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Neurocognitive Behavior Analysis of Sexting Phenomenon in Young Adults

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Abstract. Recent advancements in information and communication technology (ICT) and the growing use of technological equipment by young adults, combined with unrestricted access to the Internet and social media and the unrestricted use of smartphones and computers, have resulted in the emergence of social phenomena such as sexting. This article serves two purposes: To capture the phenomenon of sexting to investigate young adults' perceptions of sexting and the frequency with which social media users exchange sexual messages via a self-report questionnaire and to describe the behavioral profile of social media users network users via a cognitive decision-making detection test. Data were collected and analyzed using descriptive statistical analysis methods from a sample of young adults, students, and social network users (N = 377, Age: 18-39 years). The findings indicated that the sexting phenomenon is gaining traction among young adults, based on data processing and analysis from the administration of the reference questionnaire. Simultaneously, it appears to be related to participants' behavioral profiles in the cognitive dimension of decision-making. The current study's findings, which are being piloted, may aid in developing broad conclusions that can be accepted and affect policy and decision-making in the disciplines of clinical psychology, and cognitive neuroscience and education. In summary, sexting poses numerous risks to young adults in Greece and must be addressed more effectively in the interests of stakeholders and the larger community. Additionally, lawmakers, legislators, and authorities should take steps to safeguard children, adolescents, and young people who are heavily interested in social media and have integrated it into their daily life.

Keywords. Decision-Making, Neurocognition, Iowa Gambling Task, Behavioral Analysis, Sexting Phenomenon, Young Adults

1. Introduction

Sexting is cyberbullying that takes its name from the words "sex" and "texting." Sexting has been referred to as the production, reproduction, and distribution of sexually explicit images to others since 2005. This content can take the form of images, photos, videos, verbal or written messages and is frequently associated with naked or semi-naked personal photographs of people (Rey *et al.*, 2019) transmitted via communication technologies, primarily cell phones, computers, tablets, or the Internet. Sexting may have adverse consequences and raises legal, sociological, and psychological concerns (Roberts, 2003; Walker, Sancu, & Temple-Smith, 2013, Wikipedia, Burke, *et al.*, 2014, Dir *et al.*, 2013, O'Connor & Drouin, 2020). Recent advancements in Internet technologies (smartphones, personal computers, and social media) (Strassberg, Mc Kinnon, Sustaita, & Rullo, 2013) and a more digitalized world, in general,

provide young adults with the opportunity to use and have easy access to these advancements (Crimmins & Seigfried-Spellar, 2014). Such use can present enormous opportunities and risks, both positive and negative (Agustina & Gomez-Duran, 2012; Holoyda et al., 2017; Ayala, Cala, & Dalouh, 2020; O'Connor & Drouin, 2020). On the other end of the spectrum, which is the subject of this discussion, there appears to be an increase in sexting. This relatively new issue has manifested itself in our modern globalized societies. It will unavoidably have a significant impact on future generations' uprisings (Gutierrez-Puertas et al., 2017), and the case of the covid-19 pandemic has raised even more concerns. Sexting appears to have exploded in popularity in recent years due to easy Internet access via cell phones, tablets, and computers, as well as the development of social media. While sexting is thought to have originated as a way for couples to overcome distance issues in their relationships and to reconnect, heat up or spice up their sex lives, and even cheat or flirt with someone other than their partner, this appears to no longer be the case (O'Connor & Drouin, 2020, Drouin & Landgraff, 2012). Because adolescents are more adaptable to change and faster learners than any other age group throughout their lives, they appear to be the first to suffer adverse consequences if left unsupervised. Sexual awakening, an openness to experimentation and sexual play, and a newly discovered interest in the genital parts of the body and other sex that develop during puberty (Cole & Cole, 1996) make sexting particularly appealing to children and adolescents. A sizable percentage of teens and adults alike will begin exchanging photos, videos, pictures, or messages with self-explanatory content (Drouin & Landgraff, 2012).

2. Literature review

2.1. Epidemiology

Referring to sexting, research over the last decade has revealed essential data, some of which are detailed below. According to a 2014 study, 65% of participants had sent sexually explicit texts or photos, while 69% had received them; 31% had shared such private communications with others. 46% of respondents had a favorable opinion of people who send naked photos. Females were more likely than males to feel pressured to sext. Respondents from African American backgrounds sexted more frequently than respondents from white backgrounds. Most respondents believed that sexting was harmful (Brinkley et al., 2017). According to a survey conducted by "The Key," 61% of secondary school principals cited "sexting" as a source of concern. This percentage appears to be greater than the percentage associated with the dangers associated with drugs, obesity, and bullying. Adult women appear to be at a greater risk as a group, according to the media. According to a 2011 study conducted in the United States (Lenhart et al., 2011), while 8% of 12–17-year-olds reported experiencing some form of online bullying, only 2% of them had sent sexually explicit images or videos, but 1 in 6 had received them. According to a 2008 study conducted in the United States on Sexting and Adolescents, 71% of teenage girls have sexted, 44% believe it is common to share their pictures with people who were not intended to see them, 38% believe it makes dating easier, and 51% have done so in response to pressure from the opposite sex. 66% of adolescent females and 60% of adolescent males did it to appear "fun or erotic." 44% of teenage sexters sexted in response to the content they received, and 29% of teens said it increased their lustfulness. Numerous studies have expressed concern and drew attention to this new fashion/trend, not only among parents, but also among social policymakers, legislative authorities, and the general public (Agustina & Gomez-Duran, 2012; Farber et al., 2012; Walker et al., 2013; Gamez-Guadix et al., 2017; Olatunde & Balogun, 2017; Maheux et al., 2020; O'Connor & Drouin, 2020, referred to cases of minors and non-minors engaging in sexting and exchanging sexually explicit images of themselves, their peers, and even third parties have been reported, most

frequently without their consent (*De Santisteban & Gamez-Guadix, 2018*). Such audiovisual material violates child pornography, public order, and protection and privacy laws while absolving perpetrators of legal consequences (*O'Connor & Drouin, 2020*). Additionally, media outlets have reported on instances of suicidal thoughts and attempts (*Ayala, Cala, & Dalouh, 2020; Goodchild van Hilten, 2015; Comartin et al., 2012; O'Connor & Drouin, 2020*), frequently as a result of minors' inability to cope with online and public leaks of personal images and private sexual information, sexual discomfort during puberty, and people's illusion of anonymity and invisibility (*Gutierrez-Puertas et al., 2017; Holoyda et al., 2017*).

2.2. The Case of Greece

In Greece, research focuses primarily on bullying and cyberbullying. Bullying and victimization recur on a systematic basis in between one and ten children (www.stobullying.gov). In Greece, SafeLine.gr reports increasing online reports of child pornography, personal information leakage, and cyberbullying, reaching 47% for child pornography, 18% for personal information leakage, and 1% for cyberbullying. There has been a similar increase in reports from other countries (www.inhope.org). This could be due to a decline in the age at which children access new technologies and engage with social media, particularly following the lockdown in response to the covid-19 pandemic (SaferInternet4kids.gr, <https://www.bovary.gr/living/health-diary/ti-einai-sexting>). According to another Greek study, only 4% of children aged 9-16 have experienced online harassment (compared to 6% of the European [EU Kids] average), and 17% have experienced harassment in general (either online or in-person), compared to 19% of the European [EU Kids] average. In general, sexting (in contrast to bullying) is a phenomenon that has received insufficient attention in Greece; as a result, scientific research studies are rare. This appears to be the subject's first large-scale study. This could be due to moral dilemmas and issues, specific traditional values in Greek upbringing, certain social or personality characteristics associated with establishing close intimate relationships, or religious concerns.

Additionally, Greek children are believed to be raised with more traditional values. Perhaps this is related to the fact that young people seek more socially acceptable ways to express sexual desires, as Greeks appear to possess social characteristics associated with establishing close intimate relationships. The way of life, particularly during the approximately three-month-long summer vacation and school closure, and the massive influx of tourists during the summer, which allows for increased physical, sexual activity, may also influence behavioral differences. Religious and traditional ethics do not permit minors to engage in any form of physical or internet sexual activity. Interfamilial rules remain stringent and taboo. As a result, less than 2% of teenagers aged 14-15 sexted, as the results indicated. This study aims to fill a void in the body of knowledge regarding sexting in Greece. In any case, Greek society, like any other, will have to address the issue promptly and responsibly. This study aims to fill a void in the research of sexting phenomena in Greece. Additionally, in order to more fully characterize the phenomena of sexting and the behaviors of social network users connected with it, it is necessary to describe the profile of sexters' actions and impulses when sharing content. One approach to investigate the collection of sexting behaviors is through decision making, which is influenced by impulse and emotional factors in general (*Gkintoni et al, 2015*).

2.3. Neurobiological Model of Behavioral Decision-Making

Decision-making is critical in daily life because it entails analyzing and weighing the short- and long-term costs and rewards of competing activities. The decision-making process's output, i.e., the course of action to be taken, is determined by an interaction between *impulsive*

or emotionally driven systems that respond to immediate (potential) rewards and losses or threats, and *reflective or cognitive control systems* that maintain a longer-term perspective. These loops have varying degrees of influence over decision-making behavior (Ko et al., 2010). While the limbic loop is involved in immediate responses to (potential) rewards, losses, or threats (i.e., impulsive behavior) as well as emotional control, i.e., adjusting behavior to changing circumstances, the cognitive loop is more concerned with long-term or future perspectives, i.e., cognitive control (Van den Bos et al., 2013).

The Iowa Gambling Task (IGT) is a task designed to examine decision-making processes, specifically the creation of long-term lucrative strategies in everyday life in opposition to satisfying a need, in this case earning money. The test subjects are required to construct a long-term successful monetary scenario in the face of uncertainty and a conflict between the probability of encountering an instant significant reward (+100 Euro) in two long-term losing decks (250 Euro; decks A and B) and the probability of encountering. Men and women perform differently on the Iowa Gambling Task (IGT), a decision-making task in which subjects learn to distinguish between long-term advantageous and long-term disadvantageous decks of cards through exploration: men choose more cards from the long-term advantageous decks than women do within the standard number of 100 trials. On the basis of a large body of evidence, it has been proposed that the outcome of decision-making processes, i.e., which action is ultimately taken, is determined by an interaction between two distinct forebrain loops: a limbic (affective/motivational) loop encompassing the prefrontal cortex (PFC) in its orbital sub-region, i.e., orbitofrontal cortex (OFC), the amygdala, and ventral striat The two decision-making loops (cognitive and emotional) are suggested to be activated concurrently during IGT performance, with their relative weights varying according to task phase, i.e. the limbic loop may dominate the early phase, while the cognitive loop may dominate the late phase, suppressing limbic loop activity. Recent research indicates that IGT performance is hemisphere lateralization dependent. For example, it has been demonstrated that IGT performance is positively correlated with activity in the right ventrolateral prefrontal cortex, the right anterior insula, and the right caudate nucleus head. Furthermore, patient investigations have revealed a stronger association between performance impairments and right-sided frontal lesions than with left-sided lesions. These findings imply that as the IGT continues, the right hemisphere may begin to take precedence. Thus, a highly complex and dynamic interaction between different cortico-basal ganglia networks exists, involving 5-HT regulation and a right-sided bias that results in a shift away from evaluating the relative value of decks and toward a behavioral program based on expected long-term payoffs for the various decks.

3. Materials and methods

3.1. Aim of Research

The purpose of this research was to document and assess critical features in young adults as part of an epidemiological study examining the prevalence and severity of various types of sexting practices. After that, the prevalence and correlation of various forms of sexting practices will be researched and addressed. Any constraints associated with the current research will also be considered.

3.2. Participants

The study examined studied data from 377 social networking users ranging in age from 18 to 39, but mostly white, who had access to the internet and participated willingly and voluntarily. However, the sample consisted primarily of young adults aged 20-27. As a result,

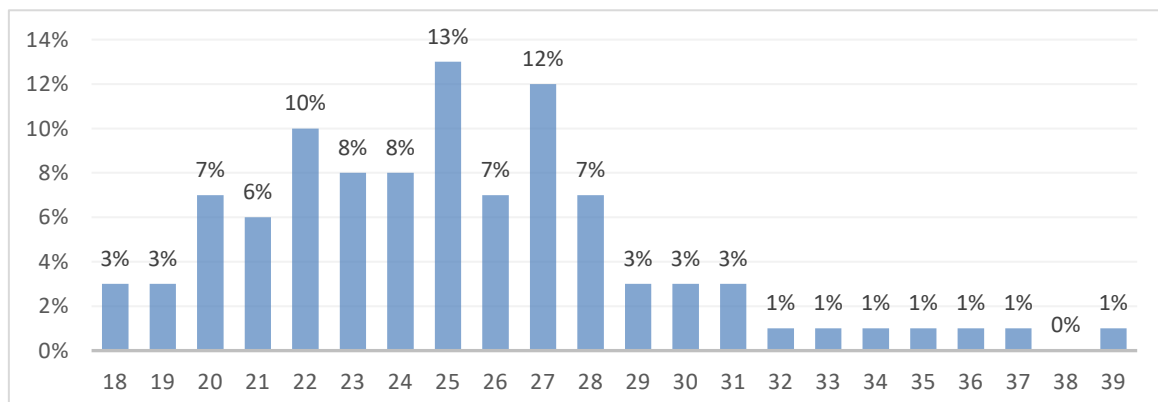
future study should include a greater number of minors. The sample consisted primarily of residents of Greece's northwest regions, rather than the capital city, where young adults' attitudes may differ. In the current survey, 81% of respondents indicated that they had exchanged a sexually explicit communication, and 66% indicated they had also exchanged an image/video. Additionally, 66% of the sample shared a sexually explicit communication with another individual, and 60% received a nude/half-naked photo of an acquaintance. To conduct this research, the authors' first concern was to develop a questionnaire whose content corresponded to the research's objectives in order to serve as an indispensable and adequate research tool. As such, it was written in the manner in which the research questions and hypotheses were formulated during the research's construction phase. Measurable objectives were developed from the research questions and case studies, which served as the foundation for developing the questionnaire. The questionnaire's methodology development was expected to identify the most appropriate verbal formulations so that the question could be investigated accurately, and the research participants could understand it. This is necessary in order to document respondents' perspectives and ascertain their attitudes toward the subject of sexting (Sudman & Bradburn, 1983). It was constructed using closed response questions with multiple-choice or yes / no / maybe responses. Three hundred and seventy-seven social network users' data were analyzed. SPSS software was used for all statistical analysis. For this research project, data were collected and analyzed using descriptive statistics methods.

Also, for the identification of Decision-Making Behavior in Sexting Phenomenon, participants were administered, the neuropsychological task, Iowa Gambling Task (Bechara et al, 1994). Specifically, participants were asked through the test to choose one card at a time from four decks (A, B, C, and D) displayed on a computer screen in order to win "virtual" money. The participants did not know that decks A and B were associated with high monetary rewards and high monetary losses. At the same time, decks C and D had lower rewards but also lower monetary losses. The gain or loss resulting from the selection of the respective card is displayed on the screen. The variable evaluated was the total number of cards selected from the favorable decks C and D minus the number of cards selected from the dangerous decks A and B (i.e., higher scores indicate better performance). Finally, the data of the task proceeded and analyzed in combination with the self-administered questionnaire of Sexting (Gkintoni et al., 2017).

4. Results

4.1. Descriptive Statistics

Of the 377 people who took part in the survey, 39% (146 people) are Men, and 61% (231 people) are Women. The ages that took part were from 18 to 39 years old. The exact measurements and percentages of all ages are shown below (Figure x). It is observed that the



ages occupy the highest percentages from 20 to 28 years (78%). Specifically, at the age of 25, the percentage amounts to 14%, the highest based on the given total. Then follows the age of 27 years with a percentage of 12%, then 22 years with a percentage of 10%. The ages occupy the smallest percentage from 32 to 39 with percentages ranging between 2% -1%. This variation is based on the fact that the questionnaire was made available for the answer to Higher education students, where for the most part, the ages of the individuals are between 20 and 28 years old (Figure 1).

Figure 1: Age Range

The following questions were then posed to the participants: How frequently would you say that the following statements describe what occurs to individuals at your age?

- Q1: Sending sexually explicit messages to someone else
- Q2: Share sexually explicit messages with those other than those originally intended.
- Q3: Send his sex pictures or videos.
- Q4: Post your sex pictures or videos online.
- Q5: To share personal sexual images or videos of other acquaintances with other people.

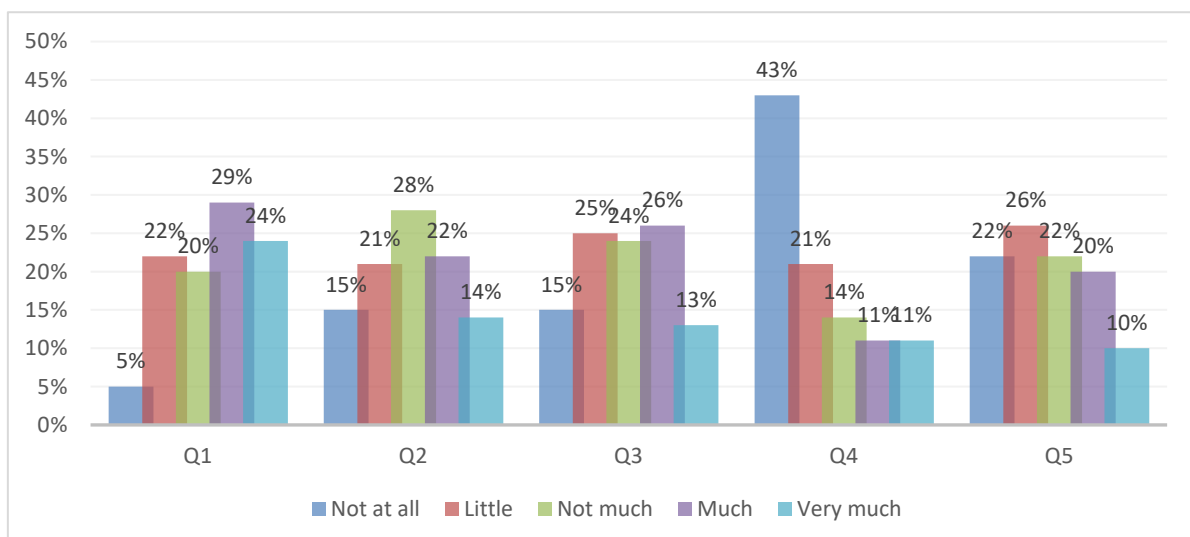


Figure 2: Sexting Questions [Q1-Q5]

To a question (Q6) asked participants about whether they have a profile on a social networking site, 97% (N = 349) answered positively as in question (Q7) whether they follow other users' profiles on social networking pages, in 92 % of the sample (N = 365) indicated that they are accustomed to monitoring. In addition. to the question (Q8) if they have profiles on a dating site, 86% (328 people) answered negatively, as in the question (Q9) if they see profiles of others on dating pages, 80% (304 people). To the question (Q10), if they send pictures or videos from their mobile phone, 91% (343 people) answered positively as respectively to the question (Q11) if they send/receive video to their computer an 81% answered that they send/receive. To the question (Q12), if respondents post photos on the internet, 90% (339 people) answered positively as in the question (Q13) about whether they upload videos on the internet, 41% (155 people) answered that they upload. Finally, when asked (Q14) if they send/receive text messages, 96% (362 people) answered in the affirmative (Figure 3).

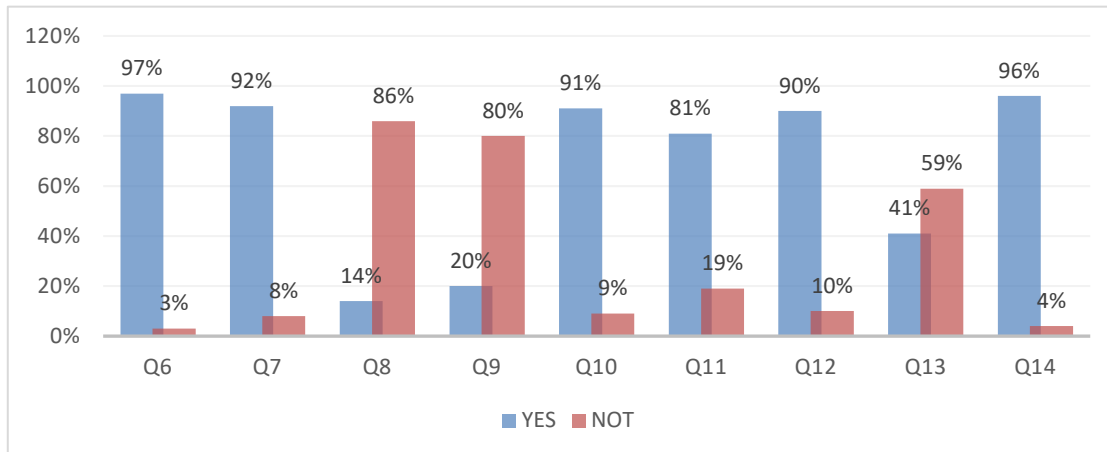


Figure 3: Sexting Questions [Q6-Q14]

The following question asked participants why they believed someone their age would send a sexual message or photo/video representing themselves. The figures below illustrate the responses (Figure 4):

- Q15: To attract or retain the attention of someone interested in him/her. [75% answered Yes], [4% answered No] [21% answered Maybe]
- Q16: Because someone pressured him/her to send them. [38% answered Yes] [30% answered No] [32% answered Maybe]
- Q17: To get someone to want them. [64% answered Yes] [7% answered No] [29% answered Maybe]
- Q18: In response to similar material received from someone. [68% answered Yes] [8% answered No] [24% answered Maybe]
- Q19: To flirt. [74% answered Yes] [3% answered No] [23% answered Maybe]
- Q20: To get attention. [76% answered Yes] [4% answered No] [20% answered Maybe]
- Q21: In response to relevant material received from someone. [68% answered Yes] [8% answered No] [24% answered Maybe]

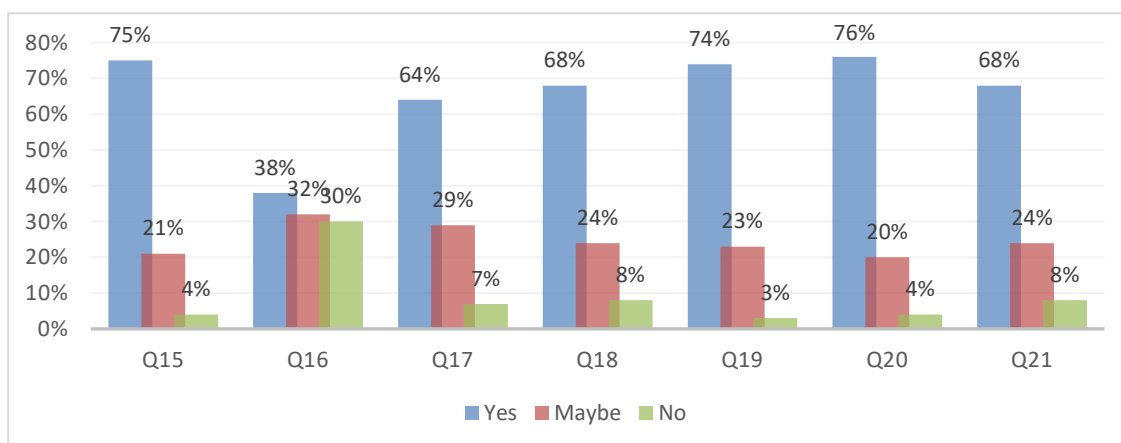


Figure 4: Sexting Questions [Q15-Q21]

In the next section, the questions were about personal experience (Figure 5):

- Q22: You have sent a sexually explicit message to someone (via email, instant message, SMS, etc.) [81% answered Yes] [19% answered No]

- Q23: You have posted a sexually explicit message on someone's profile (e.g., Facebook, etc.) [85% answered No] [15% answered Yes]
- Q24: Have you received a sexually explicit message from someone (via email, instant message, SMS, etc.) [68% answered Yes] [32% answered No]
- Q25: You shared a sexually explicit message intended for someone else, and you shared it with someone else [34% answered Yes] [66% answered No]
- Q26: You have received a message with a sexual connotation intended for personal-private communication, among others. [46% answered Yes] [54% answered No]
- Q27: Have you sent a nude or half-naked photo/video with you to someone else (via email, mobile, etc.) [66% answered Yes] [34% answered No]
- Q28: Have you taken a nude or half-naked photo of an acquaintance? [56% answered Yes] [44% answered No]
- Q29: Have you posted a nude or half-naked photo/video with you on the internet (e.g., Facebook, personal blog, etc.) [15% answered Yes] [85% answered No]
- Q30: Have you ever had a nude or semi-nude photo/video of someone who was initially intended to be private and reached out to you? [41% answered Yes] [59% answered No]
- Q31: Have you shared a nude or half-naked photo or video with someone other than the intended recipient of the original personal message? [34% answered Yes] [66% answered No]

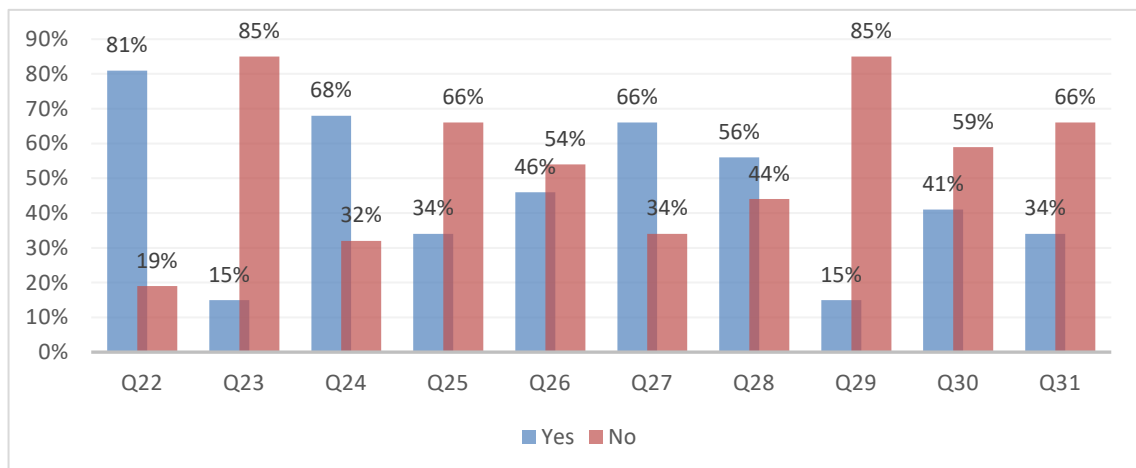


Figure 5: Sexting Questions [Q15-Q21]

The following graph illustrates the association of the Iowa Gambling Task (IGT) with the sexting self-report questionnaire. The analysis of the parameters showed that the respondents who stated that they share or post pornographic material on social networks {Q27, Q23, Q22} tended to show a lower performance in IGT choosing cards from A and B decks (long-term disadvantageous decks of cards) in contrast to the respondents who mentioned {Q25, Q29, Q31} that they are not used to sharing pornographic material through image/photo or video with others on social networks and demonstrated higher performance in IGT by choosing the cards from decks C and D (long-term advantageous decks of cards) thus presented a more conservative profile in decision making. Based on the sample of the present study, the above indicate that the sexting behaviors appear to be related to emotion-focused decision making (neurobiological model: emotional loop) as analyzed by the IGT and possibly indicate impulsive/emotional attitude of the respondents who answered the self-administered questionnaire of sexting behaviors, in contrast to participants who did not use to share pornographic material and demonstrated higher performance in IGT indicating reflective or cognitive control decision making.

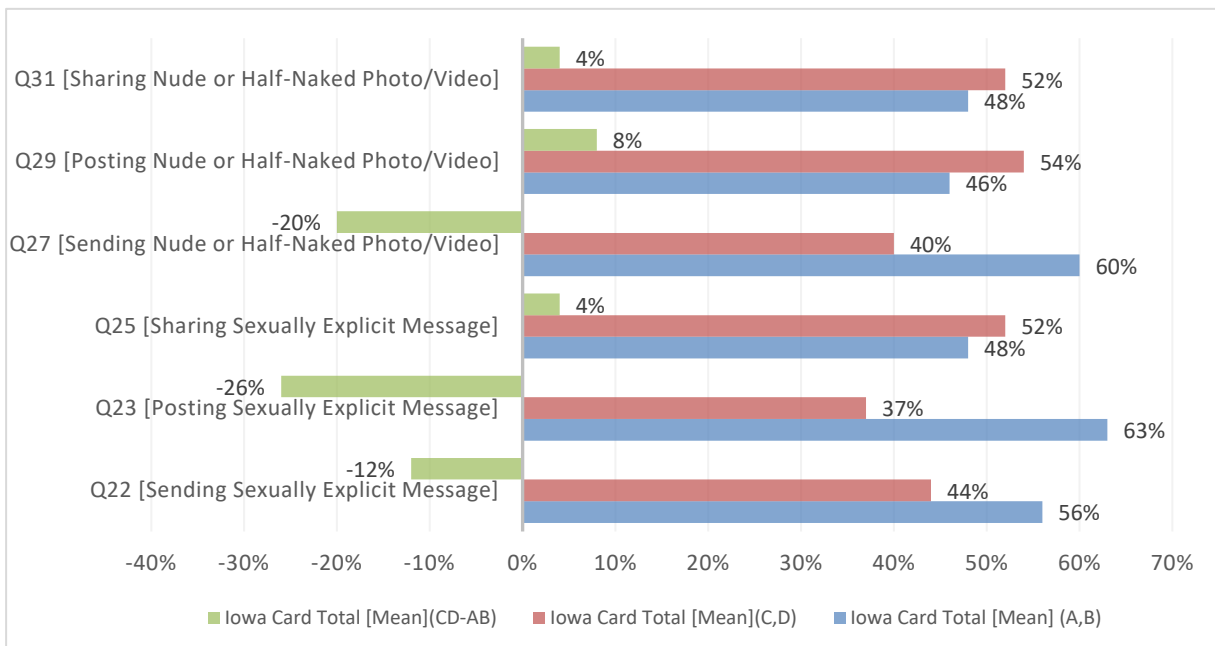


Figure 6: Iowa*Sexting Scoring

5. Discussion - Conclusion

The purpose of this paper was initially to investigate and thoroughly describe the phenomenon of Sexting as a result of the rapid development and widespread use of new technologies, particularly social media, as a means of communication between people of various ages, particularly children, adolescents, and young adults. To begin, a review of the phenomena was undertaken, followed by a detailed assessment of review studies on the epidemiology of the sexting phenomenon on a global scale, and finally, a description of the sexting phenomenon in Greece. Then, in order to ascertain the actual state of the sexting issue, particularly in Greece, a pilot study was done with a sample of a young population of adult higher education students. The pilot project had two objectives: first, to document the sexting phenomena and young people's perspectives and experiences via a self-report questionnaire; and second, to characterize the behavioral profile of social network users via a cognitive decision-making

cognition test. The study's findings indicated that 81% (N = 305) of respondents had attempted direct sexual contact with another person, while 66% (N = 249) had shared (uploaded) pornographic images/videos.

Additionally, 75% (N = 283) agree that someone in their age group may send a sexual message or photo/video to attract or retain someone's attention. Additionally, a sizable proportion of respondents, more than 68%, believe that their peers frequently exchange sexually explicit communications due to emotional or psychological pressure from their peers. One finding from the sample processing is that people who shared a photo/video of pornographic content with another person also engaged in sexting behaviors, sending comparable stuff via text messages.

Regarding the analysis of the sample individuals' behavioral profiles as revealed by their performance on the decision-making detection test (IGT), participants who stated that they shared or posted pornographic material on social media scored lower on the test and demonstrated impulsive decision-making, in comparison to participants who stated that they were not accustomed to sharing pornographic material on social media. The preceding suggests a possible correlation between decision-making and the manifestation of sexting behaviors, implying the possibility of neurobiological and neurocognitive parameters contributing to a social phenomenon with a strong emotional impact on a diverse group of sensitive and young children as the young people studied in this study.

Sexting and cyberbullying require additional research. The psychological impact of Sexting on the victim is critical for future research methods to study. However, the present study's conclusions should be evaluated within the boundaries and constraints of the study. At first look, the respondents' age range appears to be narrow, ranging from 18 to 39 years. Sexting, of course, maybe more prevalent at these ages. The study sampled a small number of young individuals and did not accurately reflect how young people and other age groups, such as children and adolescents, perceive Sexting. The current research is directed at a specific demographic; in this case, students enrolled in Greek universities. Additional research interests include the function of gender in the Sexting phenomenon and the possibility of interracial disparities.

In short, Sexting entails numerous hazards. It must be enhanced and made more relevant to stakeholders and society as a whole, which will demand tremendous work from the authorities responsible for protecting children and, subsequently, young adults. It is a social issue that has grown increasingly concerning in recent years and will continue to do so in the near future due to new social conditions that are continually changing (e.g., pandemics) and determining how populations function socially, economically, and culturally.

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