Social Media-Related Information Influences the Risk-Taking Tendency of Problematic Social Media Users

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Abstract

Based on the I-PACE model, two experiments were conducted to examine the influence of social media-related information on risk decision-making in problematic social media users. Experiment 1 employed the Wheel of Fortune task to investigate the relationship between problematic social media use and risk decision-making, revealing that the problematic group exhibited longer response times and total fixation durations, and selected risky options less frequently under high-risk conditions. Experiment 2 measured the impact of social media-related information on risk decision-making in problematic social media users by presenting social media-related cues and neutral cues; the results demonstrated that under congruent conditions, the frequency of risky option selections and time to first fixation for the problematic group increased. The overall study indicates that problematic social media use affects risk decision-making, with social media-related information exerting a greater influence on the problematic group, thereby increasing their risk-taking propensity during risk decision-making. Future research could investigate the brain activity of problematic social media users during the risk decision-making process to gain deeper insights into the relationship between problematic social media use and risk decision-making.

Full Text

Preamble

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Highlight 1: Using eye-tracking technology to objectively and dynamically capture gaze patterns during risk decision-making processes in problematic social media users, revealing the specificity of their decision-making patterns.

Highlight 2: Manipulating the location and timing of social media-related information presentation not only verified the attentional bias toward social media-related information among problematic social media users but also confirmed the impact of such information on their risk decision-making, providing evidence for the I-PACE model and for classifying problematic social media use as an addictive behavior.

2. Have you published or submitted any articles using the same data as this study? If yes, please attach them for review.

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Response: This study used questionnaires to screen participants and employed experimental methods to investigate the research questions.

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Response: For Experiment 1, G*Power calculation indicated a minimum of 52 participants were needed; the actual sample size was 65. For Experiments 2 and…

6. (Question appears truncated in original)

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Social-Media-Related Stimuli Interfere with Decision-Making of Problematic Social Media Users Under Risk

Abstract

Based on the I-PACE model, two experiments investigated the impact of social media-related information on risk decision-making in problematic social media users. Experiment 1 used the Wheel of Fortune task to examine the relationship between problematic social media use and risk decision-making. Results revealed that the problematic group exhibited longer response times and total fixation durations, and selected risky options less frequently under high-risk conditions. Experiment 2 measured the influence of social media-related cues versus neutral cues on risk decision-making in problematic social media users. Results showed that under congruent conditions, the problematic group increased their selection of risky options and showed altered first-arrival times. Overall, the findings demonstrate that problematic social media use affects risk decision-making, with social media-related information exerting a greater impact on the problematic group by increasing their risk-taking tendency during risk decision-making. Future research should explore the neural mechanisms underlying risk decision-making processes in problematic social media users to deepen understanding of this relationship.

Keywords: problematic social media use, risk decision-making, risk-taking tendency, I-PACE model
Classification Code: B84

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1. Introduction

According to the *Digital 2023 Global Overview Report*, as of January 2024, global social media users reached 5.04 billion, with this number continuing to grow (Statista, 2024). Compared to traditional face-to-face communication, social media transcends temporal and geographical limitations, providing a compensatory function for social interaction. Social media users obtain substantial social rewards through interaction, observation, and comparison with others, which reinforces repeated social media use over extended periods (Meshi et al., 2015; Jiang et al., 2016), leading to excessive or problematic use among some individuals. Problematic social media use refers to excessive preoccupation with social media, driven by strong motivations to log in or use social media, involving substantial time and energy investment that negatively impacts individuals' other social activities, studies, work, interpersonal relationships, or mental health (Wegmann & Brand, 2020). Despite its increasing prevalence, problematic social media use has not been explicitly included in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) or the *International Classification of Diseases, Eleventh Edition* (ICD-11). Research indicates that imbalanced and dysfunctional decision-making constitutes both a risk factor for and consequence of addictive behaviors, with individuals with substance use disorders and behavioral addictions showing difficulties in value-based decision-making (Meshi et al., 2021; Valyan et al., 2020; Wegmann et al., 2021). However, the relationship between problematic social media use and risk decision-making remains unclear and requires further investigation. Theoretical models and related studies suggest that specific cue information influences use and other behaviors in addicted or problematic users (Balconi et al., 2017; Brand et al., 2019; Brand et al., 2016; Moretta et al., 2022; Robinson & Berridge, 1993, 2003). For instance, social media-related cues interfere with ambiguous decision-making in problematic social media users (Wegmann et al., 2021), yet research on their impact on risk decision-making is relatively scarce. Decision-making processes involve multiple cognitive processing stages (Müller et al., 2022), but previous studies have not examined specific stages, and most have relied on behavioral measures with inconsistent findings across behavioral and physiological outcomes. Therefore, more objective evidence is needed to investigate the relationship between problematic social media use and risk decision-making, particularly when social media-related information is presented.

1.1 Problematic Social Media Use and Risk Decision-Making Existing research has found that imbalanced and dysfunctional decision-making serves as both a risk factor for and consequence of addictive behaviors. Numerous studies have confirmed that individuals with substance use and behavioral addiction disorders struggle with value-based decision-making (Chen et al., 2020; Kovács et al., 2017; Muller et al., 2022; Verdejo-Garcia et al., 2018). However, findings regarding the relationship between problematic social media use and decision-making have been inconsistent.

Meta-analytic results from Ioannidis and Hook indicate that problematic internet use is associated with impaired decision-making, with commonly used tasks including the Iowa Gambling Task, Balloon Analogue Risk Task, Cambridge Gambling Task, and Dice Gambling Task—showing similar performance deficits as observed in individuals with substance use disorders (Chen et al., 2020; Ioannidis et al., 2019). In contrast, problematic social media users do not show impaired risk decision-making in the Card and Lottery Choice Task (Muller et al., 2021, 2022; Ostendorf et al., 2020). Using the Wheel of Fortune task, Meshi and Freestone found that more severe problematic social media use was associated with increased selection of risky options under high-risk conditions, but not under low-risk conditions (Meshi et al., 2021). Meshi and Ulusoy conducted three experiments using the Balloon Analogue Risk Task within the same study, yielding inconsistent results: Experiments 1 and 3 found problematic social media use associated with more conservative risk decision-making, while Experiment 2 showed no relationship (Meshi et al., 2020).

Khoury et al., using the Dice Gambling Task and Iowa Gambling Task, found no significant differences in task scores between smartphone-dependent and control groups, yet physiological skin conductance response (SCR) data revealed significant between-group differences in risk decision-making. Iowa Gambling Task results indicated that more severe smartphone dependence was associated with disadvantageous decision-making (Khoury et al., 2019). The Iowa Gambling Task is a commonly used but complex measure. Meshi et al. found that Facebook addiction scores were only significantly correlated with performance on the final block of the Iowa Gambling Task. While the first half of the Iowa Gambling Task is typically considered to measure ambiguous decision-making and the latter half risk decision-making, some studies do not make this distinction (Meshi et al., 2019). The comprehensive model of addiction suggests that the presence of addiction cues influences the relationship between problematic social media use and decision-making, with research using the Iowa Gambling Task demonstrating that social media-related cues interfere with ambiguous decision-making in problematic social media users (Wegmann et al., 2021).

In summary, numerous factors influence the relationship between problematic social media use and decision-making, with decision type being a critical factor. Decision-making can be categorized based on context into ambiguous decision-making and risk decision-making. Risk decision-making occurs when explicit information about possible outcomes and probabilities is either provided or can be calculated, with decision-makers primarily evaluating which options are preferable in terms of expected value. In contrast, ambiguous decision-making involves situations where decision-makers lack explicit information about possible outcomes or outcome probabilities, involving feedback processing, emotional components, and implicit learning (Schiebener & Brand, 2015). Different measurement tools for risk decision-making may yield different results, and the presence or absence of social media-related information may also influence risk decision-making in problematic social media users.

1.2 Attention Processing and Risk Decision-Making Attention refers to the orientation and concentration of mental activity on specific objects and constitutes an important foundation for most cognitive activities. Attention plays a crucial role in decision-making and appears in many decision-making theories, such as the attentional drift-diffusion model (attention DDM), which integrates eye movement characteristics with the drift-diffusion model of decision-making (Orquin & Mueller Loose, 2013). The DDM assumes that in value-based binary choice, decision-makers sample option information through a stochastic process, accumulating evidence until the accumulated evidence for one option becomes sufficiently large relative to the other, at which point a decision is made in favor of the option with greater accumulated evidence (Kaplan & Haenlein, 2010; Liu et al., 2022). The attention DDM further proposes that this stochastic sampling process is related to eye movement attention. When decision-makers fixate on an option, they accumulate relative evidence (i.e., decision value) for that option, and when the accumulated evidence for one option becomes sufficiently large relative to the other, a decision is made. This attention-integrated DDM has received substantial empirical support (Ashby et al., 2016; Fisher, 2017; Krajbich et al., 2010), with findings that options receiving longer fixation durations and more frequent fixations are more likely to be selected because fixation amplifies the value of the option, while higher-value options also attract more attention (Gluth et al., 2020; Pachur & Schulte-Mecklenbeck, 2017; Thomas et al., 2019).

Research in behavioral and neuroeconomics suggests that attentional processes may underlie psychological anomalies in (risk) decision-making. Attention is a mechanism that prioritizes the allocation of relevant resources to perception, memory, or tasks based on current goals, in which sensory information is weighted according to motivational relevance (Nobre et al., 2014). In attentional cueing paradigms, when target locations are consistent with precue direction, precues accelerate information detection, discrimination, and judgment, demonstrating attention's facilitative effect on perceptual decision-making—or increased sensitivity at cued versus uncued locations. Martín et al. found in healthy participants that attention to reward cues predicted individual risk-taking, with individuals showing greater attentional bias toward high-value cues (San Martín et al., 2016). A study on risk decision-making in gambling disorder found that the average attention to gains among individuals with gambling disorder moderated the influence of gain value on gambling choices—when gain values were low, individuals with higher attention to gains began selecting gambling options (Hoven et al., 2023).

1.3 Problematic Social Media Use, Risk Decision-Making, and Attention Processing The Interaction of Person-Affect-Cognition-Execution (I-PACE) model posits that perception of internal and external triggers influences affective and cognitive responses in problematic social media users (including cue reactivity, craving, and attentional bias), which in turn leads to decisions to act in specific ways (Brand et al., 2019). Wegmann et al. demonstrated that presenting social media-related cues versus neutral cues on the backs of cards in the Iowa Gambling Task interfered with ambiguous decision-making in problematic social media users (Wegmann et al., 2021). Building on previous research, Nikolaidou et al. used a dot-probe task to investigate attention in problematic social media users, finding that problematic social media users, particularly those with high craving levels, showed attentional bias toward social media-related images (Nikolaidou et al., 2019). Integrating the I-PACE model, we can reasonably hypothesize that the appearance of social media-related cues triggers attentional bias in problematic social media users, which subsequently influences attention to option cards and, in conjunction with the attentional activation diffusion model, alters participants' choices and decision-making. However, this study only included behavioral data and could not further investigate participants' decision-making processes. The continuous presentation of social media-related cues may affect not only early-stage information perception and collection but also the entire decision-making process. This influence could involve individuals being attracted to social media-related information, reducing the weight of decision task card information, and selecting more cards with social media-related information on the back; alternatively, it could involve forming opposition to social media-related information to better complete the Iowa Gambling Task, thereby consuming more resources and selecting fewer social media-related cards. Research using resting-state MRI to investigate attention networks in problematic social media users also found reduced prefrontal control over attention networks (Lee et al., 2021), suggesting that problematic social media users likely exhibit attentional impairment or anomalies that may influence individual decision-making.

Müller et al.'s five-stage model of decision-making from a neuropsychological perspective provides support for attention's influence on decision-making. The five-stage model posits that decision-making is a multi-stage process, beginning with perception and representation. Only information that is perceived and attended to can undergo further processing, potentially triggering approach or avoidance behavioral tendencies toward relevant stimulus information before processing. These affective processes may cause changes in somatic activity, which together with perceived information are used to construct mental representations of decision options and their attributes (Müller et al., 2022). Khoury et al.'s experiment using skin conductance responses confirmed that smartphone-dependent and control groups showed different physiological reactions—i.e., changes in somatic activity—when perceiving and processing identical dice gambling task information (Khoury et al., 2019). However, in the aforementioned studies, social media-related cues were presented continuously, making it impossible to determine precisely at which stage and how social media-related cues influence decision-making in problematic social media users.

1.4 Research Rationale In summary, the relationship between problematic social media use and risk decision-making is unclear, influenced by numerous factors, and primarily investigated through behavioral measures. Therefore, Experiment 1 employed eye-tracking technology and a relatively pure risk decision-making task—the Wheel of Fortune task (without feedback to minimize working memory, emotional, and learning effects)—to monitor participants' decision-making processes and further understand the relationship between problematic social media use and risk decision-making. Based on the above, we propose **Hypothesis 1:** There is a significant relationship between problematic social media use and risk decision-making. Given attention's important role in problematic social media use and decision-making, we propose **Hypothesis 2:** Problematic social media users differ significantly from normal social media users in attentional processing during risk decision-making. Experiment 2 manipulated the timing and location of social media cue and neutral cue presentation to investigate the influence of social media-related information on attentional processes and decision-making in problematic social media users, proposing **Hypothesis 3:** The presentation of social media-related cues influences attentional processes and decision-making in problematic social media users.

Experiment 1

2.1.1 Participants

Using G*Power 3.1, with a significance level of $\alpha = 0.01$ and medium effect size (f = 0.25), the predicted total sample size to achieve 80% statistical power was at least 52 participants. Through Wenjuanxing, we administered the Bergen Social Media Addiction Scale (BSMAS), the revised Facebook Addiction Scale (FAS), and the Internet Addiction Test Networking Sites Scale (IAT-SNS) to university students in Tianjin, obtaining 538 responses. Participants were screened using the following criteria: scoring 3 or above on at least 4 items of the BSMAS, and scoring above the mean on both the FAS and IAT-SNS. This yielded 35 problematic social media users (problematic group) and 36 non-problematic social media users (control group). Six participants who responded carelessly during the experiment were excluded. All participants had normal or corrected-to-normal vision, no history of mental illness, had not participated in material evaluation or similar experiments, and participated voluntarily after being informed they could withdraw at any time. Detailed demographic information for both groups is presented in Table 1 .

Table 1 Demographic Information for Problematic and Control Groups (M±SD)

<table>
<tr><th>Group</th><th>BSMAS</th><th>FAS</th><th>IAT-SNS</th></tr>
<tr><td>Problematic (n=31, 6 male)</td><td colspan="3">20.26$±1.61|13.71±2.43|24.55±5.47||Control(n = 34, 4male)|20.91±1.85|23.59±1.94|42.12±$4.67</td></tr>
<tr><td>p-value</td><td><0.001</td><td><0.001</td><td><0.001</td></tr>
</table>

Note: BSMAS = Bergen Social Media Addiction Scale; FAS = Facebook Addiction Scale; IAT-SNS = Internet Addiction Test Networking Sites Scale

2.1.2 Measures

Bergen Social Media Addiction Scale (BSMAS): Developed by Andreassen et al., this 6-item scale measures the six core components of behavioral addiction: salience, mood modification, tolerance, withdrawal, conflict, and relapse (Andreassen et al., 2016; Andreassen et al., 2012). Using a 5-point rating scale, total scores range from 6 to 30. It is currently the most widely used scale, with its Chinese version validated in Chinese samples (Chen et al., 2016). Cronbach's α in this study was 0.74.

Facebook Addiction Scale (FAS): Developed by Koc and Gulyagci, this 8-item scale measures addiction levels across time spent and intensity of use, with higher scores indicating greater addiction tendency (Koc & Gulyagci, 2013). Chinese scholars Chen et al. revised it into a Chinese version of the Social Networking Sites Addiction Scale (Chen et al., 2018), using a 5-point scale from 1 (completely uncharacteristic) to 5 (completely characteristic). In this study, "Facebook" was replaced with "social media" (e.g., "The first thing I think about when I wake up in the morning is checking social media"). Cronbach's α in this study was 0.82.

Internet Addiction Test Networking Sites Scale (IAT-SNS): Developed by Pawlikowski et al., this 12-item scale uses 5-point ratings across two dimensions: loss of control/time management and craving/social problems (Pawlikowski et al., 2013; Wegmann et al., 2015). Cronbach's α in this study was 0.87.

2.1.3 Apparatus

The experiment used an Eyelink 1000 Plus eye tracker developed by SR Research (Canada) with a sampling rate of 1000 Hz, monocular (right eye) recording. Stimuli were presented on a 24-inch monitor with a resolution of 1920$×$1280 pixels. The experimental program was written in Experiment Builder. The screen was positioned 70 cm from the head-and-chin rest, and participants completed the task via keypress responses.

2.1.4 Procedure

Adapted from Meshi et al.'s Wheel of Fortune task—originally developed by Neeltje et al. based on Tymula et al.'s task model to measure adolescents' subjective preferences for risky and ambiguous choices (Blankenstein et al., 2016)—participants in this study made independent decisions under risk to earn as much money as possible without feedback. As shown in Figure 1 [Figure 1: see original paper], participants chose between two options: a certain option (100% chance of receiving ¥5) and a risky option (varying probabilities and amounts: ¥5, ¥8, ¥20, ¥50, and ¥125; probabilities of 12.5%, 37.5%, 50%, 62.5%, and

87.5%). The combination of certain and risky options created 25 different option pairs. To balance position effects, each option pair was presented twice with positions swapped, resulting in 50 trials presented randomly.

The experiment was conducted in a quiet eye-tracking laboratory. Before starting, the experimenter assisted participants in stabilizing their head position and adjusting their posture, then presented instructions to ensure understanding of the task. A 9-point calibration was performed for the right eye.

The experiment included practice and formal phases. The practice phase followed the same procedure as the formal phase but with different option content. A circular solid fixation point first appeared at the center of the screen, requiring participants to fixate on its center while drift correction was performed. If deviation was <0.8°, it was accepted. After the fixation point disappeared, task options were presented, and participants made a choice between the two options. A blank screen followed each choice before the next trial began, as shown in Figure 2 [Figure 2: see original paper]. To ensure diligent performance, participants were told they would receive a cash red packet reward after the experiment, with the amount related to their actual choices.

Figure 1 Wheel of Fortune Task (Meshi et al., 2021) (Example)
Figure 2 Experimental Flow Diagram

2.1.5 Statistical Analysis

A total of 3,250 trials were collected. After excluding trials with 50% risk level and applying the following criteria, 2,322 trials remained for formal analysis. Exclusion criteria: (1) trials skipped on first viewing (IA_{SKIP} = 1); (2) fixation duration <80 ms; (3) IA_{SKIP} = 1; (4) data beyond $±$3 standard deviations. Each trial included two areas of interest (AOIs). Data were analyzed using SPSS 23 and R 4.3.2, with independent samples t-tests, Bayesian logistic regression, and repeated measures ANOVA.

2.2 Results

2.2.1 Choice Outcomes To examine the effects of risk level and participant type on risky option selection, Bayesian logistic regression was conducted with risky option selection as the dependent variable and participant type and risk level as independent variables. Results showed significant coefficients for risk level and the interaction between risk level and participant type. Specifically, whether individuals selected risky options was influenced by risk level. Under low-risk conditions, no significant difference existed between groups in risky option selection. Under high-risk conditions, the problematic group selected risky options less frequently. Details are presented in Table 2 .

Table 2 Bayesian Logistic Regression Model with Risky Option Selection as Dependent Variable

Predictor	95% CI
Participant Type (ref: Control)	
Risk Level (ref: Low)	
Participant Type × Risk Level (ref: Control × Low)	

Response times for both groups under high- and low-risk conditions are shown in Figure 3 [Figure 3: see original paper]. A 2 (participant type: problematic, control) × 2 (risk level: low, high) repeated measures ANOVA revealed a significant main effect of participant type, $F(1, 63) = 5.91$, $p = 0.018$, $^2p = 0.08$, with post-hoc comparisons showing longer response times in the problematic group. The main effect of risk level was not significant, $F(1, 63) = 0.08$, $p = 0.781$. The interaction between participant type and risk level was not significant, $F(1, 63) = 1.33$, $p = 0.253$.

Figure 3 Response Times for Problematic and Control Groups Under Different Risk Levels

2.2.2 Eye Movement Results Eye movement measures included first arrival time, first fixation duration, total fixation time, and fixation count. Separate 2 (participant type: problematic, control) × 2 (risk level: low, high) × 2 (option type: risky, certain) repeated measures ANOVAs were conducted, with results shown in Table 3 and Table 4 .

First Arrival Time (also called first fixation latency) refers to the onset time of the first fixation entering the current AOI, reflecting individual attentional vigilance and early-stage eye movement patterns of attentional bias. For first arrival time, the main effect of participant type was significant, $F(1, 63) = 5.98$, $p = 0.017$, $^2p = 0.09$, with post-hoc comparisons showing longer first arrival times in the problematic group. The main effect of option type was significant, $F(1, 63) = 59.16$, $p < 0.001$, $^2p = 0.48$, with longer first arrival times for certain versus risky options. The interaction between participant type and option type was marginally significant, $F(1, 63) = 3.13$, $p = 0.082$, $^2p = 0.05$. Simple effects analysis indicated that for certain options, the problematic group's first arrival time was significantly longer than the control group's.

First Fixation Duration refers to the duration of the first fixation point within an AOI, reflecting processing difficulty and cognitive resources consumed. For first fixation duration, the main effect of participant type was not significant, $F(1, 63) = 0.02$, $p = 0.990$. The main effect of option type was significant, $F(1, 63) = 8.19$, $p = 0.006$, $^2p = 0.12$, with longer first fixation durations for certain versus risky options. The interaction between risk level and option type was significant, $F(1, 63) = 6.50$, $p = 0.013$, $^2p = 0.09$. Simple effects analysis showed that under high-risk conditions, first fixation duration for certain options was significantly longer than for risky options.

Table 3 Means and Standard Deviations of Early-Stage Eye Movement Measures (ms) (M±SD)

Risk Level	Option Type	First Arrival Time	First Fixation Duration
Low	Risky	412$±58|186±32||*Low*|*Certain*|450±80|184±25||*High*|*Risky*|441±75|185±31||*H*	

Total Fixation Time refers to the sum of durations of all fixations within an AOI, reflecting late-stage attentional processing patterns. For total fixation time, the main effect of participant type was significant, F(1, 63) = 4.51, p = 0.038, ^{2}p = 0.07, with the problematic group showing significantly longer total fixation times. The main effect of option type was significant, F(1, 63) = 328.37, p < 0.001, ^{2}p = 0.84, with longer total fixation times for risky versus certain options. The interaction between risk level and option type was significant, F(1, 63) = 135.92, p < 0.001, ^{2}p = 0.68. Simple effects analysis showed that under both high- and low-risk conditions, total fixation time for risky options exceeded that for certain options.

Fixation Count refers to the total number of fixation points within an AOI, reflecting the importance of AOI content for information processing (Yan et al., 2013). For fixation count, the main effect of participant type was marginally significant, F(1, 63) = 3.61, p = 0.062, ^{2}p = 0.05, with the problematic group showing significantly more fixations. The main effect of option type was significant, F(1, 63) = 341.13, p < 0.001, ^{2}p = 0.84, with more fixations on risky versus certain options. The interaction between risk level and option type was significant, F(1, 63) = 101.36, p < 0.001, ^{2}p = 0.62. Simple effects analysis showed that under both high- and low-risk conditions, fixation counts for risky options exceeded those for certain options.

Table 4 Means and Standard Deviations of Mid- and Late-Stage Eye Movement Measures (ms) (M±SD)

Risk Level	Option Type	Total Fixation Time	Fixation Count
Low	Risky	885$±245|3.97±1.11||*Low*|*Certain*|991±229|4.47±1.00||*High*|*Risky*|392±89	

2.3 Discussion

Behavioral results showed that whether individuals selected risky options was influenced by risk level. Only under high-risk conditions did significant differences emerge between the problematic and control groups in risky option selection, partially confirming Hypothesis 1. Similar to Meshi and Freestone's findings, more severe problematic social media use made individuals more susceptible to risk level influences. However, whereas Meshi and Freestone found that more severe problematic social media use increased risky option selection under high-risk conditions, our study found that the problematic group selected risky options less frequently (Meshi et al., 2021). Our results align with Meshi and Ulusoy's findings that problematic social media users exhibit more conservative behavior and greater risk aversion (Meshi et al., 2020). Response time data also indicated that problematic social media users' risk decision-making was affected.

Eye movement results confirmed Hypothesis 2. For first arrival time, problematic social media users required more time to fixate on option information. Combined with the five-stage theory of decision-making, this suggests that the problematic group may exhibit impairment in early-stage perception of contextual information. The absence of significant group differences in first fixation duration suggests that problematic social media use may not affect the processing of option features. Differences in total fixation time and fixation count indicate that problematic social media users may need to expend more time and cognitive effort processing option information to maximize gains.

In summary, Experiment 1 confirmed that the relationship between problematic social media use and risk decision-making is influenced by risk level, with significant between-group differences in both early- and late-stage attentional measures. Therefore, Experiment 2 presented cue information first to explore whether early presentation of social media-related cues alone would affect participants' risk decision-making and attentional processes.

Experiment 2

3.1.1 Participants

Same as Experiment 1, with five participants who responded carelessly excluded. Detailed demographic information is presented in Table 5 .

Table 5 Demographic Information for Problematic and Control Groups (M±SD)

<table>
<tr><th>Group</th><th>BSMAS</th><th>FAS</th><th>IAT-SNS</th></tr>
<tr><td>Problematic (n=32, 6 male)</td><td colspan="3">20.37$±1.64|13.59±2.33|24.56±5.41||Control(n = 34, 5male)|20.76±1.79|23.62±1.91|42.62±$5.06</td></tr>
<tr><td>p-value</td><td><0.001</td><td><0.001</td><td><0.001</td></tr>
</table>

3.1.2 Apparatus

Same as Experiment 1.

3.1.3 Materials

Materials included two parts. Part 1 was the Wheel of Fortune task, identical to Experiment 1. Part 2 consisted of 5 social media app icons and 5 non-social media app icons (neutral icons), each processed using Photoshop CC (2019). Social media-related cues included icons for WeChat, Weibo, QQ, etc., while neutral cues included Meitu Xiuxiu, Railway 12306, QQ Music, etc. These ten icons were paired and presented before option pairs. Selected from common app icons rated for familiarity and representativeness, the two image categories did not differ significantly in familiarity but differed significantly in representativeness.

3.1.4 Procedure

The procedure was similar to Experiment 1. A circular solid fixation point first appeared at the center of the screen, requiring participants to fixate on its center while drift correction was performed. If deviation was <0.8°, it was accepted. After the fixation point disappeared, relevant cue images were presented for 500 ms before automatically disappearing, followed by the Wheel of Fortune task options. Participants selected between the two options, followed by a blank screen before the next trial began, as shown in Figure 3 [Figure 3: see original paper].

Figure 3 Experimental Flow Diagram

The experiment used a 2 (participant type: problematic, control) × 2 (risk level: high, low) × 2 (between-condition variation: C1, C2) mixed design. Social media-related and neutral cue pairings included three conditions: (1) neutral-neutral image pairs first (baseline condition); (2) social-neutral image pairs where the social icon appeared on the same side as the subsequent risky option (congruent condition); (3) social icon on the opposite side from the risky option (incongruent condition). To more directly compare the three pairing conditions' effects on certain and risky options, cue presentation conditions were simplified into a between-condition difference variable with two levels: the difference between congruent and baseline conditions (C1), and the difference between incongruent and baseline conditions (C2).

3.1.5 Statistical Analysis

A total of 9,900 trials were collected. After excluding trials with 50% risk level and applying the same criteria as Experiment 1, 7,672 trials remained for formal analysis.

3.2 Results

3.2.1 Behavioral Results To investigate the influence of social media-related and neutral cues on risk decision-making, repeated measures ANOVAs were conducted with risky option selection frequency and response time as dependent variables, and participant type, risk level, and between-condition difference as independent variables. Results are shown in Table 6 .

For risky option selection frequency, the main effect of participant type was not significant, F(1, 64) = 0.05, p = 0.831. The main effect of risk level was significant, F(1, 64) = 4.23, p = 0.044, ^{2}p = 0.06, with more risky options selected under low-risk conditions. The main effect of between-condition difference was significant, F(1, 64) = 5.04, p = 0.028, ^{2}p = 0.07, with more risky options selected in congruent versus incongruent conditions. The interaction between participant type and between-condition difference was significant, F(1, 64) = 5.04, p = 0.028, ^{2}p = 0.07. Simple effects analysis showed no significant differences for the control group across between-condition difference levels, while the problematic group showed significant differences: they selected more risky options in the congruent condition than baseline, and fewer in the incongruent condition than baseline.

For response time, the main effect of participant type was not significant, F(1, 64) = 0.02, p = 0.894. The main effect of risk level was significant, F(1, 64) = 10.07, p = 0.002, ^{2}p = 0.14, with longer response times under low-risk conditions. The main effect of between-condition difference was significant, F(1, 64) = 9.52, p = 0.003, ^{2}p = 0.13, with longer response times in congruent versus incongruent conditions. The interaction between participant type and between-condition difference was significant, F(1, 64) = 5.05, p = 0.028, ^{2}p = 0.07. Simple effects analysis showed no significant differences for the control group, while the problematic group showed significantly longer response times in the congruent condition than baseline, and shorter response times in the incongruent condition than baseline.

Table 6 Statistical Information for Behavioral Results Under Different Experimental Conditions

<table>
<tr><th>Risk Level</th><th>Between-Condition Difference</th><th>Risky Selection Frequency</th><th>Response Time (ms)</th></tr>
<tr><td>Low</td><td>C1</td><td>-0.19$±1.71| − 6±110||Low|C2|0.21±1.20|18±83||High|C1|−0.25±1.39|31±106||High|C2|0.31±1.26|0.53±$1.24</td><td></td></tr>
</table>

3.2.2 Eye Movement Results Separate 2 (participant type: control, problematic) × 2 (risk level: low, high) × 2 (option type: risky, certain) × 2 (between-condition difference: C1, C2) repeated measures ANOVAs were conducted on first fixation duration, first arrival time, gaze duration, and total fixation time. Results are shown in Table 7 and Table 8 .

For first fixation duration, the main effect of participant type was not significant, F(1, 64) = 0.01, p = 0.910. The main effect of risk level was significant, F(1, 64) = 5.22, p = 0.026, ^{2}p = 0.08, with longer first fixation durations under low-risk conditions.

For first arrival time, the main effect of participant type was significant, F(1, 64) = 5.46, p = 0.023, ^{2}p = 0.08, with the problematic group showing significantly longer first arrival times. The interaction between participant type and between-condition difference was significant, F(1, 64) = 4.32, p = 0.042, ^{2}p = 0.06. Simple effects analysis showed that at the C1 level, the difference between problematic and control groups was significant: the problematic group showed a larger difference in first arrival time between congruent and baseline conditions than the control group.

Gaze duration refers to the duration from first fixation onset to its first departure from the current AOI, reflecting mid- or mid-to-late-stage attentional bias patterns. For gaze duration, the main effect of participant type was not significant, F(1, 64) = 0.94, p = 0.335. The main effect of risk level was significant, F(1, 64) = 11.48, p = 0.001, ^{2}p = 0.15, with longer gaze durations under low-risk conditions. The main effect of option type was significant, F(1, 64) = 4.28, p = 0.043, ^{2}p = 0.06, with longer gaze durations for risky versus certain options. The interaction between risk level and between-condition difference was significant, F(1, 64) = 11.04, p = 0.001, ^{2}p = 0.15. Simple effects analysis showed that under high-risk conditions, the gaze duration difference in C2 was significantly greater than in C1. The three-way interaction between risk level, option type, and between-condition difference was significant, F(1, 64) = 6.02, p = 0.017, ^{2}p = 0.09. Simple effects analysis showed that under high-risk conditions, for risky options, the gaze duration difference in C2 was significantly greater than in C1.

For total fixation time, the main effect of participant type was not significant, F(1, 64) = 0.07, p = 0.786. The main effect of risk level was significant, F(1, 64) = 14.07, p < 0.001, ^{2}p = 0.18, with longer fixation times under low-risk conditions. The main effect of between-condition difference was significant, F(1, 64) = 8.53, p = 0.005, ^{2}p = 0.12, with smaller fixation time differences in C1 versus C2.

Table 7 Means and Standard Deviations of Early-Stage Eye Movement Differences (ms) (M±SD)

<table>
<tr><th>Risk Level</th><th>Option Type</th><th>Between-Condition Difference</th><th>First Fixation Duration</th><th>First Arrival Time</th></tr>
<tr><td>Low</td><td>Risky</td><td>C1</td><td colspan="2">-
2$±19|12±71||Low|Certain|C1|−
3±23|40±89||High|Risky|C1|−
3±26| −
4±23||High|Certain|C1|−
7±24| − 6±$30</td></tr>
</table>

Table 8 Means and Standard Deviations of Mid- and Late-Stage Eye Movement Differences (ms) (M±SD)

Risk Level	Option Type	Between-Condition Difference	Total Fixation Time
Low	Risky	C1	$23\$\pm 65 \vert\vert Low \vert Certain \vert C1 \vert 23 \pm 65 \vert\vert High \vert Risky \vert C1 \vert 1$

3.3 Discussion

Experiment 2's results confirmed Hypothesis 3. Behavioral results showed that risky option selection was influenced by risk level. In congruent conditions, the problematic group increased their selection of risky options, while in incongruent conditions they decreased selection. That is, whichever side social media-related cues appeared on, the problematic group tended to select options on that side. The control group's selections were unaffected by social media cues. Similar patterns emerged for response times, consistent with trends from other researchers using the Iowa Gambling Task (Wegmann et al., 2021).

Eye movement data showed that the problematic group was more susceptible to social media-related cues, requiring more time to notice option information, particularly in congruent conditions. No significant between-group differences emerged for first fixation duration, gaze duration, or total fixation time. Experiment 2 confirmed that merely presenting social media-related information can affect the early attentional stage of risk decision-making in problematic social media users, subsequently influencing risk decisions.

4 General Discussion

This study employed the Wheel of Fortune task and eye-tracking technology to investigate the impact of social media-related information on risk decision-making in problematic social media users. Results showed that compared to the control group, the problematic group exhibited longer response times and selected risky options less frequently under high-risk conditions. Social media-related information significantly influenced risk decision-making in the problematic group but not in the control group.

Our findings revealed that in the Wheel of Fortune task, the problematic group selected risky options less frequently under high-risk conditions, demonstrating risk aversion—consistent with Meshi et al.'s (2020) finding that problematic social media users show more conservative performance and greater risk aversion in risk decision-making tasks. Significant differences in first arrival time may indicate that problematic group participants cannot promptly detect effective information, suggesting impaired attentional vigilance (Sun & Shi, 2017; Yan et al., 2013), which aligns with research showing reduced prefrontal control over attention networks in problematic social media users (Lee et al., 2021).

Additionally, results showed longer response times in the problematic group, indicating they required more time to complete the decision-making process. This appears contrary to some research showing positive correlations between problematic social media use and impulsivity. However, impulsivity is a multifaceted construct that cannot be represented solely by response speed. Lewin's review of problematic social media use and impulsivity noted inconsistent findings, with network analysis showing no significant correlation (Lewin et al., 2023). According to Fuzzy-Trace Theory, individuals process information through two modes: verbatim processing (bottom-up, effortful) and gist processing (top-down, experience-based and intuitive) (Müller et al., 2022). Since this study presented pie charts rather than specific numbers, this may have increased the difficulty of verbatim processing, requiring more cognitive effort. Combined with eye movement data showing significantly more fixations on options by problematic group participants, this suggests that the same information required greater cognitive effort for the problematic group to process. This may indicate that the problematic group relied more on bottom-up, verbatim processing, while the control group used more gist processing, enabling faster and more efficient decision-making. The five-stage model of decision-making indicates that beyond the first two stages of perception and representation, the third stage of option evaluation involves coordinated processing of impulsive and reflective systems, where individuals classify, manipulate, and update collected information. Reduced ability to control and focus attention in problematic social media users may explain why they required more volitional effort and time to achieve their goals.

Experiment 2 results showed that social media-related information significantly affected risk decision-making performance in the problematic group. When social media-related cues appeared on the same side as risky options, the problematic group increased their selection of risky options and showed increased response times, with values being smallest when cues and risky options were on opposite sides. This demonstrates that problematic individuals are more susceptible to social media-related information. Eye movement data showed longer first arrival times in the problematic group, with greater susceptibility to congruent conditions. The influence of social media-related cues on the problematic group aligns with Wegmann et al.'s findings that individuals with high social-network-use disorder tendencies perform better under advantageous conditions, similar to patterns observed in substance use and eating disorders (Kriegler et al., 2019; Lescher et al., 2020; Wegmann et al., 2021). The I-PACE model and attentional activation diffusion model effectively explain our results. According to the I-PACE model, problematic social media users develop attentional bias toward social media-related images, which affects the early stage of decision-making by increasing fixation time on that side. According to the attentional activation diffusion model, when individuals fixate on an option, they accumulate relative evidence for that option, making it more likely to be selected (Ashby et al., 2016; Brand et al., 2019; Fisher, 2017). These results confirm attentional bias toward social media-related cues in problematic social media users.

Notably, in Experiment 2, no significant between-group differences emerged in response times for completing choices. This may be because the task was relatively simple and all participants had prior experience from Experiment 1, enabling proficient responding that reduced between-group time differences. Alternatively, the appearance of social media-related cues may have increased relative evidence for the ipsilateral option, accelerating response speed in the problematic group. According to the I-PACE model, social media-related cues may trigger cue reactivity and craving in problematic social media users, leading to faster choices and more selections of options on the same side as social media-related cues.

The risk decision-making process involves multiple stages and cognitive abilities. In this study, the presented social media-related cues affected the early attentional stage in problematic social media users, subsequently influencing their final risk decisions. This does not align with findings that later-accumulated evidence carries greater weight (Kaplan & Haenlein, 2010; Liu et al., 2022) and cannot precisely locate how social media-related cue presentation affects the risk decision-making process (e.g., neural mechanisms or emotional changes). Future research should address these questions.

Regarding potential issues with the graphics used in this study possibly affecting verbatim processing in the problematic group and resulting in longer response times and total fixation times, future research could use risk decision-making tasks with explicit numerical information for further verification. Although participants in both experiments were the same and received adequate rest between experiments, potential fatigue and order effects may have influenced results. Additionally, this study did not assess the valence and arousal of cue-related images, though cue reactivity and craving can influence decision-making in problematic social media users—future studies should control for these factors more rigorously. Finally, our participant sample consisted of university students, limiting generalizability. Future research should investigate underage populations, as data indicate that approximately 20% of minors show dependent internet use, with over half primarily engaging in social chatting.

In conclusion, this study demonstrates that problematic social media use affects risk decision-making and influences attentional processes within it. Merely presenting social media-related information during the early stage of a risk decision-making task can affect the early attentional stage in problematic social media users and ultimately influence their risk decisions.

References

Chen, C. Y., Lian, S. L., Sun, X. J., Chai, H. Y., & Zhou, Z. K. (2018). The relationship between social networking site addiction and adolescent depression: The mediating role of cognitive load and core self-evaluation. *Psychological Development and Education*, 34(2), 210-218.

Jiang, Y. Z., Bai, X. L., Alatanbagen, Liu, Y., Liu, M., & Li, G. Q. (2016). Problematic social networking site use among adolescents. *Advances in Psychological Science*, 24(9), 1435-1447. https://doi.org/10.3724/sp.J.1042.2016.01435

Liu, H. Z., Wei, Z. H., Ying, J., He, Z. Q., & Li, D. Q. (2022). Causality and weight: Eye movement models of decision-making. *Psychological Science*, 45(1), 242-249. https://doi.org/10.16719/j.cnki.1671-6981.20220133

Sun, J. C., & Shi, R. (2017). Attentional bias toward crying facial expressions: Evidence from eye movements. *Acta Psychologica Sinica*, 49(2), 155-163. https://doi.org/10.3724/sp.J.1041.2017.00155

Yan, G. L., Xiong, J. P., Zang, C. L., Yu, L. L., Lei, C., & Bai, X. J. (2013). A review of major eye movement indicators in reading research. *Advances in Psychological Science*, 21(4), 589-605. https://doi.org/10.3724/sp.J.1042.2013.00589

Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors*, 30(2), 252-262. https://doi.org/10.1037/adb0000160

Andreassen, C. S., Torsheim, T., Brunborg, G. S., & Pallesen, S. (2012). Development of a Facebook addiction scale. *Psychological Reports*, 110(2), 501-517.

Ashby, N. J., Jekel, M., Dickert, S., & Glöckner, A. (2016). Finding the right fit: A comparison of process assumptions underlying popular drift-diffusion models. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 42(12), 1982.

Balconi, M., Venturella, I., & Finocchiaro, R. (2017). Evidences from rewarding system, FRN and P300 effect in Internet-addiction in young people. *Brain Sciences*, 7(7), 81.

Blankenstein, N. E., Crone, E. A., van den Bos, W., & van Duijvenvoorde, A. C. (2016). Dealing With Uncertainty: Testing Risk- and Ambiguity-Attitude Across Adolescence. *Developmental Neuropsychology*, 41(1-2), 77-92. https://doi.org/10.1080/87565641.2016.1158265

Brand, M., Wegmann, E., Stark, R., Muller, A., Wolfling, K., Robbins, T. W., & Potenza, M. N. (2019). The Interaction of Person-Affect-Cognition-Execution (I-PACE) model for addictive behaviors: Update, generalization to addictive behaviors beyond internet-use disorders, and specification of the process character of addictive behaviors. *Neuroscience and Biobehavioral Reviews*, 104, 1-10. https://doi.org/10.1016/j.neubiorev.2019.06.032

Brand, M., Young, K. S., Laier, C., Wolfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience and Biobehavioral Reviews*, 71, 252-266. https://doi.org/10.1016/j.neubiorev.2016.08.033

Chen, H., Strong, C., Lin, Y. C., Tsai, M. C., Leung, H., Lin, C. Y., G, A. H. P., & Griffiths, M. D. (2016). Time invariance of three ultra-brief internet-related instruments: Smartphone Application-Based Addiction Scale (SABAS), Bergen Social Media Addiction Scale (BSMAS), and the nine-item Internet Gaming Disorder Scale- Short Form (IGDS-SF9) (Study Part B). *Addictive Behaviors*, 101. https://doi.org/10.1016/j.addbeh.2019.04.018

Chen, S., Yang, P., Chen, T., Su, H., Jiang, H., & Zhao, M. (2020). Risky decision-making in individuals with substance use disorder: A meta-analysis and meta-regression review. *Psychopharmacology* (Berl), 237(7), 2021-2037. https://doi.org/10.1007/s00213-020-05506-y

Fisher, G. (2017). An attentional drift diffusion model over binary-attribute choice. *Cognition*, 168, 34-45. https://doi.org/10.1016/j.cognition.2017.06.007

Gluth, S., Kern, N., Kortmann, M., & Vitali, C. L. (2020). Value-based attention but not divisive normalization influences decisions with multiple alternatives. *Nature Human Behaviour*, 4(6), 554-563.

Hoven, M., Hirmas, A., Engelmann, J., & van Holst, R. J. (2023). The role of attention in decision-making under risk in gambling disorder: An eye-tracking study. *Addictive Behaviors*, 138, 107550. https://doi.org/10.1016/j.addbeh.2022.107550

Ioannidis, K., Hook, R., Goudriaan, A. E., Vlies, S., Fineberg, N. A., Grant, J. E., & Chamberlain, S. R. (2019). Cognitive deficits in problematic internet use: meta-analysis of 40 studies. *British Journal of Psychiatry*, 215(5), 639-646. https://doi.org/10.1192/bjp.2019.3

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, 53(1), 59-68. https://doi.org/10.1016/j.bushor.2009.09.003

Khoury, J. M., Couto, L., Santos, D. A., VHO, E. S., Drumond, J. P. S., Silva, L., Malloy-Diniz, L., Albuquerque, M. R., das Neves, M. C. L., & Duarte Garcia, F. (2019). Bad Choices Make Good Stories: The Impaired Decision-Making Process and Skin Conductance Response in Smartphone Addiction. *Frontiers in Psychiatry*, 10, 73. https://doi.org/10.3389/fpsyt.2019.00073

Koc, M., & Gulyagci, S. (2013). Facebook addiction among Turkish college students: the role of psychological health, demographic, and usage characteristics. *Cyberpsychology, Behavior, and Social Networking*, 16(4), 279-284. https://doi.org/10.1089/cyber.2012.0249

Kovács, I., Richman, M. J., Janka, Z., Maráz, A., & Andó, B. (2017). Decision making measured by the Iowa Gambling Task in alcohol use disorder and gambling disorder: a systematic review and meta-analysis. *Drug and Alcohol Dependence*, 181, 152-161.

Krajbich, I., Armel, C., & Rangel, A. (2010). Visual fixations and the computation and comparison of value in simple choice. *Nature Neuroscience*, 13(10), 1292-1298.

Kriegler, J., Wegener, S., Richter, F., Scherbaum, N., & Wegmann, E. (2019). Decision making of individuals with heroin addiction receiving opioid maintenance treatment compared to early abstinent users. *Drug and Alcohol Dependence*, 205, 107593.

Lee, D., Lee, J., Namkoong, K., & Jung, Y. C. (2021). Altered functional connectivity of the dorsal attention network among problematic social network users. *Addictive Behaviors*, 116, 106823. https://doi.org/10.1016/j.addbeh.2021.106823

Lescher, M., Wegmann, E., Müller, S. M., Laskowski, N. M., & Müller, A. (2020). A Randomized Study of Food Pictures-Influenced Decision-Making Under Ambiguity in Individuals With Morbid Obesity. *Frontiers in Psychiatry*, 11, 822.

Lewin, K. M., Kaur, A., & Meshi, D. (2023). Problematic Social Media Use and Impulsivity. *Current Addiction Reports*, 10(3), 553-562. https://doi.org/10.1007/s40429-023-00495-2

Meshi, D., Elizarova, A., Bender, A., & Verdejo-Garcia, A. (2019). Excessive social media users demonstrate impaired decision making in the Iowa Gambling Task. *Journal of Behavioral Addictions*, 8(1), 169-173. https://doi.org/10.1556/2006.7.2018.138

Meshi, D., Freestone, D., & Ozdem-Mertens, C. (2021). Problematic social media use is associated with the evaluation of both risk and ambiguity during decision making. *Journal of Behavioral Addictions*, 10(3), 779-787. https://doi.org/10.1556/2006.2021.00047

Meshi, D., Tamir, D. I., & Heekeren, H. R. (2015). The Emerging Neuroscience of Social Media. *Trends in Cognitive Sciences*, 19(12), 771-782.

Meshi, D., Ulusoy, E., Ozdem-Mertens, C., Grady, S. M., Freestone, D. M., Eden, A., & Ellithorpe, M. E. (2020). Problematic social media use is associated with increased risk-aversion after negative outcomes in the Balloon Analogue Risk Task. *Psychology of Addictive Behaviors*, 34(4), 549-555. https://doi.org/10.1037/adb0000558

Moretta, T., Buodo, G., Demetrovics, Z., & Potenza, M. N. (2022). Tracing 20 years of research on problematic use of the internet and social media: Theoretical models, assessment tools, and an agenda for future work. *Comprehensive Psychiatry*, 114, 152286. https://doi.org/10.1016/j.comppsych.2021.152286

Müller, S. M., Liebherr, M., Wegmann, E., & Brand, M. (2022). Decision Making – A Neuropsychological Perspective. In *Encyclopedia of Behavioral Neuroscience*, 2nd edition (pp. 396-403). https://doi.org/10.1016/b978-0-12-819641-0.00132-8

Muller, S. M., Wegmann, E., Garcia Arias, M., Bernabeu Brotons, E., Marchena Giraldez, C., & Brand, M. (2021). Deficits in executive functions but not in decision making under risk in individuals with problematic social-network use. *Comprehensive Psychiatry*, 106, 152228. https://doi.org/10.1016/j.comppsych.2021.152228

Muller, S. M., Wegmann, E., Garcia Arias, M., Bernabeu Brotons, E., Marchena Giraldez, C., & Brand, M. (2022). Decision Making and Risk Propensity in Individuals with Specific Internet-Use Disorders. *Brain Sciences*, 12(2). https://doi.org/10.3390/brainsci12020201

Nikolaidou, M., Fraser, D. S., & Hinvest, N. (2019). Attentional bias in Internet users with problematic use of social networking sites. *Journal of Behavioral Addictions*, 8(4), 889-896. https://doi.org/10.1556/2006.8.2019.60

Nobre, A. C., Kastner, S., Summerfield, C., & Egner, T. (2014). Attention and Decision-Making. In *The Oxford Handbook of Attention*.

Orquin, J. L., & Mueller Loose, S. (2013). Attention and choice: A review on eye movements in decision making. *Acta Psychologica*, 144(1), 190-206. https://doi.org/https://doi.org/10.1016/j.actpsy.2013.06.003

Ostendorf, S., Muller, S. M., & Brand, M. (2020). Neglecting Long-Term Risks: Self-Disclosure on Social Media and Its Relation to Individual Decision-Making Tendencies and Problematic Social-Networks-Use. *Frontiers in Psychology*, 11, 543388. https://doi.org/10.3389/fpsyg.2020.543388

Pachur, T., & Schulte-Mecklenbeck, M. (2017). Prospect Theory Reflects Selective Allocation of Attention. *Journal of Experimental Psychology: General*, 147(2), 147-169.

Pawlikowski, M., Altstötter-Gleich, C., & Brand, M. (2013). Validation and psychometric properties of a short version of Young's Internet Addiction Test. *Computers in Human Behavior*, 29(3), 1212-1223. https://doi.org/10.1016/j.chb.2012.10.014

Robinson, T. E., & Berridge, K. C. (1993). The neural basis of drug craving: an incentive-sensitization theory of addiction. *Brain Research Reviews*, 18(3), 247-291.

Robinson, T. E., & Berridge, K. C. (2003). Addiction. *Annual Review of Psychology*, 54, 25-53.

San Martín, R., Appelbaum, L. G., Huettel, S. A., & Woldorff, M. G. (2016). Cortical Brain Activity Reflecting Attentional Biasing Toward Reward-Predicting Cues Covaries with Economic Decision-Making Performance. *Cerebral Cortex*, 26, 1-10.

Schiebener, J., & Brand, M. (2015). Decision Making Under Objective Risk Conditions-a Review of Cognitive and Emotional Correlates, Strategies, Feedback Processing, and External Influences. *Neuropsychology Review*, 25(2), 171-198. https://doi.org/10.1007/s11065-015-9285-x

Statista. (2024). Number of internet and social media users worldwide as of

January 2024. https://www.statista.com/statistics/617136/digital-population-worldwide/

Thomas, A. W., Molter, F., Krajbich, I., Heekeren, H. R., & Mohr, P. N. C. (2019). Gaze bias differences capture individual choice behaviour. *EconStor Open Access Articles and Book Chapters*.

Valyan, A., Ekhtiari, H., Smith, R., & Paulus, M. P. (2020). Decision-making deficits in substance use disorders: cognitive functions, assessment paradigms, and levels of evidence. In *Cognition and Addiction* (pp. 25-61).

Verdejo-Garcia, A., Chong, T. T., Stout, J. C., Yucel, M., & London, E. D. (2018). Stages of dysfunctional decision-making in addiction. *Pharmacology, Biochemistry and Behavior*, 164, 99-105. https://doi.org/10.1016/j.pbb.2017.02.003

Wegmann, E., & Brand, M. (2020). Cognitive Correlates in Gaming Disorder and Social Networks Use Disorder: A Comparison. *Current Addiction Reports*, 7(3), 307-317. https://doi.org/10.1007/s40429-020-00314-y

Wegmann, E., Muller, S. M., Trotzke, P., & Brand, M. (2021). Social-networks-related stimuli interferes decision making under ambiguity: Interactions with cue-induced craving and social-networks-use expectancies in problematic social-networks users. *Journal of Behavioral Addictions*, 10(2), 254-265. https://doi.org/10.1556/2006.2021.00036

Wegmann, E., Stodt, B., & Brand, M. (2015). Addictive use of social networking sites can be explained by the interaction of Internet use expectancies, Internet literacy, and psychopathological symptoms. *Journal of Behavioral Addictions*, 4(3), 155-162.

Appendix: Scale Items (5-point rating scale)

Bergen Social Media Addiction Scale (BSMAS): 1. Spent a lot of time thinking about social media or planning to use it 2. Felt an increasing urge to use social media 3. Used social media to forget personal problems 4. Tried to reduce social media use without success 5. Become restless or troubled if prohibited from using social media 6. Used social media so much that it negatively impacted work/studies

Facebook Addiction Scale (FAS): 1. Found it difficult to concentrate on schoolwork due to social media use 2. Experienced insomnia due to excessive social media use 3. Felt anxious if unable to use social media 4. Tried to spend less time on social networks without success 5. The first thing I think about when waking up is opening social media 6. Neglected household chores due to excessive social media use 7. Reduced real-life socializing due to social media use 8. Family/friends think I spend too much time on social media

Internet Addiction Test Networking Sites Scale (IAT-SNS): 1. Used social media to feel better when in a bad mood 2. Wanted to reduce social media use time but failed 3. Negatively impacted studies due to social media use 4. Experienced insomnia due to excessive social media use 5. Actually spent more time on social media than intended 6. Often told myself "just a few more minutes" when using social media 7. Felt depressed, moody, or nervous when not using social media, which disappeared once using it 8. Became defensive or secretive when asked about specific social media activities 9. Got angry when interrupted while using social media

Note: Figure translations are in progress. See original paper for figures.