THE EFFECT OF REWARD-BASED AND URGENCY-DRIVEN NEUROMARKETING STIMULI ON IMPULSIVE PURCHASE INTENTIONS: EVIDENCE FROM ONLINE CONSUMERS IN BOSNIA AND HERZEGOVINA

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Abstract

This paper tests the first hypothesis (H1) of a wider study on neuromarketing-informed digital design for startups: reward-based and urgency-driven digital stimuli are positively linked with impulsive purchase intentions among online consumers. A cross-sectional survey of 303 online consumers in Bosnia and Herzegovina combined Likert-scale items on impulse buying, urgency and scarcity with binary visual comparison tasks. Most respondents preferred the gamified interface (59.4%) and the higher-urgency sales page (64.4%); urgency-based decision-making correlated most strongly with impulse buying tendency (Spearman rho = .417, p < .001). However, the scarcity-impulse item scored lowest in the survey (M = 2.46, SD = 1.30); 29.0% of respondents reacted to the message "Only 3 left in stock" with explicit distrust, and 41.9% reported no effect from countdown timers. Age significantly moderated scarcity responses (Kruskal-Wallis H = 16.91, p = .005, epsilon-squared = .056), with younger respondents reporting higher scarcity-driven impulses than older respondents. These findings offer only partial support for H1: reward and urgency stimuli increase attention, preference and perceived pressure, but their translation into impulsive purchase intentions is uneven and limited by consumer skepticism, particularly among older, more experienced digital consumers. Implications for ethical, effective use of reward- and urgency-based design by startups are discussed.

Key words: *Gamification; Impulse Buying; Neuromarketing; Scarcity; Urgency.*

JEL Classification: *D91; M31; M37.*

I. INTRODUCTION

Consumer decision processes have undergone a fundamental change in digital environments in the last two decades. In fast online environments with visual competition and frictionless interaction, buying decisions are often made within seconds, and are affected by interface design, emotional cues and the timing of persuasive stimuli, rather than by deliberation over product features. For startups, which usually lack a brand and must fight for consumer attention from the start, understanding why certain digital design choices trigger impulse buying isn't an academic luxury, but a practical necessity.

An emerging literature in consumer neuroscience and behavioral marketing has connected impulsive buying to reward-anticipation processes in the mesolimbic dopamine system of the brain, to reduced prefrontal regulatory engagement under emotional arousal, and to the attentional dominance of salient stimuli over competing information. The design features most directly informed by this research are reward-based mechanisms, such as gamification, points, streaks and limited-time discounts, and urgency-driven cues, such as scarcity messages and countdown timers. Both types of stimuli are now standard in digital commerce, and are widely used by startups, often by copying successful platforms rather than through systematic testing.

Yet despite their abundance, the extent to which reward-based and urgency-driven stimuli translate into impulsive purchase intentions among real consumers beyond controlled laboratory settings and beyond the large markets in which most previous research has been conducted is poorly documented. Another open question is the boundary conditions of these effects. As consumers become more familiar with persuasive design techniques, do reward and urgency cues still elicit the desired behavioral responses or do they more and more elicit skepticism and resistance?

The paper aims to answer these questions by testing the first hypothesis (H1) of the larger study on neuromarketing informed digital design for startups: H1 – Reward-based and urgency-driven neuromarketing stimuli positively influence impulsive purchase intentions among online consumers. The hypothesis is tested using data collected from a quantitative cross-sectional survey of 303 online consumers in Bosnia and Herzegovina. The survey combines Likert-scale items on impulse buying, urgency responsiveness and reactions to scarcity with binary visual comparison tasks contrasting gamified and non-gamified application designs with high- and low-urgency sales pages.

II. LITERATURE REVIEW

Neuromarketing arose in the early 2000s out of the shared recognition by marketing, cognitive neuroscience and behavioral economics that consumers are not always reliable narrators of their own purchasing decisions (Ariely and Berns, 2010). Much of what causes the purchase takes place before conscious awareness, in an automatic, affect-laden processing, before deliberate evaluation. Neuromarketing research, measuring brain activity, physiological responses and behavior, not just self-report, has accumulated evidence that emotion and reward influence consumer decisions at least as much as rational preference, and often more so.

An impulse purchase is a spontaneous, immediate purchase, which is driven by a sudden urge and is largely free of the deliberation that weighs utility against cost (Rook, 1987). Consumer neuroscience has provided a mechanistic account of this process as a competition between reward-anticipation systems and regulatory prefrontal circuitry. Knutson, Rick et al. (2007) found that activation of the nucleus accumbens during product exposure predicted subsequent purchasing, whereas activation of the insula, associated with loss aversion and the discomfort of paying, predicted restraint. Shiv and Fedorikhin (1999) observed that with limited cognitive resources, affective reactions to tempting options tend to dominate analytical judgment, reducing prefrontal activity that would otherwise inhibit impulsive decisions. The most commonly cited expression of this dynamic is Kahneman's (2011) dual-process framework of fast, affective System 1 and slow, analytical System 2. Digital marketing techniques, such as high color contrast, motion, scarcity language and countdown timers, are designed to raise arousal and capture attentional resources before reflective evaluation can intervene.

This literature is the basis for reward-based design. Berridge and Kringelbach (2008) distinguish between the 'wanting' and 'liking' components of reward. The wanting component, mediated by dopamine signaling, motivates approach behavior and drives the urgency of desire, while the liking component reflects the hedonic quality of the reward itself. In the consumer context, this distinction suggests that a marketing stimulus can successfully trigger approach motivation – the urge to click, engage or purchase – without the consumer necessarily obtaining the expected level of satisfaction. Interactive stimuli have been shown to elicit striatal dopamine release themselves, a finding that is directly relevant to the efficacy of gamified interfaces in sustaining engagement (Koepp, Gunn et al., 1998). More recent applied research has focused on gamification in mobile applications. Barari (2024) conducted a meta-analytic review of 62 studies and found that gamification was associated with customer engagement through cognitive, hedonic, pragmatic and social experience components, but privacy concerns weakened this relationship. Paschmann, Bruno et al. (2025) examined usage data from a gamified market-research application and found that game-based rewards enhanced engagement more than conventional value-based rewards. They also found a “dark side”: once users were in a state of flow within the game itself, engagement with the game was less strongly linked to the value-added behavior the application was designed to promote. This literature collectively hints that gamification might foster engagement through the broader experience it offers, rather than narrow reward mechanics, and its effect on purchase-related outcomes is not unconditionally positive.

Urgency-driven cues - scarcity messages, countdown timers and limited time offers - operate on similar attentional and emotional mechanisms but are governed by another constraint: persuasion knowledge. Friestad and Wright's (1994) persuasion knowledge model suggests that over time, consumers develop an understanding of the persuasive intent of marketers and the particular tactics used to influence behavior and apply it to evaluate, counter or discount persuasive attempts. When consumers recognize a persuasion attempt, they switch from affective to reflective processing, which can diminish or reverse the intended effect (Campbell and Kirmani, 2000), leading to skepticism and loss of trust. Mathur, Acar et al. (2019) conducted a large-scale audit of e-commerce websites, describing how countdown timers, low-stock warnings and other “dark patterns” are employed at scale to influence consumer behaviour, often without consumers’ knowledge. More recently, Singh, Vishvakarma et al. (2024), in a review of 80 studies of dark patterns and digital nudging, found scarcity and social proof techniques to be among the categories most consistently associated with short-term revenue gains, while noting that consumer awareness of these techniques is the critical factor in whether they undermine or enhance brand trust. For startups, whose marketing is disproportionately delivered via social media and targeted advertising to young, digitally immersed audiences, Nyrhinen, Sirola et al. (2024) found a positive attitude towards targeted advertisements was associated with social media impulsiveness, and both were associated with online impulse buying, especially among consumers with lower self-control. This literature has developed in parallel with the regulatory environment, which explicitly bans dark patterns in the EU’s Digital Services Act, directly linking the urgency and scarcity-based techniques examined in this study to an active regulatory boundary (European Parliament and Council of the European Union, 2022).

Overall, the literature offers a solid theoretical foundation for the expected positive relationship between reward-based and urgency-driven stimuli and impulsive purchase intentions based on the reward-anticipation and dual-process accounts of consumer decision-making. At the same time, the persuasion knowledge and dark-patterns literatures suggest that this association may be attenuated, or even reversed, once consumers recognize these stimuli as deliberate persuasive tactics – a tension that has rarely been studied empirically with behavioral survey data from consumers outside major Western markets. Kaur and Sharma (2024) reviewed the literature on online impulse buying between 2001 and 2024 and concluded that digital-specific antecedents of impulse buying are underrepresented in the broader behavioral literature, reinforcing the need for the survey-based approach adopted here.

III. METHODOLOGY

This is a component of an extensive quantitative cross-sectional research that probes the correlation between digital stimuli regarding neuromarketing and consumer behavior in online environments, with a particular focus on digital marketing for startups. This paper addresses the first hypothesis of the project: H1 – Reward-based and urgency-driven neuromarketing stimuli are positively associated with impulsive purchase intentions of online consumers.

The structured online questionnaire was distributed through social media platforms and university networks in Bosnia and Herzegovina using Google Forms and was open for approximately two weeks, resulting in 303 valid responses. The survey involved three measurement formats: Likert-scale items (1-5) for impulse buying tendency, urgency responsiveness, ad appeal, and scarcity reactions; a binary forced-choice visual comparison task where participants had to choose between a gamified, reward-rich application interface inspired by Duolingo and a simpler, minimal-design alternative; and a second binary visual comparison task contrasting two versions of a sales page with different levels of urgency signal explicitness, along with categorical items measuring respondents' emotional reactions to a specific scarcity message ("Only 3 left in stock") and to live countdown timers.

Among the 303 respondents, 58.1% were female (n = 176) and 41.9% were male (n = 127). Age groups were 16-24 (30.0%, n = 91), 25-34 (27.4%, n = 83), 34-44 (20.5%, n = 62), 45-54 (15.8%, n = 48), 55-64 (5.0%, n = 15) and 65+ (1.3%, n = 4). Most respondents were full-time employed (60.4%) or students (19.8%); 87.8% reported daily use of mobile applications or online tools. The sample was made through convenience sampling and thus the responses of younger and digitally active respondents are overrepresented. Therefore, the findings should be interpreted as indicative of the patterns in the digitally active consumers from Bosnia and Herzegovina and should not be considered representative of the general population.

All relevant items were calculated for means, standard deviations and frequency distributions (descriptive statistics). To formally test H1, Spearman rank-order correlations (ρ) were calculated between impulse buying tendency, urgency responsiveness, scarcity impulse and purchase likelihood, as the ordinal Likert scale items did not meet the normality assumptions of parametric tests. Kruskal-Wallis H tests were used to test whether responses to scarcity-related items differed significantly across age groups (reported as effect sizes as epsilon-squared ($\varepsilon^2 = H / (n - 1)$), following Tomczak and Tomczak (2014)). An additional Kruskal-Wallis test was performed to determine whether self-reported susceptibility to gamification mechanics (streaks, points and rewards) predicted the desire to use the preferred application version. Statistical significance was determined at $p<0.05$.

IV. RESULTS

This paper investigates the association of reward-based and urgency-based digital stimuli and impulsive purchase intentions of consumers in Bosnia and Herzegovina. The data obtained from a questionnaire was processed using descriptive statistics, binary visual preference analysis, and non-parametric inferential tests. The analysis aimed to test the first hypothesis (H1) to investigate whether gamification and reward mechanics, scarcity messages, and urgency cues are positively related to self-reported impulsive purchasing tendencies.

Table 1 displays descriptive statistics for the Likert-scale items most relevant to reward-based and urgency-based stimuli. These items have the highest mean scores for the appeal of online advertisements (M = 3.29) and the use of limited time offers to speed up decision making (M = 3.26), and a moderate general impulse buying tendency (M = 3.00). In contrast, the item directly measuring scarcity impulse - 'the message "Only 3 left" makes me more likely to buy without much thinking' - scored the lowest mean score in the whole survey (M = 2.46, SD = 1.30), with 52.5% of respondents disagreeing (choosing 1-2) and only 25.1% agreeing (choosing 4-5).

Table 1. Descriptive Statistics for Reward- and Urgency-Related Survey Items (N = 303)

Survey Item	Mean	SD	% 4-5	% 1-2
I sometimes buy or subscribe to things online even though I had not planned it in advance.	3.00	1.45	45.9%	39.9%
Limited-time offers or discounts often make me decide faster.	3.26	1.34	52.1%	31.4%
When I see an attractive online advertisement, I feel a strong urge to click and learn more.	3.29	1.36	49.5%	31.7%
"Only 3 left in stock" makes me more likely to buy without much thinking.	2.46	1.30	25.1%	52.5%
Desire to start or continue using the selected (preferred) application version.	3.12	1.06	37.6%	23.4%

Note. All items measured on a 1-5 scale. N = 303.

To investigate the impact of reward oriented digital design more directly, participants were presented with two application versions for the language learning and asked which one they would prefer. Option 1 was designed to be gamified and like Duolingo, with more color, fun illustrations, and a rewarding interface; Option 2 was simpler, with minimal colors and a straightforward layout. As a result, 59.4% (n=180) of the participants chose the gamified design (option 1) while 40.6% (n=123) chose option 2. In terms of the most compelling feature of the preferred version, 59.7% of all respondents pointed to visual design (colors and layout), 49.5% named simplicity and low stress, 34.7% named a fun or playful feel, and only 14.5% explicitly chose streaks, points or rewards as the main attraction. When asked directly if the streaks, points and rewards make them more likely to open an app regularly

without much thinking, 36.0% answered "Yes" (n = 109), 39.3% answered "Partially" (n = 119) and 24.8% answered "No" (n = 75).

To measure urgency cues, respondents were shown two different versions of a sales page and asked which one made them feel more urgency to purchase. The majority of participants (64.4%, n=195) selected the version with more explicit urgency signals, and 35.6% (n=108) selected the version with less explicit signals. However, responses to the specific scarcity message "Only 3 left in stock" were far more mixed. The most common response was distrust or belief that the message is false (29.0%, n = 88), followed by no particular feeling (26.4%, n = 80) and fear of missing out, FOMO (26.1%, n = 79). A smaller group reported feeling motivated and excited to act quickly (10.2%, n = 31). Likewise, reactions to live countdown timers followed a similar pattern: no effect was the most common reaction (41.9%, n = 127), followed by distrust of the brand (23.8%, n = 72), FOMO (19.8%, n = 60), and excited urgency (12.2%, n = 37). Table 2 summarizes the two binary visual comparison tasks most directly related to H1.

Table 2. Visual Comparison Tasks Related to Reward-Based and Urgency-Driven Design (N = 303)

Comparison Task	Preferred / Stronger Option	n	%
Preferred application design (Duolingo-inspired)	Option 1 - gamified, reward-rich design	180	59.4%
	Option 2 - minimal, simple design	123	40.6%
Sales page version creating stronger purchase urgency	Option 1 - explicit urgency signals	195	64.4%
	Option 2 - lower-urgency version	108	35.6%

Correlations using the Spearman rank order were calculated across all the major Likert scale items to investigate the relationships between reward- and urgency-related variables and impulsive purchase intentions. Table 3 provides a summary of the correlations most directly relevant to H1. The urgency responsiveness ("limited-time offers make me decide faster") was the strongest correlation with impulse buying tendency of any pair in the entire dataset ($\rho = .417$, $p < .001$) indicating that consumers who report faster decision making under urgency are also the most prone to unplanned purchasing. Scarcity impulse was significantly but modestly correlated with impulse buying tendency ($\rho = .208$, $p < .01$) and with purchase likelihood ($\rho = .301$, $p < .01$). It was moderately correlated with urgency responsiveness ($\rho = .326$, $p < .01$). Ad appeal ("urge to click") was most strongly correlated with urgency responsiveness among all variable pairs involving that item ($\rho = .479$, $p < .01$), suggesting that advertising attractiveness and urgency-based decision making are closely related in this sample.

Table 3. Spearman Rank-Order Correlations Relevant to H1 (N = 303)

Variable Pair	ρ	Sig.
Impulse buying tendency ↔ Urgency decides faster	.417	**
Impulse buying tendency ↔ Scarcity impulse	.208	**
Urgency decides faster ↔ Scarcity impulse	.326	**
Urgency decides faster ↔ Ad urge to click	.479	**
Urgency decides faster ↔ Purchase likelihood	.314	**
Scarcity impulse ↔ Purchase likelihood	.301	**

*Note. ** $p < .01$. All values are Spearman's ρ. N = 303.*

A Kruskal-Wallis H test indicated that scarcity impulse differed significantly across age groups ($H = 16.91$, $df = 5$, $p = .005$, $\varepsilon^2 = .056$, small-to-moderate effect). Younger respondents (16-24 years) reported the highest mean scarcity impulse (M = 2.69), while older respondents, particularly those aged 55-64 (M = 1.87) and 25-34 (M = 2.22), reported considerably lower scores. A consistent pattern emerged for emotional reactions to the "Only 3 left in stock" message: as shown in Table 4, the proportion of respondents reacting with FOMO decreased from 36.7% among 16-24 year-olds to 13.3% among 55-64 year-olds, while the proportion reacting with distrust increased from 21.1% to 46.7% across the same age range. By contrast, impulse buying tendency and urgency responsiveness did not differ significantly across age groups, indicating that age moderates reactions to scarcity specifically rather than impulsivity in general.

Table 4. Age Group Differences in Emotional Reaction to the Scarcity Message "Only 3 Left in Stock" (n = 297)

Age Group	FOMO	Motivated & Excited	No Particular Feeling	Distrustful (Fake)	Total
16-24	36.7%	10.0%	23.3%	21.1%	90
25-34	24.7%	7.4%	28.4%	32.1%	81
34-44	16.7%	13.3%	28.3%	36.7%	60
45-54	27.7%	8.5%	31.9%	29.8%	47
55-64	13.3%	6.7%	26.7%	46.7%	15

Note. Percentages within each row total less than 100% because the "feeling strong pressure / stress" category (6.3% overall) is omitted; n = 297 (6 open-ended responses excluded). Kruskal-Wallis test for scarcity impulse: $H = 16.91$, $df = 5$, $p = .005$, $\varepsilon^2 = .056$. The 65+ group (n = 4) is excluded as too small to interpret reliably.

Finally, a Kruskal-Wallis test examined whether self-reported susceptibility to gamification mechanics predicted the desire to use the preferred application version. The results indicated a statistically significant

difference across engagement groups (H = 23.25, df = 2, p < .001). As shown in Table 5, respondents who reported that reward mechanics make them more likely to open an app regularly ("Yes") expressed significantly greater desire to use the preferred application (M = 3.43) compared to those who were only partially engaged (M = 3.12) or not engaged at all (M = 2.68). A Mann-Whitney U test confirmed that respondents who chose the gamified application design (Option 1) reported significantly higher desire to use the app (M = 3.23) than those who chose the minimal design (M = 2.97; U = 12525.0, p = .042).

Table 5. Gamification Engagement and Desire to Use the Preferred Application (N = 303)

Gamification Engagement	n	Mean Desire to Use (1-5)	Group
Yes - reward mechanics make me open the app regularly	109	3.43	High
Partially - some effect	119	3.12	Medium
No - does not affect me	75	2.68	Low

Note. Kruskal-Wallis H = 23.25, df = 2, p < .001.

V. DISCUSSION

The findings provide only partial support for H1. The pattern of results maps closely onto the theoretical distinction made in the literature review between automatic attention and reward processes on one hand and persuasion knowledge on the other. Descriptive and behavioural-preference wise, reward-based and urgency-driven stimuli were clearly attractive to consumers: a majority preferred the gamified application design (59.4%) and the more urgency-driven sales page (64.4%) and urgency responsiveness produced the single strongest correlation with impulse buying tendency in the entire data set ($\rho = .417$, $p < .001$). This is consistent with the reward-anticipation account of impulsive purchasing (Knutson, Rick et al., 2007; Berridge and Kringelbach, 2008) and with Kahneman's (2011) System 1 framing; urgency framing and gamified design seem to activate fast, affective processing in ways associated with self-reported impulsivity.

At the same time, the item that measured scarcity impulse most directly, the "Only 3 left" message, produced the lowest mean score in the entire survey (M = 2.46), and nearly 30% of respondents reacted with outright distrust rather than urgency or excitement. This pattern is in line with the persuasion knowledge model (Friestad and Wright, 1994; Campbell and Kirmani, 2000): consumers seem to attribute a scarcity message to strategic intent rather than to authentic information when they recognize it as a marketing tactic, which reduces or reverses its effect even as the underlying urgency framing continues to draw attention at the level of broad preference. This interpretation is further bolstered by the fact that 41.9% of respondents said that countdown timers had no effect on them and a further 23.8% of respondents said timers create distrust for the brand, consistent with Mathur, Acar et al. (2019) and Singh, Vishvakarma et al. (2024) who characterized such cues as "dark patterns" that work only if consumers are unaware of them.

This picture is further nuanced by a significant age moderation of scarcity responses (H = 16.91, p = .005, ε^2 = .056). Younger respondents (16-24) were more likely to report FOMO in response to the scarcity message (36.7%) and more likely to report a general scarcity impulse (M = 2.69) whereas older respondents, especially those in the 55-64 age group, were significantly more likely to respond with distrust (46.7%) and reported the lowest scarcity impulse (M = 1.87). This is in line with the notion that persuasion knowledge accumulates with longer exposure to digital marketing: older, more experienced digital consumers seem to have developed stronger resistance to urgency-based tactics in particular, although impulse buying tendency and general urgency responsiveness did not differ significantly between age groups. In other words, it appears that age does not dampen impulsivity per se, but it does dampen the particular persuasive mechanism of artificial scarcity.

The results in terms of gamification are broadly in line with the literature on applied gamification (Barari, 2024; Paschmann, Bruno et al., 2025). Most participants preferred the gamified application design and reported to be more willing to use it (M = 3.23 vs. M = 2.97 for the minimal design, p = .042). Self-reported susceptibility to reward mechanics was strongly associated with the desire to use the preferred application (H = 23.25, p < .001). However, in line with Paschmann, Bruno et al.'s (2025) finding of a "dark side" to gamification engagement, the explicit reward elements - streaks, points, rewards - were the least frequently cited reason for preference (14.5%), far behind visual design (59.7%) and simplicity (49.5%). This indicates that in this sample, gamification's contribution to engagement is mostly mediated by the more general aesthetic and experiential features of the interface, rather than the reward mechanics narrowly defined, although respondents more attuned to those reward mechanics do report stronger usage intentions.

Taken together, these results suggest that both reward-based and urgency-based stimuli are positively related to impulsive purchase intentions in this sample, but that this relationship is not uniform or unconditional. It is strongest for broad preference measures and for the association between urgency-based decision-making and overall impulsivity, and weakest for the most explicit and recognizable scarcity and reward cues, which are also the cues most clearly targeted by current and emerging digital-platform regulation, including the Digital Services Act's ban on dark patterns (European Parliament and Council of the European Union, 2022). For startups this means that reward and urgency mechanics still have real persuasive power, but overusing them, especially in overt, easily identifiable formats such as "X left in stock" messages and generic countdown timers, risks creating the very distrust that destroys the long-term consumer relationships startups need, especially among older consumer segments.

VI. CONCLUSION

The paper tested the first hypothesis of a larger study of neuromarketing-informed digital design for startups, that reward-based and urgency-driven neuromarketing stimuli positively correlate with impulsive purchase intentions among online consumers. The study used survey data from 303 respondents in Bosnia and Herzegovina and found that reward-based and urgency-driven stimuli were associated with greater preference, attention and perceived pressure. A majority of respondents preferred the gamified application design and the higher-urgency sales page; urgency-based decision-making produced the strongest correlation with impulse buying tendency in the dataset ($\rho = .417$, $p < .001$). Meanwhile, direct measures of scarcity impulse scored the lowest mean score in the survey ($M = 2.46$), almost 30% of respondents responded to a scarcity message with explicit distrust, and age significantly moderated scarcity-related responses ($H = 16.91$, $p = .005$, $\varepsilon^2 = .056$). These findings with respect to H1 are summarized in Table 6.

Table 6. Summary of Hypothesis 1 (H1) Testing Results

Hypothesis	Main Descriptive Finding	Key Inferential Evidence	Conclusion
H1: Reward-based and urgency-driven neuromarketing stimuli are positively associated with impulsive purchase intentions among online consumers.	Majorities preferred the gamified design (59.4%) and the higher-urgency sales page (64.4%), but the scarcity-impulse item scored lowest in the dataset (M = 2.46) and 29.0% of respondents reacted to a scarcity message with distrust.	ρ(urgency, impulse buying) = .417**; Kruskal-Wallis: age × scarcity impulse, H = 16.91, p = .005, ε^2 = .056; Kruskal-Wallis: gamification engagement × usage desire, H = 23.25, p < .001.	Partially supported

*Note. ** p < .01.*

Overall, the study finds partial evidence for H1. Reward-based and urgency-driven stimuli are certainly associated with self-reported impulsivity and behavioral preference, particularly through urgency framing and broad-preference gamification effects, but their most explicit and identifiable guises – claims of artificial scarcity and generic countdown timers – are met with significant skepticism, especially by older consumers. For startups, the practical implication is that reward and urgency mechanics should be used selectively and credibly: gamification should be designed around genuine progress and aesthetic quality rather than generic point systems, and scarcity and urgency claims should be reserved for situations of genuine scarcity, communicated honestly, with particular attention to demographic targeting given the pronounced age-related differences observed in this study. Key limitations of this analysis, such as the overrepresentation of younger, digitally active respondents in the convenience sample and the cross-sectional, self-report nature of the data, mean that the relationships found here are associations rather than causal effects, and future research using purpose-designed stimuli and longitudinal or experimental designs would be valuable in establishing the direction and stability of these relationships.

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