on YouTube + 0.282 Time on Facebook + 0.089 Age + 0.002 Gender

The results of the Wald test (Hair Jr. et al., 2013) revealed that two of the variables introduced into the model discriminated between impulsive and self-controlled choices ($p < .05$), usage time of Instagram and age. However, upon examination of the β value of the time spent on Instagram, no changes in the choice

values (β = 0.000) were observed insofar as, for every year of age (β = 0.089), there was a 0.09 increase in the probability of choosing the self-controlled choice (LLR) (Table 2, factor X8: age). These results indicate that the null hypothesis for this effect (H1) should not be rejected.

In terms of the Hosmer and Lemeshow goodness-of-fit test (*p* = 0.004), it can be concluded that, due to its significance, the model does not fit well among the frequencies of cases observed and the frequencies of forecast cases. Considering the classification adjustment foreseen in the model, Table II shows greater sensitivity to the correct classification of impulsive responses (70%), but it is extremely low for self-controlled responses (37%), with an overall percentage of 54%. On the other hand, the pseudo-R^2 measures, such as the Count R^2, Cox and Snell R^2 and Nagelkerke R^2, initially show no variance explained by the model.

1.4.3 Relationship between Smartphone and App Usage Time and Perceived Dependence on Smartphones

An initial correlation analysis was conducted to establish a relationship between the variables -corresponding to H2-. Table III shows that the dependence on smartphones (SPAI score) was correlated with the total usage time of the smartphone and with the usage time of the WhatsApp and Facebook apps.

Table 1-3: Correlations of Usage Time (SP and Apps) with Perceived Dependence (SPAI Score).

Variable	Variable Descriptors			Correlation with SPAI Score	
	Mean	St. Dev.	n	Pearson's *r* Coefficient	p-Value
SPAI Score	58.05	15.56	19	1.00	
Total Usage Time	425907.8	181927.89	19	0.51	0.02*
Chrome	30002.63	39236.08	19	0.11	0.52
WhatsApp	120198.47	79111.46	19	0.44	0.09**
YouTube	58188.42	81390.12	19	0.01	0.79
Instagram	62538.63	47181.27	19	0.11	0.81
Facebook	33930.42	39815.04	19	0.45	0.06**

** p-Value ≤ 0.05; ** p-Value ≤ 0.10.*

Source: own elaboration.

Furthermore, a multiple regression analysis was performed with the aim of proving these interactions. Thus, perceived dependence on the smartphone (SPAI score) acted as the dependent variable and the usage time of the device and apps acted as the independent variables. Table IV shows that the F value was of 5.75, which was significant at the level of 0.05 (p = 0.029). The only independent variable with a significant and positive effect was the total usage time (p = 0.029). The adjusted R^2 value was of 0.27; thus, the total usage time of the smartphone explains 27% of the perceived dependence on the smartphone. No other usage time of the apps had a significant effect on perceived dependence. Therefore, these results support the hypothesis (H2) that, as usage time of smartphones increases, perceived dependence increases as well. The equation obtained was:

Perceived Dependence on the Smartphone = 39.13 + 0.0000407 Total Usage Time

Table 1-4: Multiple Regression Analysis of Usage Time on Perceived Dependence on Smartphone.

Dependent Variable	Independent Variable	β	*t-Value*	*p*	R^2	F
Perceived dependence on smartphone	Total Usage Time	4.08E-05	2.4	0.029*	0.27	5.75**
	WhatsApp	0.19	0.75	0.462		
	YouTube	-0.43	-1.66	0.116		
	Instagram	-0.31	-1.23	0.235		
	Facebook	0.34	1.64	0.120		
	Chrome	-0.48	-0.20	0.844		

* p-Value ≤ 0.05
** Significant at 5 percent level (p=0.029)

Source: own elaboration.

1.4.4 Relationship between Perceived Dependence on the Smartphone and Intertemporal Choice

Then, a lineal regression analysis was conducted with perceived dependence on the smartphone (SPAI score) as the independent variable and the average responses given by each participant in the 63 choice conditions as the dependent

variable, which corresponds to H3. A value of 1 for impulsive responses (SSR) was assumed in this case. Table V shows that the F value was of 5.31, which was significant at the level of 0.05 (p = 0.034). Perceived dependence had a significant and positive effect on the average choice of the impulsive response (p = 0.029), as, for every increase point in the SPAI value obtained, there was a 0.5 increase in the percentage of selected impulsive choices. The adjusted R^2 value was 0.23; thus, perceived dependence on the smartphone explains 23% of the intertemporal choice. Therefore, these results support the hypothesis (H3) that, as dependence on smartphones increases, users' choice impulsiveness increases as well. The equation obtained was:

Intertemporal Choice = 0.25 + 0.005 Perceived Dependence on the Smartphone

Table 1-5: Linear Regression Analysis of Perceived Dependence on Intertemporal Choice.

Dependent Variable	Independent Variable	β	*t-Value*	*p*	R^2	F
Intertemporal Choice	Perceived dependence on smartphone	0.005	2.3	0.034*	0.23	5.31

* p-Value ≤ 0.05

Source: own elaboration.

1.5 Discussion

1.5.1 Key Findings

The objective of this study was to contribute to the literature in the area by incorporating objective measurements on usage time of smartphones and apps and applying a methodology based on behavioural economics to explore a possible pattern of impulsive choice related to increased use of smartphones and apps. Regarding this possible relationship, the usage time of smartphones or apps was found to have no effect on the users' intertemporal choice. Although the results evince a significant effect of the usage time of the Instagram app and age as mediating variables, the R^2 variables fail to show variance explained by the model when applying logistic regression as an analysis technique. These results do not

confirm the first hypothesis. An aspect to consider concerning this finding is that, as in the study by Tang *et al*. (2017), the intertemporal choice task used differed from the designs based on the titration method, which have been applied in prior studies, as described by Rodzon *et al*. (2011).

On the other hand, interestingly, a correlation was found between the total usage time of the smartphone and the WhatsApp and Facebook apps and the smartphone dependence level obtained with the SPAI-S score. This finding concurs with Rozgonjuk *et al*.'s (2018) finding in terms of the correlation between problematic smartphone use (PSU) and average minutes of screen time over a week. Nevertheless, the cited study did not consider usage time of the apps, hence the relevance of the finding that shows that two of the global top five apps according to App Annie Intelligence (2018) have usage times that significantly correlate with smartphone dependence in the analysed sample. In addition, the consistency between the results from the point of view of the measurement's temporary framework is noteworthy; the study by Rozgonjuk *et al*. (2018) considered only a week's record, whereas the present study obtained usage times throughout four consecutive weeks. Additionally, the multiple regression analysis found a significant and positive effect of total usage time on smartphone dependence, while the specific usage times per app failed to show a significant effect, a result that is consistent with the findings of Barnes *et al*. (2019). This leads to the interpretation that smartphone dependence does not rely on the use of any particular app (although two of the apps showed significant bivariate correlations) but that the joint usage of the apps as a whole seems to have an effect on users' reported dependence. These findings confirm the second hypothesis.

Moreover, smartphone dependence had a significant and positive effect on the average of impulsive choice behaviour (SSR). This result is similar to that of Tang *et al*. (2017), although these authors performed a Pearson correlation of the scores obtained using the SPAI and BIS scales. The latter, named the Barratt Impulsiveness Scale, intends to measure a general impulsiveness trait, and is made

up of 30 items. They found a positive relationship ($R^2 = 0.223$, $p = 0.012$) with an explained variance value that nears that obtained by this study ($R^2 = 0.23$, $p = 0.034$), indicating that the higher the reported level of dependence, the larger the percentage of impulsive choices. This finding is relevant also because this relationship is established through data obtained in a choice test, unlike the previously mentioned study that applied a screening scale to determine impulsiveness as a personality trait. This opens the possibility to continue exploring the relationship between the use of mobile services and a choice pattern based on the concept of temporal discounting from the perspective of behavioural economics. On the other hand, in terms of variables of gender and age, no significant differences were found between men and women, and although a positive relationship was initially found between age and a more self-controlled choice pattern, statistical hypothesis testing was not significant. Regarding other scales, and the questionnaire on nomophobia (NMP-Q) in particular (Yildirim & Correia, 2015), similarities are observed in the factors of not being able to communicate and losing connectedness of the NMP-Q and the functional impairment factor of the SPAI, as both cases evince impact on social and familial life, and even academic or work performance. These results provide additional evidence by finding a significant effect of users' reported smartphone dependence on the choice responses in an intertemporal choice task. Thus, an additional step was taken by incorporating a response to a set of intertemporal choice situations as a criterion variable, allowing this methodological alternative to be considered for future research on the relationship between smartphone dependence and users' intertemporal choice pattern.

1.5.2 Theoretical Implications

Based on suggestions in the literature on behavioural addictions, the possibility that smartphone usage time could predict participants' responses in an intertemporal choice task was proposed. To address this question, one of the study's contributions consists of incorporating, firstly, an objective measurement of the usage time of smartphones and apps over a period of four weeks, which exceeds the time

reported by previous studies (Esmaeili Rad and Ahmadi, 2018; Rozgonjuk *et al*., 2018; Wilcockson *et al*., 2018) and matches that reported by Lee *et al*. (2018), and, secondly, the use of an intertemporal choice task as an alternative to measure the effect of the quantity and delay of a set of rewards on participants' choices. Although it was found that the total usage time had a positive and significant effect on dependence of smartphones (a fact that supports the second hypothesis), it failed to have any effect on intertemporal choice (which resulted in a lack of support for the first hypothesis). The overall results provide the possibility to explore the connection between these variables further, since, as mentioned by Tang *et al*. (2017), smartphone users may prefer a reward that is closer in time given the immediateness of access to information and entertainment provided by mobile services, thus generating a behaviour pattern that is more sensitive to the swiftness with which these kinds of experiences are attained. Results obtained, particularly for the first hypothesis, allow suggesting that studying the use of smartphones and its consequences on users' quality of life must go beyond usage time, since it is possible that the driving force behind influence may not be usage time as such, but motive of use or the context in which the use is taking place and its function (job-related, academic, entertainment), a thought that has been proposed in recent papers (Busch & McCarthy, 2021; Cho, 2020). Moreover, this study contributes to the literature on the use of smartphones from the perspective of behavioural economics in conjunction with traditional techniques such as screening tests as well as objective measures of use of smartphones and apps, finding a relationship between usage time and dependence on the device and a positive effect of this dependence on the average choice of the impulsive option.

1.5.3 Limitations and Future Research

Interpretation of the results must keep some limitations in mind. Firstly, and as reported similarly by Tang *et al*. (2017), the presentation of an immediate reward (SSR) took place through a fixed sequence, therefore caution must be exercised when comparing these results with those of studies applying a titrating sequence, although it can be considered that the two procedures have been used by

researchers to establish delay discounting and it has been reported that there are no systematic differences in its estimation between these two techniques (Rodzon et al., 2011).

Secondly, the sample consisted of college students, thus, future studies could include participants with different age ranges to calculate possible differences in impulsiveness levels concerning usage time of smartphones and apps. Thirdly, although a small-N design perspective was applied, the sample size for future studies should be larger, including participants of different ages and occupations, which would give more depth to the results. Fourthly, the choice situations occurred in laboratory conditions, which may differ from users' daily conditions. Fifthly, future studies could incorporate qualitative measurements based on open-ended questions in order to collect data to allow interpretation of results in a broader way, especially when (as seen in this area of study) literature thus far has overwhelmingly followed quantitative techniques (cross-sectional surveys). Future studies could also apply different designs to measure choice behaviours to provide evidence about the possible effect of variables associated with the use of smartphones on users' intertemporal choice.

1.6 Conclusion

The overall aim of this study was to investigate a possible relationship between the level of use of smartphones and apps and a pattern of impulsive choice, characterized by favouring positive yet immediate consequences. Regarding this possible relationship, the usage time of smartphones or apps was found to have no effect on the users' intertemporal choice. On the other hand, a correlation was found between the total usage time of the smartphone and the WhatsApp and Facebook apps and the smartphone dependence level obtained with the SPAI-S score. This result provides preliminary evidence as to what type of apps can be related to higher levels of dependency from objective measures of time of use. Additionally, smartphone dependence had a significant and positive effect on the average of impulsive choice behaviour (SSR). This is relevant because this relationship is

established through data obtained in a choice test, unlike previous studies that applied screening scales to determine impulsiveness as a personality trait. This opens the possibility to continue exploring the relationship between the use of mobile services and a choice pattern based on the concept of temporal discounting from the perspective of behavioural economics. Finally, the study of the relationship between the use of smartphones and other choice behaviours must include contextual factors and different types of uses and benefits for consumers derived from mobile apps.

2. Parents' Literacy on Mobile Advertising Aimed at Children: A Cross-Cultural Approach[2]

Abstract

Purpose: The use of mobile devices by children and adolescents is increasing significantly; therefore, it is relevant to research the level of advertising literacy (AL) of parents who act as mediators between children and mobile advertising. This study explores the conceptual, moral, and attitudinal dimensions of AL and its relationship with different styles of parental control.

Design/methodology/approach: A cross-sectional survey was applied simultaneously to a sample of parents with children aged between 5 and 16 in three Spanish-speaking countries: Mexico, Spain, and Colombia. Participants from the three countries were recruited via online social media networks and were asked to fill in an online survey. A questionnaire, which has been adapted from previous literature to suit the mobile advertising context and the population of interest, was designed. Cross-country samples of varying sizes, with a predetermined quota of 200 participants for each country, were used. The total sample consisted of 1,454 participants.

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[2] Article citation: Robayo-Pinzon, O., Rojas-Berrio, S., Núñez-Gómez, P., Miguélez-Juan, B., & García-Béjar, L. (2022). Parents' literacy on mobile advertising aimed at children: a cross - cultural approach. *Young Consumers*, *23*(2), 255–281. https://doi.org/10.1108/YC-05-2021-1331

Findings: Four factors of mobile AL were found, which, to a greater extent, correspond to the dimensions of AL proposed in the literature. The following are the dimensions that were identified: cognitive, moral, attitudinal, and an emerging factor known as “children’s perceived mobile AL.” Differences in parents’ perceived knowledge of mobile advertising, parental control styles and AL levels in the three countries were identified. Parents with an authoritative style were identified to have more knowledge than those with an indulgent style. Differences were also identified between countries concerning the amount of exposure that children have to mobile advertising, while no significant differences were found in the moral dimension.
Practical implications: Marketing practitioners and public policymakers must consider that parents differ in some dimensions of AL. Parents also seem to lack adequate knowledge about the advertising tools available to announcers that affect children and adolescents in a mobile communication environment. Therefore, government agencies should consider developing mobile digital media literacy programs for parents.
Originality: This article explores the dimensions of AL applied to the mobile context and identifies the level of parental mobile AL in three Spanish-speaking countries as well as the differences between these sub-samples concerning parental mobile AL profiles and parental control styles, thus expanding the literature on AL with a cross-cultural approach.

Keywords: advertising literacy; mobile advertising; children; parents; consumer behavior; cross-cultural.

3. Social Media Sites Users' Choice between Utilitarian and Informational Reinforcers Assessed Using Temporal Discounting

3.1 Introduction

Social media use is one of the most popular online activities. It has been defined as "any online resource that is designed to facilitate engagement between individuals." (Bishop, 2019, p. 63). Its growth has been exponential worldwide (Kizgin et al., 2018). By January 2022, there were more than 4.62 billion active social media users around the world—58.4% of the world's population. In addition, social media sites were the top type of website visited by global Internet users. The average daily time a user spent on a social media platform was 2 hours and 27 minutes (Chaffey, 2022). Among the most popular social media sites were Facebook—with over 2.9 billion users—followed by YouTube with 2.2 billion, and Instagram—with 2 billion (Lua, 2022). In terms of the accelerated adoption and growing use of social networks, young people make up one of the most frequent user groups on social media platforms. To illustrate, in the U.S, around 89% of teenagers between the ages of 13 and 17 have access to a smartphone, and they report constant use of social media sites (Abi-Jaoude et al., 2020).

The literature has identified self-expression, community building, entertainment, and emotional support as among the major motives for social media use (Abbasi, 2019). Furthermore, teenagers are one of the most vulnerable populations to develop adverse effects from extensive social media usage (Aschbrenner et al., 2019; Dalvi-Esfahani et al., 2021; Lachmann et al., 2018). Research suggests that

negative effects on health and well-being—including life dissatisfaction (Błachnio et al., 2016; Sahin, 2017), sleep deprivation (Levenson et al., 2016), eating disorders and body image concerns (Holland & Tiggemann, 2016)—can be derived from prolonged use of social media. As well, there can be negative effects on students' academic performance (Samaha & Hawi, 2016).

Recently, behavioral economics, a discipline that combines operant psychology and microeconomics, has been employed to address the problematic use of technologies such as smartphones or Internet use (Acuff et al., 2018). In particular, applying the concept of temporal discounting to the study of the phenomenon, tries to establish relationships between dependence and time of use and a tendency toward impulsivity, measured through scales or intertemporal choice task procedures (Peng et al., 2022; West et al., 2021).

Behavioral economics provides a framework for the analysis of choice behavior and decision-making by describing individual allocation of behaviors between simultaneous available potential reinforcers (Warren K Bickel et al., 2014). Specifically, the Multiple Choice Procedure (MCP) is a tool developed to investigate the relationship between drugs and alternative reinforcers (Griffiths et al., 1993). It has been an effective approach to researching addictive behaviors that elicit public health concerns, such as video game playing (Bassett et al., 2020), gambling (Butler et al., 2018), and substance consumption such as marijuana (Greenwald & Stitzer, 2000), alcohol (Benson et al., 2009), cocaine (Jones et al., 1999), and heroin (Madden et al., 1997).

The MCP evaluates individuals’ decisions by providing them with two or more choices between a motive of interest (e.g., drugs) and an increasing value of alternative reinforcers (e.g., actual or fictional monetary payments), until the crossover point is reached, which is the stage when the participant no longer chooses the stimulus of interest and begins to choose the alternative reinforcer (Griffiths et al., 1993). This method is based on the concept of delay discounting, which refers to the devaluation of later results of behavior. That is, as the outcome moves further into the future, it has less influence over the current choice (Madden

& Johnson, 2010). Discounting delayed reinforcers denotes that individuals have to choose between the value of a delayed reinforcer that is discounted, compared to the value of an immediate reinforcer (Arfer & Marsch, 2001). The implication is that individuals have to choose between a small sooner reward (SS) and a larger outcome available later (LL) (Kodi B. Arfer & Luhmann, 2015). For instance, individuals may save up for an appealing product (LL) or impulsively buy something (SS), or they may invest money for the future (LL) or to spend that money to get the last smartphone (SS). Typically, most people would prefer SS to LL (Foxall & Sigurdsson, 2012).

Furthermore, consumer behavior literature—specifically the Behavioral Perspective Model (BPM) (Foxall, 1998, 2010)—states that behaviors are affected by two kinds of consequences (utilitarian and informational) that may serve as reinforcements or punishments. Utilitarian reinforcement (UR) is that associated with the direct use or consumption of the product, whose benefits (or lack thereof) act as reinforces or punishers, influencing the purchase intention. On the other hand, informational reinforcement (IR) relates to the symbolic and social effects derived from the purchase or consumption process, which are given in the specific context of the customer (G R Foxall, 2018). Moreover, these decisions are affected by temporal considerations. Many routine purchasing decisions do not involve major discrepancies as to whether it is desirable to buy or consume now or to wait for some time before having the opportunity to consume a product. This would be the case for most fast-moving consumer goods. For these products, waiting a long time may even be counterproductive, as there would be no more of a benefit in the future than at present, and prices may even increase in the future. However, some products can provide a very pleasurable consequence in the short term, leading to a pattern of choice that can lead to dependence or addiction such as with alcoholism and cigarette smoking (G R Foxall, 2016).

In the case of the use of social media networks, it is possible that since it is a behavior with such a high frequency of daily occurrence with brief exposures (micro-moments of use), the user does not perceive the existence of a conflict between the

immediate pleasure of this informational reinforcer and a long-term goal, such as having better grades at the end of the term or better job performance indicators at the end of the year. On the other hand, monetary rewards (real or fictitious) have been used as an alternative reinforcer (Bassett et al., 2020; Buono et al., 2017; Butler et al., 2018), and although they could be considered both utilitarian and informational reinforcers, due to the potential to generate prestige and admiration in others, in these experimental conditions the amounts used could hardly be associated with such a social acceptance effect, nor would it be easy for participants to make this visible to their peers.

Few studies seek to explore alternatives for reducing dependence or time spent on digital platforms based on these principles. Although studies have recently been published that apply the concepts of utilitarian and informational reinforcement in behavior analysis-based therapy contexts, smartphone and social network dependence behaviors have not yet been taken into account. Therefore, the present study aims to contribute to the growing literature on IR in economic research (Gilroy & Kaplan, 2020; Gilroy & Picardo, 2022). Extant research has primarily focused on the exploration of smartphone dependence (Billieux, 2012; Robayo-Pinzon et al., 2021; Sun et al., 2019). However, there is evidence that there are differences among smartphone devices addiction and social network services addiction (Stuart J. Barnes et al., 2019). Also, limited research has explored how to establish the relative reinforcement value of a monetary reward over the option to use social media networks. No prior study has attempted to apply the MCP to establish these relative reinforcement values between monetary rewards, real or fictional, and social network use over different periods of time. Therefore, this study intends to answer the following research question: What is the relative reinforcement value of monetary rewards versus different time periods of social media networks use?

To accomplish this objective, this research applies an experimental design based on contingency management (Krishnamurti et al., 2020), in which it was established whether a utilitarian reinforcement (monetary reward) is preferred to an

informational one (social media sites usage) in different conditions of delivery time of the reinforcers.

3.2 Materials and methods

3.2.1 Participants

The participants were part of a large university in Bogotá, Colombia, and received an incentive of hours of academic credit once they completed the online questionnaire. A total of 390 participants completed the experiment, of whom 44 were excluded because they indicated multiple crossover points in the MCP (despite instructions to cross only once) or because data were missing in at least one version of the MCP. Additionally, 35 participants were excluded due to their age. The inclusion criterion in this statistical analysis was that the participants were young adult students between the ages of 18 and 30 years. The remaining 311 participants were 48.55% male with a mean age of 20.6 years (SD = 3.10, Range = 15–30) and 50.48% female with a mean age of 20.2 years (SD = 2.84, Range = 15–29); 87% were graduates of an undergraduate degree program or were currently students in one; 36.7% reside in households with a medium socioeconomic level, 35.4% were in low-middle stratum, 13.5% were in low stratum, 11.3% were in a high-middle stratum; 2.3% were in a high stratum, and the remaining 1% was in the very lowest stratum.

3.2.2 Instruments

3.2.2.1 Multiple Choice Procedure

Participants were asked to make hypothetical discrete decisions between fixed magnitudes of reinforcement (social network time usage) and increasing amounts of a monetary reinforcement (Colombian pesos). For each version of the MCP (Bassett et al., 2020; Butler et al., 2018; Griffiths et al., 1993), participants were instructed that once they selected money, they would have to continue selecting

money for that version of the MCP. After receiving the respective instructions to carry out this laboratory study, they answered the 6 versions of the MCP, including three different magnitudes of informational reinforcement (that is, 5, 15, and 45 minutes of social media network use) and two different time points to receive the alternative monetary booster (i.e., immediately or delayed by one week). The social media network usage times were selected by the researcher from a pilot test. Each magnitude of the first booster was paired with the two-time points to receive the monetary booster and presented in sequential order (i.e., 5 minutes vs. money right away, 5 minutes vs. money a week later, 15 minutes vs. immediately, 15 minutes vs. money one week later, 45 minutes vs. money right away, 45 minutes vs. money one week late). The monetary booster started at $10,000 (about 2.5 dollars), increased to $12,000 (about 3 dollars), then to $15,000 (about 4 dollars), then to $20,000 (about 5.2 dollars), and finally to $25,000 (about 6.5 dollars). These values correspond to Colombian pesos. Each version of the MCP generated a single crossover point, which was conceptualized as the relative reinforcement value of using social media networks (informational) compared to an alternative monetary reinforcement (utilitarian) (See Appendix B).

3.2.2.2 Social Media Addiction Scale

The Social Media Addiction Scale (SMAS) was originally developed by Tutgun-ünal & Deniz (2015), shows adequate levels of validity and reliability, and has 41 items covering four dimensions: “occupation,” i.e., how much time the participant thinks he/she is busy checking his/her social media networks; “mood modification,” i.e., how often the user takes refuge in social media to escape reality or the daily routine; “relapse,” the user’s unsuccessful efforts to control the amount of time spent checking social media networks; and the “conflict” between the intention to use social networks more at times when there are other tasks or activities to be done, which results in a contradiction that generates discomfort in the user. The SMAS consists of a five-point Likert scale (1. Never, 2. Rarely, 3. Sometimes, 4. Often, and 5. Always). The scale was initially back-translated with a subsequent cognitive

validation pilot test. The result was the final Spanish version. Analyses were conducted using total SMAS scores, which were obtained from the sum of the scores for each item (See Appendix B).

3.2.3 Procedure

The participants completed an online questionnaire via the Lime Survey platform. This was composed of a section of demographic and social media usage questions, the six versions of the MCP, and the SMAS. All participants signed informed consent waivers, and the method was approved by the university's institutional ethics committee.

3.3 Results

Forty percent of the participants reported that they use social networks between 1 and 2 hours a day; 38% between 2 and 3 hours; 16% for 4 hours or more; and the remaining 9% use them for 1 hour or less per day. Table 1 shows the mean value and the standard deviation for each of the main variables. Most the participants reported that the social media network they use the most is Instagram (53.3%), followed by TikTok (20.6%) and Facebook (13.3%). The results in the SMAS indicate that on average the participants have a low level of dependence on the use of social networks (M = 91.94, SD = 27.20, Range = 41–181), it is noteworthy that 75% of the participants present a low level of dependence on the use of social networks and in very few cases they present a high level of dependence. As can be seen in Table 1, there is no significant difference in the crossover points of the six versions of the MCP, nor is there a significant difference in the SMAS according to gender.

To test whether the MCP evaluating hypothetical choices between social media use and an alternative monetary reward was sensitive to the magnitude of the reward and/or delay, a 2 × 3 repeated measures factorial ANOVA (Delay [immediate, 1-week delay] Magnitude [5, 15, 45 minutes to use social media]) was conducted, using MCP crossover points as the dependent variable. The separate models for

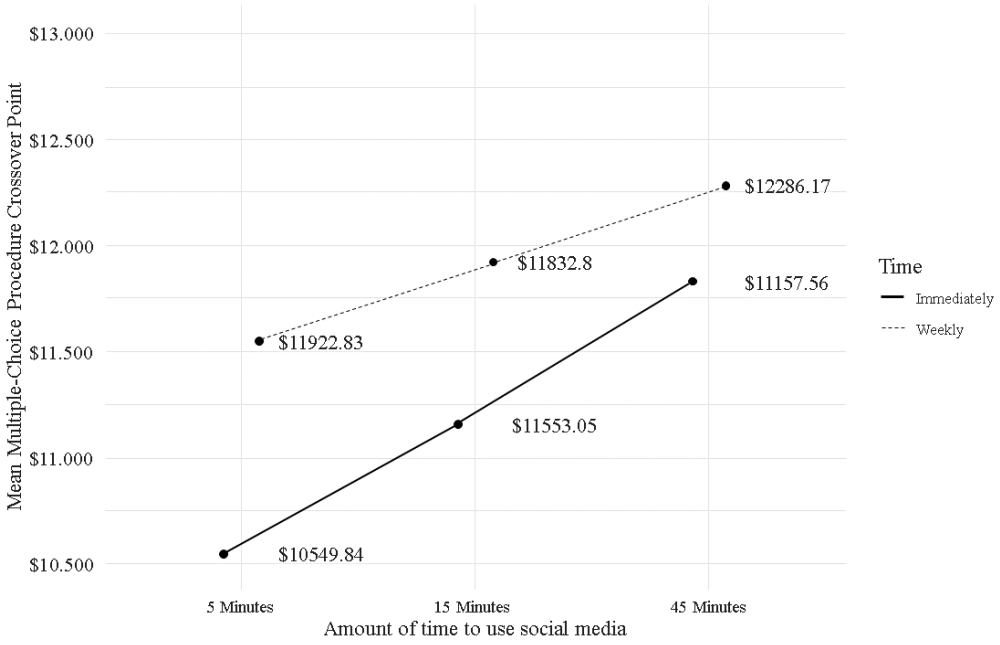
men and women yielded non-significant results. In the same way, the models separated by social media network yielded non-significant results. Therefore, only the model for the complete sample is presented. The average values of the crossover points for the six versions of MCP are presented in Table 1 and Figure 1.

Table 3-1: Means and standard deviations for the main study variables.

Variable	M	SD	M H	SD H	M M	SD M	T value
MCP5i	10549.84	2516.38	10761.59	2777.79	10356.69	2253.24	0.17
MCP15i	11553.05	5137.11	11721.85	5178.36	11420.38	5154.20	0.65
MCP45i	11157.56	3691.00	11165.56	3921.62	11171.97	3501.24	0.94
MCP5w	11922.83	5581.12	11788.08	5823.64	12089.17	5401.06	0.60
MCP15w	11832.80	4874.33	12218.54	5598.68	11496.82	4092.87	0.22
MCP45w	12286.17	6463.68	11907.28	7031.69	12694.27	5922.21	0.26
SMAS	91.94	27.20	91.78	27.08	92.10	27.17	0.92

Source: own elaboration.

Figure 3-1: Mean Multiple Choice Procedure crossover points of each of the six versions.

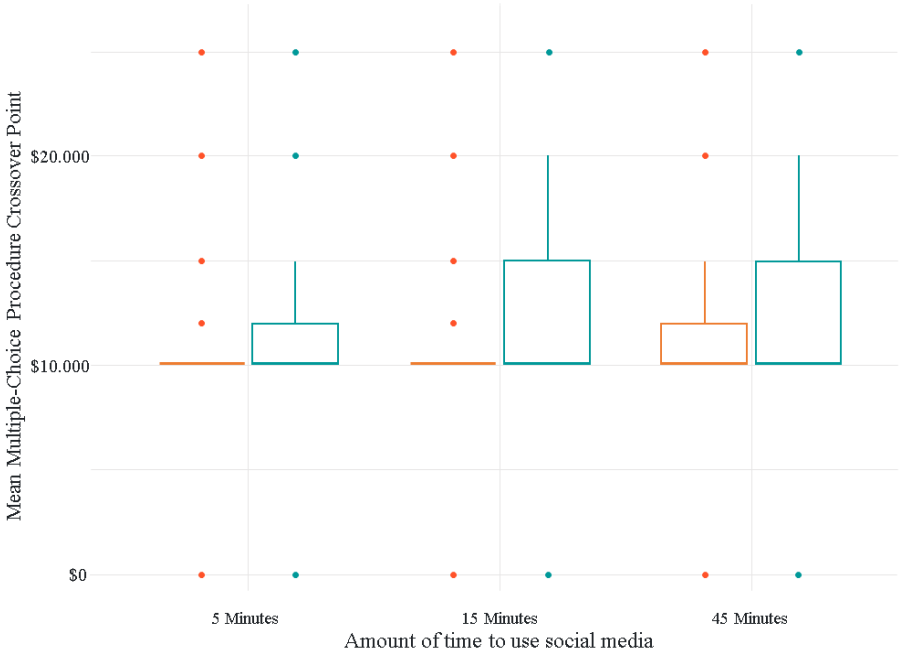


The factorial ANOVA (see Table 2) allows us to determine that there is a statistically significant effect of the delay of the alternative reinforcer ($F(1, 310) = 10.21$, $p < 0.05$). That is, the average crossover points were higher when the monetary

reinforcer was delayed one week (M = 11,180) compared to the immediate delivery of the monetary reinforcer (M = 11,921). This indicates that the relative reinforcement value of using social media networks increases when the delivery of the monetary reinforcer is delayed. It is observed that there is no statistically significant effect of the interaction between the magnitude of the reinforcer and the delay time of the alternative reinforcer. Additionally, there is a statistically significant effect of the magnitude of the reinforcer ($F(2, 620) = 9.5$, $p < 0.05$), such that the average crossover points were higher for 45 minutes (M = 12059) of time to use social networks, followed by 15 minutes (M = 11540) and then 5 minutes (M = 12059), demonstrating a temporal magnitude effect for the relative reinforcement value of using social media networks.

Because the interaction is not significant, the main effects of each of the two variables (the magnitude of the reinforcer and the delay time of the alternative reinforcer) must be interpreted. A significant main effect can be followed with pairwise comparisons. A Student t-test with a Bonferroni correction detected that there are significant differences between the average crossover points between the magnitude of the reinforcer of 5 minutes of use of social networks and 15 minutes ($t = 3.27$, $p < 0.05$), and also between the mean crossover points between the reinforcer magnitude of 15 minutes of social media use and 45 minutes ($t = 4.40$, $p < 0.05$). These results are illustrated in Figure 2.

Figure 3-2: Mean Multiple Choice Procedure crossover points of each of the six versions.



However, as shown in Table 3, the bivariate correlations between the crossover points of each version of the MCP (the mean crossover point of the MCP and the total scores of the SMAS) do not present a statistically significantly correlation. Therefore, it is not feasible to perform a multiple hierarchical regression analysis to assess the contribution of the MCP to the prediction of the total SMAS score.

Table 3-2: Bivariate correlations.

MCP1	MCP2	MCP3	MCP4	MCP5	MCP6	MCP_PROM	SMDS
1	0,225	0,502	0,128	0,241	0,216	0,444	0,075
0,225	1	0,274	0,703	0,299	0,407	0,742	0,093
0,502	0,274	1	0,356	0,306	0,207	0,563	0,077
0,128	0,703	0,356	1	0,388	0,493	0,801	0,091
0,241	0,299	0,306	0,388	1	0,546	0,697	0,003
0,216	0,407	0,207	0,493	0,546	1	0,77	0,077
0,444	0,742	0,563	0,801	0,697	0,77	1	0,099
0,075	0,093	0,077	0,091	0,003	0,077	0,099	1

Source: own elaboration.

Bearing in mind that the Social Media Survey (SMS) variable is a categorical variable that measures the amount of time in hours that participants usually dedicate daily to social networks, an ANOVA is performed to identify whether the total score of the SMAS is seen as significantly modified, depending on the amount of daily use. The results are shown in Table 4.

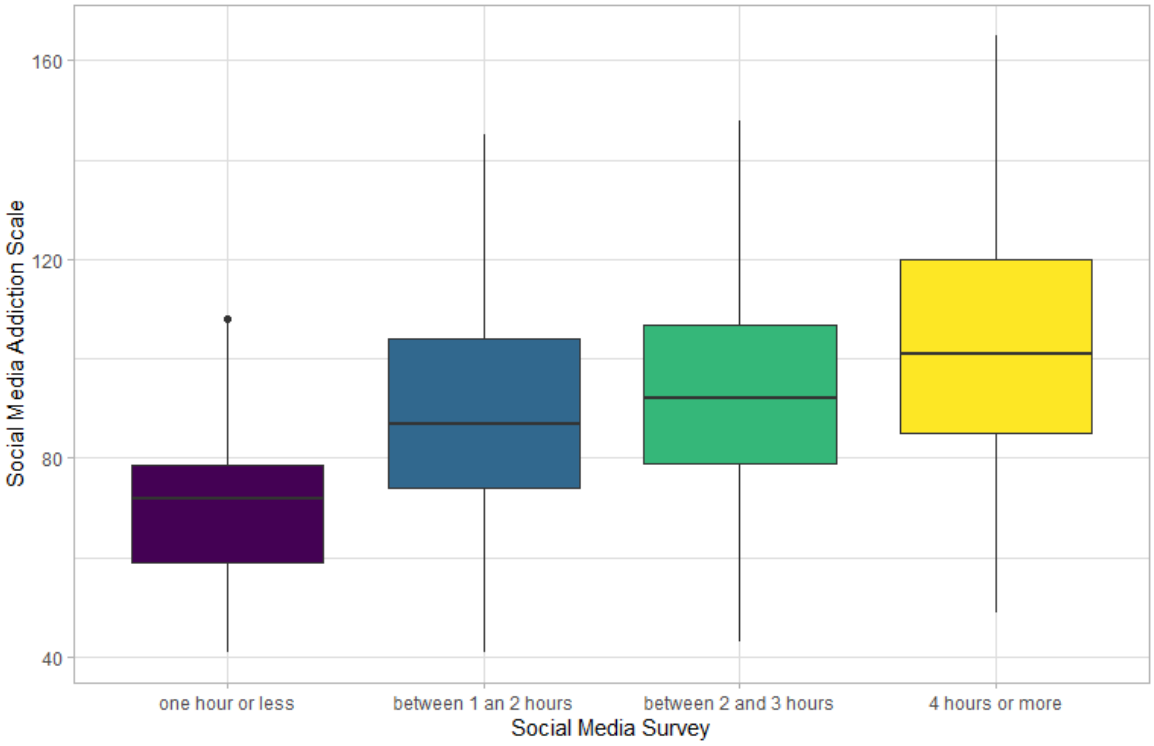
Table 3-3: ANOVA between SMAS scores and time of daily use of social networks.

Df	Sum Sq	Mean Sq	F value	Pr(>F)
3	18742,1	6247,38	10,5844	0,00
302	178254	590,246		

Source: own elaboration.

The analysis of variance (ANOVA) demonstrates that there is a statistically significant effect on the amount of time that the participants use each day, ($F(3,302) = 10.58$, $p < 0.05$), That is, the SMAS score was higher when the usage time was 4 hours or more, compared to the other amounts of time. For this result to be valid, the assumptions of the ANOVA must be satisfied. Therefore, the Shapiro Wilk test was performed ($p > 0.05$), which indicates that the assumption of normality was met. The Bartlett test was also applied. ($p > 0.05$), which indicates that the assumption of homogeneity of variances is fulfilled. The average total SMAS score for participants who reported the use of 1 hour or less of social network time was 70.5 (SD = 18.8). For participants who reported the use of between 1 and 2 hours (the majority of the participants), the average total was 89.1 (SD = 24.3). For participants who reported between 2 and 3 hours use, it was 91.9 (SD = 24.3). Finally, for participants who reported the use of 4 hours or more it was 103. That is, as the amount of time of use increases, there is also an increase in the total SMAS score, which is illustrated in Figure 3.

Figure 3-3: LSD Test - Social Media Addiction Scale in function of Social Media Survey.



This conclusion was confirmed by applying the least significant difference (LSD) test, which allows us to conclude that there are statistically significant differences between each pair of categories of the SMS, except for the combination: “Between 1 and 2 hours” and “Between 2 and 3 hours.”

3.4 Discussion

Results of this study contribute to the literature on non-substance dependence by employing the MCP as an emergent methodology in applying behavioral economics, specifically temporal discounting, in the context of social media networks usage. Similar to previous studies in other contexts, the MCP was found to be a valid method for estimating the relative reinforcement value of social media network use as an informational reinforcement alternative to a utilitarian alternative, such as a monetary reward. However, there are differences between the types of

behaviors reported in the literature and the use of social media networks. Social media use may be seen as a collection of micro moments of consumption.

This feature constitutes a main difference with similar behaviors such as gambling or videogames. Social media networks are permanently available for users through the smartphone. The personal character and physical presence of the smartphone provides the permanent access, therefore, to the informational reinforcement in lower but frequent “doses.” From the results obtained, it can be observed how the relative value of the alternative utilitarian reinforcer increases as it grows in magnitude, especially when the delay is one week, in order to modify the preference that participants show for the use of social networks as an informational reinforcer, and thus reverse the continuum of choices in favor of this immediate and pleasant option. Although in the literature on temporal discounting it has been reported that its absence or low levels are associated with routine purchases, usually of food products (G R Foxall, 2018), it could be considered from the evidence found in this study, which is consistent with previous studies, that the use of social networks, being an informational reinforcer, would be presented as a routine pattern of choice with a high frequency of daily occurrence, something that is noteworthy and relevant to confirm in future research.

It should also be considered that in Colombia the use of social networks is among the highest in the world, with 81.3% of the population using social networks by January 2022, showing a year-on-year growth of 7.2%, i.e., 2.8 million new users per year (Kemp, 2022a). In this context, the immediate accessibility to the informational reinforcement and with almost 2.5 hours of average daily social media usage globally (Kemp, 2022b), makes this behavior different to similar activities such as gambling or playing video games. Therefore, more research is needed in the field.

On the other hand, this study supports the relative reinforcing value of an informational consequence such as social media use and its sensitivity to both the magnitude of reinforcement and the delay in delivery as individual factors. However,

there was no significant effect on the crossover points for the interaction of the categories of these two variables. As suggested above, it is possible that this behavior is qualitatively different from gambling or playing video games, given the fragmented nature of usage throughout the day. This makes it difficult for users to subjectively estimate how much time they spend using social networks per day. Another difference that should be considered when interpreting the results is that fewer versions of the MCP were used in this study compared to previous studies. This may have resulted in lower sensitivity for the measurement of crossover points because the differences in the magnitudes of the monetary reinforcers were larger between each discrete choice situation. However, the significant effect of magnitude and delay indicates that as the amount of time to use social networks increases, the value of the monetary reward for the crossover points also increases, and these values are higher for the One Week Delay condition. This result is consistent with what has been reported in previous studies (Bassett et al., 2020). The relative reinforcement value of social media networks use increases the longer the time of use, with the effect being greater for the One Week Delay condition.

Further analysis established that there is a significant association between the categories of daily social networking time (SMS) and the SMAS score, a result similar to that reported in previous studies. In this case it was found that the average SMAS score was significantly higher for participants who reported a daily use of 4 hours or more and between 2 and 3 hours compared to those who reported 1 hour or less. This finding is similar to that found for gambling behavior (Butler et al., 2018), alcohol use (Correia & Little, 2006), and video game playing (Bassett et al., 2020; Buono et al., 2017).

Thus, this study provides the first application of the MCP to the assessment of the relative reinforcement value of social media networks time compared to a utilitarian reinforcer, such as a monetary reward. In this sense, the findings on reinforcer magnitude and delay effects are consistent with previous research that have applied behavioral economics to the study of non-substance–related addictions, such as

problem gambling (Alessi & Petry, 2003; Dixon et al., 2006) and obesity (Rasmussen et al., 2010; Weller et al., 2008).

One interesting aspect for mental health policy is comparing what Dixon (Dixon et al., 2006) has done previously on problem behavior such as gambling in terms of the application of interventions based on targeted behavioral therapies such as acceptance and commitment therapy or cognitive behavioral therapy, which have shown positive results in populations of video game players (Buono et al., 2017). However, in the case of social media networks, it has been found that in countries such as Spain, Chile, and Colombia, based on a sample of young adults and adolescents, that a significant percentage do not consider themselves to be dependent on these platforms, let alone addicted to them (Almenara et al., 2020). This may be an effect of the normalization of the use of social networks. Given their omnipresence in daily activities, which gives them a character of social acceptance, it becomes difficult to recognize that there may be an impact on quality of life or psychological and emotional well-being, particularly in the youngest users.

Nevertheless, there is evidence in the literature in favor of another alternative intervention, namely contingency management, which uses monetary incentives to influence individual behavior by making them prefer these incentives to the use of substances such as cocaine and alcohol (Krishnamurti et al., 2020; Petry et al., 2012). In cooperation with the private sector, it may be possible to design mobile applications that provide coupons or discounts on brands of their choice in exchange for a reduction in daily social media usage. These applications can be tested on young users. Of course, technical and data privacy aspects must be considered, given the most recent EU regulations, for example. On the other hand, the fact that no differences were found in terms of gender usage can be interpreted that the use of social networks is so prevalent that there is no difference in their relative reinforcement value between men and women. This is a clear difference with video game playing, where there is a greater use of and dependence on video games in the case of men (Buono et al., 2017; Butler et al., 2018).

Finally, this study provides a first approach to the use of the MCP in the context of social network use, as well as empirical evidence for the application of the BPM to digital consumption behavior in young users in conjunction with a methodology based on behavioral economics. Also, the present study aims to contribute to the growing literature on IR in economic research. These findings pave the way for the search for possible clinical and social interventions in the face of this growing consumption phenomenon.

3.5 Limitations and future research

Some limitations must be acknowledged. First, placebo control conditions were not employed. Second, the sample was composed of college students; thus, the results should be generalized with caution. Future studies should include a more diverse sample, and, ideally, populations from different regions of the world could be compared because there are different rates of social network use in developed versus emerging countries (Kemp, 2022b). On the other hand, our results did not support the interaction effect of magnitude and delay of the alternative reinforcers. Thus, future research may consider replicating this research in the context of a mobile application intervention in a natural environment, which would provide ecological validity that complements the studies that have so far been carried out in experimental settings. By expanding the context to natural settings, that is, outside laboratory or experimental conditions, the MCP can be established as a methodology based on behavioral economics that contributes to the intervention of these emerging behaviors of dependence on social media networks content.

4. Conclusions and recommendations

4.1 Conclusions

This thesis sought to establish the relationship between the use of social media apps and mobile advertising and a set of behaviours including a pattern of intertemporal choice and level of dependence on these apps, the level of mobile advertising literacy and the relative reinforcement value of using social media apps versus different magnitudes of alternative monetary reinforcement. The study of these relationships constitutes both a theoretical and methodological contribution to the growing line of research in what has become known as the “dark side” of mobile marketing. This is of great importance for business management in terms of their corporate social responsibility policies and practices, integrated marketing communications and self-regulation with respect to the effects on their audiences of their actions in this mobile digital environment, particularly if vulnerable populations such as children and adolescents are considered.

The three chapters developed, of which the first two have already been published in high-impact journals, and the third is currently under peer review, also address some important research priorities formulated by the Marketing Science Institute (MSI, 2022), for the period 2022-2024. These include, firstly, "Data challenges from business disruption and missing information", given that in recent years marketing has been incorporating the use of big data and analytics, and more recently with major changes in the regulatory environment, organisations now face several challenges in their policies and actions related to data capture and privacy levels of their users. These decisions need to optimise the potential benefits of delivering personalised brand communications and promotions in an environment that is

increasingly protective of users' privacy and autonomy on digital platforms. The challenge is particularly greater in terms of data capture, since companies can no longer track key variables in users' digital footprints, which has generated problems in the optimization of service delivery and especially in the actions of advertising targeting. This type of methodological challenge was faced and discussed in the first chapter, when by that time, the Facebook and Cambridge Analytica scandal had forced a change in the regulation for the capture of data from the users of social media networks by the European Union. This is a sample of the difficulties that had to be overcome to capture data on the use of smartphones and apps while strictly observing the regulations applicable at that time.

Additionally, the second chapter addresses a topic that is related to the priority "Regulatory and public policy issues affecting member companies", since organizations today face the challenge of changes in regulations regarding the use of cookies and third-party data adopted by tech giants Google and Apple. The study of constructs such as mobile advertising literacy is even more relevant in a context in which changes will begin to be seen in the interaction between users and digital advertising campaigns, since advertisers will have less precise data in relation to the browsing behaviour of users. In addition, it may be even more interesting to observe these changes in the functioning of this type of brand communication in the case of vulnerable populations such as children and adolescents and the mediating role played by their parents and caregivers.

In addition, there is growing interest in the literature regarding the effects of smartphone and app use on consumer behaviour, especially since after the COVID pandemic, average daily usage times increased significantly in many countries, with Brazil and Mexico standing out in Latin America (data.ai, 2022). Therefore, one of the most relevant contributions of the first research question was to be able to incorporate a methodological alternative to obtain an objective measurement of smartphone and app usage time. In addition to this, we sought to explore, based on the principles of behavioural economics, the possible effect of usage time on the

pattern of intertemporal choice, in such a way that a working hypothesis consisted of assuming that a longer usage time would be related to a more impulsive pattern of choice.

First, from a descriptive perspective, for the first time in the literature, usage data was reported from a consumer panel with a duration of four weeks, indicating both the average number of apps installed (68.6) and the average daily usage time (4.1 hours), the latter not far from what was reported for the year 2019 for the Colombian case (App Annie Intelligence, 2020). Interestingly, a pareto distribution of app consumption was also found, with 71.2% of total smartphone usage time spent on just five apps, of which the most used was the instant messaging platform WhatsApp, as well as two apps that are part of the Meta group: Instagram and Facebook. The fact that the TikTok app did not yet appear among the most used apps at that time is revealing of how quickly the usage landscape is changing, especially in these social media and entertainment categories.

A second contribution consisted of contrasting a first approach based on behavioural economics, which looked at the possible relationship between app usage time and a self-controlled or impulsive choice pattern (H1), with another, which sought to establish the relationship between usage time and participants' perceived dependence on the smartphone. Although, in relation to H1, no significant relationship was found, for the H2 analysis it was evidenced that the total time of use of the smartphone is related to the level of perceived dependence by the users. These results are encouraging with respect to the possibility of continuing to study the relationship between the time spent using apps and the prevalence of an impulsive choice pattern or a high level of perceived dependence on the smartphone. This analysis could be given in terms of whether a longer use time of some categories of apps turns out to have a positive relationship with a tendency towards impulsiveness or dependence, which could occur for social media or entertainment apps. Or if, on the contrary, a longer use time of apps associated with

productivity, such as the use of WhatsApp as a work or commercial communication tool, does not turn out to be related to these trends.

At a theoretical level, recent studies continue to explore the possibilities offered by the concept of temporal discounting to identify whether the use of certain apps, particularly social networking apps, significantly predicts a pattern of choice characterised by a preference for smaller but immediate consequences (impulsivity) over more delayed but larger consequences (self-control). It has been considered from a public health perspective that a tendency to make impulsive decisions should be something that should not only be identified but also intervened, as the literature has abundantly found evidence pointing to the strong association between impulsivity and harmful behaviours such as substance addiction, video game and gambling addiction and criminal behaviour.

One such study combines the perspectives of computer sciences and behavioural economics to predict individual hyperbolic discount rates from the Likes on the Facebook profiles of a sample of 2,378 participants, who in addition to allowing access to their digital footprint on this social media platform, completed an instrument that presented an intertemporal discounting task with fictitious monetary rewards. To perform the predictive analysis, they developed a machine learning-based model, which allowed them to predict individual discount rates with a higher accuracy (up to r=0.30) than previous studies based on screening scales or, like the one reported in this thesis, from smartphone and app usage time data. This new approach goes a step further, because it considers a type of behaviour represented in the Likes given by participants to different posts that have appeared on their Facebook wall over time and, by combining it with their choice responses in the intertemporal discounting task, they have obtained a model with greater predictive capacity (Kurz & König, 2022).

These results lead to consider whether more important than establishing the time of use of a service, for example, the one offered by social media networks or video

platforms (YouTube, TikTok), is what users do during that exposure (Busch & McCarthy, 2021; Cho, 2020), since, as mentioned above in the case of instant messaging apps, it is possible that some users consider these platforms as portals to acquire information and certain skills or competencies. However, having access to this data that records the digital footprint of each user on each platform is not only technically very complex today, but above all, it presents important aspects to consider regarding ethics on the management of the privacy issues of users' information. The changes in the regulatory context and data access policies adopted by Apple and Google represent new challenges for brands and advertisers as well as for academic researchers.

Therefore, there is the possibility that the time of use, by itself, does not have the predictive capacity that it was thought to have at the time. This is evidenced in the results of the first chapter, where the smartphone dependency scale turns out to have more predictive capacity, as could be seen in validating H3. A challenge then arises for research in the field, because, although having usage data beyond the objectively measured time is promising, access to these data is increasingly limited. Despite this scenario, future research may shed light on whether what currently appears to be high smartphone use (in some countries, such as Brazil, it reached 5.4 average daily hours per user in 2021), turns out to be associated with impulsive behavioural patterns, or if, on the contrary, what is relevant is the type of apps used, the type of content and the tasks performed through the mobile device. In this way, the use of these apps would be considered as something "normalized", that is, something that has no positive or negative consequences of its own. These consequences will depend on other factors.

Even taking the above into account, auspicious results were obtained regarding the relationship between the time spent using WhatsApp and Facebook apps and the smartphone dependence level obtained with the SPAI-S score. These results are in line with those of previous studies such as Rozgonjuk *et al*. (2018), to which must be added the fact that the study reported in the first chapter managed to obtain data

from the panel of users over four weeks of monitoring. On the other hand, and from a more traditional study perspective, results were found that are consistent with previous studies, such as that of Tang *et al*. (2017), regarding the relationship between perceived dependence on the smartphone and the average number of impulsive choices made during the intertemporal choice task. In summary, a positive relationship was found, indicating that as the level of dependence increases, so do the average number of impulsive choices, thus confirming H3. A contribution of the study presented here is the application of an intertemporal choice task, which opens the way for the use of other techniques and concepts from behavioural economics in this line of research. In addition, clues were obtained regarding which types of apps (e.g., WhatsApp and Facebook) may be related to a higher level of smartphone dependence.

On the other hand, the third chapter addresses a research question that also aims to explore the use of social media networks in a sample of young adults, investigating from the conceptual framework of the Behavioural Perspective Model (BPM) and with an experimental approach, how a monetary incentive can reduce the use of these platforms. As a methodological contribution, we apply the Multiple Choice Procedure (MCP), a technique based on the principles of behavioural economics to establish the conditions under which a certain amount of fictitious monetary reinforcement, with two possible delivery times, can influence the reduction of the use of social media, at least for a given time. Interestingly, it was found that average crossover points were significantly higher when the monetary reinforcement was delayed by one week than when it was delivered immediately, thus confirming H1. In other words, for participants, they should have been offered a larger amount of money when delivery was delayed in exchange for not using their social media networks for a certain amount of time. These results allow us to observe the relative reinforcement value of social media, particularly when considering their immediate use. In addition, the average crossover points were higher for the 45-minute social network use condition, and progressively decreased for the 15-minute and 5-minute use conditions. That is, participants expect more

monetary reinforcement in exchange for not being able to use their social networks for longer periods of time. These results raise the possibility of continuing to study the use of social media networks as a behaviour that provides informational reinforcement and the implications that this has for the strengthening of its frequency of use, which has been observed since 2020, and how the application of the MCP can provide information that allows us to understand the relative value of reinforcement that this use behaviour has, especially among the younger public.

This interest in studying the effects of mobile platforms on young populations, who in principle may be more vulnerable to the marketing communication tactics widely present in video game apps, video platforms and social media networks, led to the question posed in the second chapter, regarding the level of mobile advertising literacy of parents of children between 5 and 16 years old. This responds to the context of increasing use of mobile apps by children and adolescents, which leads to a level of exposure to advertising messages that may be even higher than in the heyday of television, as mentioned in the general introduction. In this regard, a contribution of this study is the finding of a set of dimensions for the construct called mobile advertising literacy (MAL). In general, four factors were found that are consistent with the three dimensions proposed by Hudders *et al.* (2017), i.e. the moral, cognitive and attitudinal dimensions, with a fourth factor called "children's perceived mobile AL".

Thus, future research can validate or extend these dimensions of LA for this novel context of mobile marketing communications. With respect to other findings, it is interesting to see how low levels of knowledge about these tactics and moderate levels of parental concern about usage time and potential exposure of their children to these tactics are partly consistent with studies recently published earlier this year (Feijoo & Sádaba, 2022). The aforementioned study calls for initiatives that enable parents to differentiate between content and advertising on these platforms, while helping them to transform their own mobile device usage habits, as they themselves are role models for their children. There is also agreement between the results

reported here and those reported by Feijoo & Sádaba (2022), in that there is a significant lack of knowledge in countries like Colombia and Mexico about whether children know what this type of advertising is. In the qualitative study referenced, the researchers found that parents are not very concerned about the large amount of advertising messages and consider that they do not pose a major risk to their children, either because they think they are old enough to identify them and close or "skip" them, or because they are advertising video games and the like, which is harmless from their perspective. In connection with the above, it was also found in the study presented in the second chapter that for parents in all three countries there is moderate agreement that mobile advertising impacts their children, and secondly, there is much variation in their attitude to whether children should have easy access to these devices from an early age. This is also partly in line with what the above researchers report when they mention that the parents they interviewed generally tend to minimise the role they play in this socialisation process. These similarities lead to the conclusion that parents have a worrying combination of low levels of AL and low motivation to change this situation.

The three issues developed in the thesis are highly relevant in the current context of digital transformation of organisations and accelerated growth, both in the adoption of digital devices and platforms and in the average time of daily use in Latin American countries and in Colombia in particular. This call to investigate the phenomena associated with digital consumer behaviour is even greater when we have population groups that show a higher average usage than other cohorts, such as children, adolescents and young adults, and the possible effect that digital brand communications with its new embedded formats may have on them. Based on the results found, and the analysis conducted in the light of recently published studies, a series of implications and recommendations for different actors within this digital services consumption ecosystem are formulated below.

4.2 Recommendations

Throughout the document, the need to investigate the effect that mobile devices, and mainly social media apps and digital advertising are having on younger audiences has been highlighted. These platforms are now one of the main touchpoints between brands and their audiences, given their omnipresent, immersive, interactive, and highly personalised nature. While the academic literature presents a high volume of research on the effects of these tactics on purchasing behaviour and other recent concepts such as engagement, this line of research sought to explore the “dark side” of these technologies in relation to audiences that could be considered vulnerable.

The study of the appropriation and effect of these digital technologies by users is very important for organisations as it is currently a key factor in developing competitive advantages in terms of marketing and retailing tactics. Having knowledge about how customers are adopting (or not) and interacting with these platforms is a valuable input for managers to formulate their digital strategy. While these technological developments have proven to be very important in generating value for companies - just look at the unprecedented growth of large organisations such as Apple, Microsoft, Tencent and Amazon - firms must also be very conscious of the effect these innovations have on society and consumers, so that there is a balance in the value generated for these other stakeholders. In this sense, the three studies reported provide implications mainly for corporate social responsibility, human resources wellbeing, self-regulation policies, as well as for public policies in relation to citizen education on issues of responsible use of digital platforms.

The development and evolution of smartphones over the last 15 years, when Apple's iPhone appeared on the scene, has been marked by constant improvement in their technical and functional features, making users more motivated to use them given their intuitive nature (ease of use) and their status as ubiquitous devices throughout the day. This variety of both utilitarian (work productivity) and informational (socialisation and entertainment) functions, and their sheer

convenience have facilitated their continued use globally. This trend increased further during the recent COVID-19 pandemic crisis, causing average daily usage times to skyrocket between 2019 and 2021 by 31% for Brazil or 23% for Mexico, for instance (data.ai, 2022). While there is no consensus on what represents excessive smartphone use in terms of usage time, the most recent literature (Weinstein & Siste, 2022), indicates that verbally reported excessive use by participants has been associated with multiple behavioural and health issues, including low self-esteem, difficulties for emotional regulation, impulsivity, sleep problems, among others.

When considering the results reported in this thesis, it is found that for the first-time data on the time of use of apps is analysed and not only the total time of use of the smartphone. This allowed us to obtain a promising result in that two apps, WhatsApp and Facebook, had usage times that were correlated with smartphone dependence. In addition, the recording of the usage time occurred over a period of four weeks, whereas another previous study had collected data for just one week (Rozgonjuk *et al*., 2018). The collection of data from mobile apps has very relevant implications for companies today, given the recent international provisions regarding the use of third-party data, that is, data captured on a massive scale by certain platforms that offered brands optimize their marketing communications at the individual user level. Given this, the brands had been achieving the long-awaited size one segmentation, but now companies are considering their options to migrate to a first-party data model, in which each company must define a data use policy for its customers, with the respective ethical and regulatory implications.

On the other hand, when considering gender and age differences, although the first study found no significant differences by gender and failed to confirm an initial finding of a higher level of self-control with increasing age, the findings reported in the literature reviewed indicate that there is a higher prevalence of constructs such as smartphone dependence and social media addiction in women, along with a longer time spent using these platforms compared to men. Another difference has recently been found in an emerging construct called smartphone distraction, which

is the constant interruption of important activities in response to notifications appearing on the user's smartphone (Throuvala et al., 2021). There is growing concern regarding the dominant role that these communication, socialisation and entertainment platforms have gained, especially since the pandemic and the fact that they apply persuasive design principles, which make it difficult for users to control the consumption of these contents because the platforms apply these elements in the design of their interfaces to promote continuous use. This current scenario, associated with what is known as the attention economy (Franck, 2019), means that not only do platforms compete for exposure time to their content, but also that organisations themselves must consider whether the smartphone distraction phenomenon requires a coordinated and conscious effort to intervene in their collaborators.

This raises the possibility that not only might there be an association between a high level of smartphone dependence and an impulsive pattern of choice, as suggested in the first chapter, but that there is also an impulsive pattern of notification checking, i.e., that users prefer a small but immediately accessible reward, such as a small dose of socialising or entertainment each time they check their smartphone. This could interfere with productivity tasks in companies that have not yet considered this aspect within their organisational management processes, becoming a form of problematic technology use. Although this could be considered a form of multitasking, further research is recommended to investigate the effect of these micro-disengagements, and a possible pattern of fragmented attention in work environments. In this sense, the use of the principles and techniques of behavioural economics can be of great use in applying, for example, the Multiple Choice Procedure (MCP) in a work context to determine the relative reinforcing value of the use of social media networks against the relative reinforcing value of developing work activities.

Therefore, organizations must take into account attention management as an emerging area of study and training of their human resources, since it is beginning

to be considered as a key skill for the next decade. Attention is becoming an increasingly scarce resource, so the ability to control one's attention in an environment saturated with digital stimulation and ubiquitous mobile devices will result in a highly valued soft skill. Employees who can use the information sources and tools offered by digital platforms in a timely manner will be more competitive, as long as they can navigate the minefield of digital notifications and microdistractions. Based on the above, organizations should strengthen intervention programs that seek, first, to identify and reduce phenomena such as dependence on social networks, anxiety and social isolation associated with the excessive use of these apps, and secondly, that allow employees to identify and correct patterns of attentional bias through attention training programs.

However, the design of these programs must consider recent evidence that indicates that these changes in dependence on social networks and the anxiety of not being able to use them do not simply arise from one's own will and intention to change a reality, of which in many cases users are not aware (Zahrai et al., 2022). To this is added the fact that for many users there is a contradiction in the attitude towards social media networks and their current behaviour. For example, there are users who maintain high levels of use even though they have effects on their mood, or users who insist on consulting notifications while driving, putting at risk not only their lives but that of others as well. Results of interventions have been reported that aim at suppressing access to social networks as a way to decrease dependence and to return neural mechanisms to a baseline. However, the findings, rather than being promising, are worrying. For example, Franks et al. (2018), conducted an intervention test on self-control based on the concept of sabbatical social media, finding that after these long periods of interruption in use, came an even stronger period of use, something he called "Facebook sabbatical paradox" (Franks et al., 2018, p.11).

To counteract this return effect to a level of excessive use, organizations may consider applying behavioural economics principles, particularly temporal

discounting and the Multiple Choice Procedure (MCP), to identify those cross-over points at which users are willing to obtain a monetary (or other type) reinforcer in exchange for interrupting the use of social media networks for brief periods of time. These periods of time (mini sabbaticals) can be progressively increased through the application of principles of token economy or gamification and could even assume the structure and function of a company's own app or be incorporated into the company's app as an additional program within its employee well-being module. Identifying information related to the monetary (utilitarian) reinforcement values that are effective in generating these pauses in the use of social media networks can be particularly useful to modify the preference that employees show for the use of these platforms as sources of informational reinforcement, and thus reverse the continuum of choices in favour of this immediate and pleasant option. Finally, this type of program can indirectly promote metacognition mechanisms, making users progressively aware of the level of dependence they have been generating with social media platforms, particularly since the pandemic crisis.

Another research problem that is framed in the dark side of mobile marketing tactics and that was addressed in the thesis, is related to the process of socialization of parents in the interaction of mobile digital advertising with their children between 5 and 16 years of age. In the second chapter it was possible to establish not only the level of mobile advertising literacy (MAL) of parents, but also identified differences in some dimensions of this construct according to parental style, especially among parents with authoritative and negligent style, which was found to be the case when H1 was confirmed. From this, it is suggested the creation and application of training programs aimed at parents in topics not only of digital literacy, but especially, in aspects of mobile advertising literacy (MAL). Previous literature has identified differences in levels of digital literacy based on the socioeconomic status of parents (Radesky et al., 2020). A component to take into account in addition to this variable would be that these programs could, through a measurement instrument, establish the type of parental style of the parents along with their levels of MAL in order to customize the type of content and the skills that each participant requires the most.

An additional challenge that must be taken into account is the finding reported in several studies that account for the lack of knowledge that parents have about the importance of their role in this mediation process, which goes beyond the control of the usage time of the devices or to consider that from a certain age children already have the skills to critically process (attitudinal AL) the embedded commercial messages in the new formats of brand communication, especially influencer marketing. In addition, for the Colombian case in particular, programs to strengthen the MAL must consider some aspects that differentiate the country from Spain and Mexico, which was found to be the case when H2 was confirmed. In the first place, although the average level of general knowledge about digital topics does not present significant differences, there is less knowledge in topics such as content and ad blocking, knowledge about what mobile advertising is, the knowledge they believe their children have about mobile advertising, as well as knowledge of the apps in which children are exposed to this type of commercial messages. This landscape shows that even more efforts are required at the country level to not only motivate parents to be interested in having a more active role in this process but also to want to improve in all the dimensions that constitute MAL.

Globally, the results presented, and the suggested implications have sought to contribute to two lines of research of the doctorate in engineering, industry and organizations. In the first place, to the line of "systems and management of technology, information, knowledge and technological innovation in industry and organizations", while the topics related to the digital behaviour of the consumer and the approach from the principles of behavioural economics have allowed to present findings that can be applied to innovation in interventions on the problematic use of mobile technologies, particularly social media networks. And secondly, to the line of "engineering education", in that the approach to the problem of mobile advertising literacy made it possible to obtain results and recommendations aimed at what could become an education programme on digital issues for a very relevant population group, such as parents and caregivers of children and adolescents. As

could be observed, the situation is not very flattering at the global level, and in the case of Colombia there seem to be even more gaps in the skills of the dimensions of MAL identified and described in the second chapter.

Finally, the issues related to the dark side of mobile digital technologies, and in particular those that are part of marketing communication tactics, require further study and dedication from the global academic community. The level of influence exerted by these digital platforms, led by the giants Google, Apple, and Meta, among others, on the behaviours, personalities and well-being of younger users should not be taken lightly. Government and other consumer protection agencies should join forces to intervene through regulation but also through programmes that identify and intervene in cases that represent excessive or problematic use of social media networks, or in those populations that have low levels of MAL, as seems to be the case in Colombia. But above all, the call is for every user to be aware of how these mobile technologies benefit or affect them at a personal, family, and occupational level and thus take a more proactive and informed role, taking control of their digital behaviour and not leaving it in the hands of the tech giants and their endless economic and political ambitions.

A. Appendix: Spanish version of the Smartphone Addiction Inventory (SPAI-S)

A continuación, encontrará una serie de afirmaciones en la columna de la izquierda. Para cada una, por favor indique la respuesta que considere más apropiada de acuerdo a las cuatro opciones disponibles: Muy en desacuerdo, En desacuerdo, De acuerdo, Muy de acuerdo.

1. Me han dicho más de una vez que paso demasiado tiempo con el Smartphone.
2. Me siento preocupado/a cuando dejo el Smartphone durante un determinado periodo de tiempo.
3. Me he dado cuenta de que cada vez paso más tiempo usando mi Smartphone.
4. Me siento ansioso/a o irritable cuando mi Smartphone no está disponible.
5. Me siento bien usando mi Smartphone independientemente de lo cansado/a que me encuentre.
6. Uso el Smartphone por largos periodos de tiempo y me gasto más dinero del que tenía pensado gastar.
7. Aunque usar el Smartphone me ha producido efectos negativos en mis relaciones interpersonales, no he disminuido el tiempo que paso conectado a Internet.
8. Más de una vez he dormido menos de cuatro horas por estar usando el Smartphone.

9. En los últimos 3 meses he aumentado el tiempo que paso usando el Smartphone por semana.
10. Me siento decaído/a cuando dejo de usar el Smartphone durante un cierto tiempo.
11. No puedo controlar el impulso de usar mi Smartphone.
12. Estoy bien pasando el tiempo con el Smartphone, aunque me suponga estar menos tiempo con mis amigos/as.
13. Siento dolores/molestias en la espalda o en los ojos debido al excesivo uso del Smartphone.
14. La idea de utilizar el Smartphone es lo primero que viene a mi cabeza cuando me despierto cada mañana.
15. El uso del Smartphone me ha causado efectos negativos en mi actividad escolar o laboral.
16. Siento que me falta algo cuando dejo de usar el Smartphone durante un periodo de tiempo.
17. La relación con los miembros de mi familia ha disminuido a causa del uso del Smartphone.
18. Mis actividades sociales o de ocio se han reducido a causa del uso del Smartphone.
19. Siento la necesidad de volver a utilizar el Smartphone justo después de terminar de hacerlo.
20. Mi vida sería triste si no tuviera un Smartphone.
21. Usar el Smartphone me ha colocado en situaciones de peligro como, por ejemplo: usarlo mientras cruzo la calle o mirarlo mientras conduzco.
22. He intentado utilizar menos el Smartphone, pero mis esfuerzos no han servido de nada.
23. He convertido el uso del Smartphone en un hábito y la calidad de mi sueño y el total de horas dormidas han disminuido.
24. Necesito pasar más tiempo que antes con el Smartphone para obtener el mismo nivel de satisfacción.
25. No puedo sentarme a comer sin tener conmigo mi Smartphone.

26. Me siento cansado/a durante el día por haber usado el Smartphone hasta altas horas de la noche.

B. Appendix: Questionnaire “Uso de redes sociales e incentivos alternativos”

I. Preguntas demográficas

a. Edad en años cumplidos (solo ingresar números): _____ *

b. ¿A qué género pertenece? *

Mujer
Hombre
Prefiero no decirlo

c. ¿Cuál es el nivel educativo alcanzado o que se encuentra desarrollando? *

Técnico - Técnico Profesional
Tecnólogo
Profesional - Pregrado
Especialización - Especialización Tecnológica
Maestría
Doctorado
Posdoctorado

d. Seleccione todas las casillas que definan su situación laboral actualmente:

Empleo de medio tiempo
Empleo de tiempo completo
Desempleado
Trabajador por cuenta propia
Estudiante
Pensionado

e. ¿Cuál es su estrato socioeconómico? *

1. Bajo-bajo
2. Bajo
3. Medio-bajo
4. Medio
5. Medio-alto
6. Alto

f. ¿Cuál es su rango de ingreso personal?

Menos de 1 SMMLV (908,526)
Entre 1 SMMLV (908,526) y menos de 3 SMMLV (2,725,578)
Entre 3 SMMLV (2,725,578) y menos de 5 SMMLV (4,542,630)
Más de 5 SMMLV (4,542,630) y menos de 7 SMMLV (6,359,682)
Más de 7 SMMLV (6,359,682)

II. Uso de Redes Sociales

g. ¿Cuál es la red social que más tiempo utiliza al día? (No incluye aplicaciones de mensajería instantánea: WhatsApp, Telegram, etc.).

Facebook
Instagram
TikTok
YouTube
Twitter
Pinterest
Snapchat
LinkedIn
Otra: _____

h. ¿Aproximadamente, cuánto tiempo en promedio al día usa la red social que indicó en la pregunta anterior?

1 hora o menos
Entre 1 y 2 horas
Entre 2 y 3 horas
4 horas o más

i. ¿En qué momento del día consideras que utilizas más la red social que indicaste anteriormente? (puedes seleccionar más de una opción):

Mañana
Tarde
Noche

III. Preguntas de elección

Imagina la siguiente situación hipotética. Has sido invitado a participar en un estudio de laboratorio y estarás en el laboratorio de la universidad durante 180 minutos (3 horas). Durante ese tiempo, estarás completando actividades como crucigramas, sopas de letras, etc. para obtener créditos extra en la universidad. No tendrás acceso a tu teléfono móvil o a cualquier otro medio de comunicación. Sin embargo, después de 15 minutos de iniciada la sesión, el investigador te dice que puedes elegir entre ganar algo de dinero o tener acceso a tus redes sociales (todas las que quieras usar) durante los próximos 5, 15, o 45 minutos. El investigador te muestra tu smartphone y a continuación, te pide que realices una serie de elecciones, que se enumeran a continuación.

Para cada pregunta, debes indicar tu preferencia seleccionando una de las dos opciones disponibles. Debes responder todas las preguntas. Ten en cuenta que, independientemente de tu elección, permanecerás en el laboratorio durante los 180 minutos (3 horas) para obtener los créditos extra en la universidad. Estas opciones son hipotéticas, pero por favor, responde como si estuvieras realmente en la situación.

Situación 1

A continuación, deberás responder varias preguntas en las que escogerás entre usar tus redes sociales (todas las que quieras) durante 5 minutos de forma inmediata, o recibir de inmediato una cantidad determinada de dinero (pesos colombianos).

1.1 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $10000 de inmediato.

1.2 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $12000 de inmediato.

1.3 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $15000 de inmediato.

1.4 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $20000 de inmediato.

1.5 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $25000 de inmediato.

Situación 2

A continuación, deberás responder varias preguntas en las que escogerás entre usar tus redes sociales (todas las que quieras) durante 5 minutos de forma inmediata, o esperar un tiempo de una semana para recibir una cantidad determinada de dinero (pesos colombianos).

2.1 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $10000 dentro de una semana.

2.2 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $12000 dentro de una semana.

2.3 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $15000 dentro de una semana.

2.4 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $20000 dentro de una semana.

2.5 ¿Qué alternativa prefieres?

A. 5 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $25000 dentro de una semana.

Situación 3

A continuación, deberás responder varias preguntas en las que escogerás entre usar tus redes sociales (todas las que quieras) durante 15 minutos de forma inmediata, o recibir de inmediato una cantidad determinada de dinero (pesos colombianos).

3.1 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $10000 de inmediato.

3.2 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $12000 de inmediato.

3.3 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $15000 de inmediato.

3.4 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $20000 de inmediato.

3.5 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $25000 de inmediato.

Situación 4

A continuación, deberás responder varias preguntas en las que escogerás entre usar tus redes sociales (todas las que quieras) durante 15 minutos de forma inmediata, o esperar un tiempo de una semana para recibir una cantidad determinada de dinero (pesos colombianos).

4.1 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $10000 dentro de una semana.

4.2 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $12000 dentro de una semana.

4.3 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $15000 dentro de una semana.

4.4 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $20000 dentro de una semana.

4.5 ¿Qué alternativa prefieres?

A. 15 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $25000 dentro de una semana.

Situación 5

A continuación, deberás responder varias preguntas en las que escogerás entre usar tus redes sociales (todas las que quieras) durante 45 minutos de forma inmediata, o recibir de inmediato una cantidad determinada de dinero (pesos colombianos).

5.1 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $10000 de inmediato.

5.2 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $12000 de inmediato.

5.3 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $15000 de inmediato.

5.4 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $20000 de inmediato.

5.5 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $25000 de inmediato.

Situación 6

A continuación, deberás responder varias preguntas en las que escogerás entre usar tus redes sociales (todas las que quieras) durante 45 minutos de forma inmediata, o esperar un tiempo de una semana para recibir una cantidad determinada de dinero (pesos colombianos).

6.1 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $10000 dentro de una semana.

6.2 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $12000 dentro de una semana.

6.3 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $15000 dentro de una semana.

6.4 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $20000 dentro de una semana.

6.5 ¿Qué alternativa prefieres?

A. 45 minutos de uso de tus redes sociales navegando de inmediato.

B. Recibir $25000 dentro de una semana.

IV. Escala de actitudes frente al uso de las redes sociales

Para las siguientes preguntas por favor considera la relación que tienes con las redes sociales en general. Ten en cuenta que la escala de respuesta incluye las siguientes opciones: “Nunca” “Rara vez” “A veces” “Con frecuencia” y “Siempre”.

1. Pienso en lo que debe estar pasando ahora en mis redes sociales.
2. Lo primero que hago en el día es revisar mis redes sociales.
3. Cuando no reviso las redes sociales durante un tiempo, la idea de revisarlas ocupa mi mente.
4. Creo que mi vida sería aburrida, vacía e insípida si no tuviera las redes sociales.
5. Cuando no estoy conectado a Internet pienso mucho en revisar mis redes sociales.
6. Me pregunto qué está pasando en este momento en mis redes sociales.
7. Hay veces que paso más tiempo en las redes sociales de lo que creo.
8. Cuando estoy usando las redes sociales y quiero hacer otra cosa, me digo "unos minutos más".
9. No puedo dejar de usar las redes sociales durante mucho tiempo.
10. Hay veces que utilizo las redes sociales más de lo previsto.
11. No me doy cuenta de cómo pasa el tiempo mientras uso las redes sociales.
12. Dedico mucho tiempo a diferentes actividades (chat, ver fotografías y posts, etc.) dentro de las redes sociales.
13. Utilizo las redes sociales para olvidar mis problemas personales.
14. Dedico tiempo a las redes sociales cuando me siento solo.
15. Prefiero navegar por las redes sociales para liberarme de los pensamientos negativos sobre mi vida.
16. Cuando me aburro de mis problemas, el mejor lugar en donde encuentro refugio son las redes sociales.
17. Me olvido de todo en los momentos en que uso mis redes sociales.
18. Hay veces que intento dejar de usar las redes sociales y no lo consigo.
19. Deseo intensamente disminuir el tiempo de uso que le doy a las redes sociales.
20. Hago esfuerzos inútiles para dejar de usar las redes sociales.
21. Hago esfuerzos inútiles por disminuir el tiempo de uso de las redes sociales.
22. Intento disminuir el tiempo que paso en las redes sociales, pero no lo consigo.

23. Utilizo más las redes sociales, aunque eso afecte negativamente mi trabajo o estudios.
24. Doy menos prioridad a mis aficiones (hobbies) y actividades de ocio debido a las redes sociales.
25. Hay veces que descuido a mis seres queridos y amigos debido al uso de las redes sociales.
26. Hay veces que descuido a mis amigos por culpa de las redes sociales.
27. Debido a las redes sociales, no puedo terminar mis actividades a tiempo.
28. Para pasar más tiempo en las redes sociales, descuido las actividades relacionadas con el estudio o el trabajo.
29. Prefiero pasar tiempo en las redes sociales antes que pasar tiempo con mis amigos.
30. Mi estudio o trabajo se ven interrumpidos por el tiempo que paso en las redes sociales.
31. Mi productividad disminuye debido al uso de las redes sociales.
32. Prefiero pasar tiempo en las redes sociales que salir con mis amigos.
33. La gente me critica por el tiempo que paso en las redes sociales.
34. Intento ocultar a otras personas el tiempo que paso en las redes sociales.
35. Hay veces que me olvido de comer por culpa de las redes sociales.
36. Hay veces que dedico menos tiempo a mi cuidado personal debido al uso de las redes sociales.
37. Tengo alteraciones/perturbaciones del sueño debido al uso de las redes sociales.
38. Hay veces que presento problemas físicos (dolores de espalda, cabeza, ojos) debido al uso de las redes sociales.
39. El uso de las redes sociales me causa problemas en mis relaciones con personas importantes para mí.
40. El uso de las redes sociales me causa problemas en mi vida.
41. A medida que aumentan las cosas que tengo que hacer, mi deseo de utilizar las redes sociales aumenta a ese mismo ritmo.

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