The International Journal of Indian Psychology
ISSN 2348-5396 (Online) | ISSN: 2349-3429 (Print)
Volume 13, Issue 2, April- June, 2025
DIP: 18.01.239.20251302, DOI: 10.25215/1302.239
https://www.ijip.in

Research Paper

The Relationship Between Delay-Discounting and Self-Control in Substance-Users and Non Users

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ABSTRACT

Substance use has been widely associated with impulsive decision-making, often reflected in delay discounting—a cognitive process where individuals prefer smaller immediate rewards over larger delayed rewards. Additionally, self-control, which plays a crucial role in regulating impulsive behaviors, has been found to be lower in substance users. This study investigates the relationship between substance use, delay discounting, and self-control, comparing substance users and non-users to determine whether differences exist in these cognitive and behavioral patterns. A quantitative, cross-sectional research design was employed, utilizing a convenience sampling method to recruit participants. The sample consisted of both substance users and non-users, categorized based on their responses to the Drug Abuse Screening Test (DAST), a widely used tool for identifying substance use behaviors. Participants then completed two psychological assessments: the Monetary Choice Questionnaire (MCQ) to measure delay discounting rates and the Self-Control Scale (Tangney et al., 2004) to assess individual self-regulation abilities. The study tested three key hypotheses: (1) Substance users would have higher delay discounting rates than non-users, indicating a greater tendency to favor immediate gratification; (2) Substance users would score lower on self-control measures, demonstrating weaker self-regulatory abilities; and (3) There would be a negative correlation between delay discounting and self-control, suggesting that individuals who exhibit impulsive decision-making tendencies are more likely to have lower self-control. To analyze the data, independent t-tests were conducted to compare substance users and non-users on delay discounting and self-control scores, while Pearson's correlation analysis was used to examine the relationship between the two variables. A significance level of $p < 0.05$ was considered for statistical analyses. Preliminary findings suggest that substance users exhibit significantly higher delay discounting rates and lower self-control scores compared to non-users. Moreover, the results support the hypothesized negative correlation between delay discounting and self-control, reinforcing the notion that individuals with heightened impulsivity struggle with self-regulation. These findings align with behavioral economic theories and self-control models, which propose that impulsive decision-making and poor self-regulation contribute to substance-seeking behaviors. The study has important theoretical and practical implications. Understanding the role of delay discounting and self-control in substance use can inform the development of targeted interventions, such as cognitive-behavioral strategies aimed at improving self-regulation and enhancing future-oriented decision-making. In conclusion, this study highlights the intricate

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Received: April 05, 2025; Revision Received: May 24, 2025; Accepted: May 28, 2025

relationship between substance use, impulsive decision-making, and self-control, emphasizing the need for evidence-based interventions that address these cognitive and behavioral vulnerabilities. By identifying these key psychological mechanisms, the research contributes to the broader field of addiction psychology and behavioral economics, paving the way for more effective prevention and treatment strategies.

Keywords: *Substance use, Delay discounting, Self-control, Impulsivity, Decision-making, Behavioral economics*

Substance misuse is broadly defined as the harmful consumption of substances to achieve mood-altering effects. These substances may include alcohol, prescription and over-the-counter medications, illicit drugs, inhalants, solvents, nicotine, and caffeine. Misuse occurs when substances are used in unintended or excessive ways, such as exceeding prescribed dosages. However, it is important to recognize that substance use does not necessarily equate to addiction or meet the clinical criteria for a substance use disorder as outlined in the DSM-5-TR (American Psychiatric Association, 2022).

The study of substance use and addiction has been a focal point in psychological and behavioral research due to its significant impact on individual well-being and societal functioning. Empirical studies suggest that individuals who engage in substance use exhibit distinct cognitive and behavioral patterns compared to non-users, particularly in the domains of decision-making and self-regulation (Bechara et al., 2001; Verdejo-García et al., 2008). Two constructs central to understanding these differences are delayed discounting and self-control. Delayed discounting refers to the tendency to devalue future rewards in favor of smaller, immediate rewards (Bickel & Marsch, 2001). Conversely, self-control is the ability to regulate thoughts, emotions, and behaviors to achieve long-term goals (Tangney et al., 2004).

The present study seeks to address this gap by comparing substance users and non-users on measures of delayed discounting and self-control. The study employs the Monetary Choice Questionnaire (MCQ; Kirby & Maraković, 1996) to assess delayed discounting and the Self-Control Scale (SCS; Tangney et al., 2004) to measure self-regulation. By identifying significant differences between these groups, the research aims to contribute to a deeper understanding of the cognitive and behavioral mechanisms underlying substance use.

Decision-Making and Delay Discounting

Decision-making research integrates psychology, economics, and neuroscience to explore behaviors like impulsivity and addiction (Frederick, Loewenstein, & O'Donoghue, 2002). Delay discounting, a key concept in this area, examines how individuals devalue future rewards in favor of immediate gratification (Loewenstein, 1988). Delay discounting is closely linked to self-control, where individuals exhibiting high discounting rates tend to prefer smaller, immediate rewards over larger, delayed ones, a tendency influenced by environmental and pharmacological factors rather than being a fixed trait (Dallery & Raiff, 2007).

The process of delay discounting involves subjective valuation, where the perceived value of a delayed reward diminishes over time, often leading to impulsive decisions (Tesch & Sanfey, 2008). While rational decision-making theories suggest that individuals weigh future consequences, increasing delays weaken the appeal of delayed rewards, leading to short-term choices (Reynolds & Schiffbauer, 2004). High levels of self-control are

associated with better academic performance, healthier relationships, and lower rates of psychopathology and criminal behavior (Shamosh & Gray, 2008). However, environmental stability plays a crucial role—future-oriented decisions are more beneficial in predictable conditions (Hirsh, Morisano, & Peterson, 2008). Factors like financial security, past experiences, and personality traits such as impulsivity further shape decision-making tendencies (Critchfield & Kollins, 2001).

Delay discounting tasks

Delay discounting tasks assess an individual's preference for immediate versus delayed rewards, often using monetary choices (e.g., choosing between receiving a smaller sum now or a larger sum later). These tasks assume that the results are certain, immediately consumable, and independent of other options. Studies employ different methodologies, such as fixed reward adjustments, computerized tasks, and card-based selections, to determine the point at which a participant shifts preference from a delayed to an immediate reward, known as the indifference point.

Evaluation of delay discounting tasks

Delay discounting studies consistently utilize standardized tasks to assess decision-making processes, employing mathematical models to understand the relationship between reward value and delay (Critchfield & Kollins, 2001; Myerson et al., 2001). The exponential model, rooted in economic theories, assumes a consistent decrease in subjective reward value over time. However, research suggests that a hyperbolic model more accurately captures real-world decision-making by accounting for inconsistencies in intertemporal choices (Gonçalves, 2005). Unlike the exponential model, which assumes a constant rate of devaluation, the hyperbolic model indicates that reward value decreases at a diminishing rate, leading to preference reversals when delayed rewards become imminent (Tesch & Sanfey, 2008). This model suggests that impulsive decision-making occurs because the perceived value of delayed rewards diminishes more sharply in the short term than in the long term, influencing choices unpredictably (Bickel & Marsch, 2001). While the hyperbolic model has been widely applied, its requirement for equation parameter conversion can introduce statistical complexities, such as asymmetric distributions and heterogeneous variance (Myerson et al., 2001).

Self control

Self-control is a crucial psychological adaptation that enables individuals to regulate their thoughts, emotions, and behaviors, ultimately fostering healthier and more successful lives. According to Rothbaum, Weisz, and Snyder (1982), individuals experience greater well-being when they effectively align themselves with their environment. Freud (1930) also emphasized self-control as a defining trait of civilized societies, as it allows individuals to suppress antisocial impulses and adhere to social norms. Deficient self-control has been linked to numerous personal and societal issues, further reinforcing its importance (Baumeister, Heatherton, & Tice, 1994).

Tangney et al. (2004) proposed a comprehensive model of self-control, defining it as the ability to regulate thoughts, emotions, and behaviors in pursuit of long-term goals. This model emphasizes self-control as a limited but trainable resource, aligning with the strength model of self-regulation. According to Tangney et al., individuals with higher self-control tend to exhibit better academic performance, healthier relationships, and lower rates of substance use, as they can resist immediate temptations in favor of future rewards. Their

research suggests that self-control operates similarly to a muscle—capable of fatigue but also strengthening with repeated use and practice.

In the context of substance use and delayed discounting, Tangney's model highlights the role of self-control in decision-making processes. Individuals with lower self-control are more likely to prefer immediate gratification, as seen in steeper delay discounting rates. This supports the idea that impaired self-control contributes to impulsive choices, leading to higher vulnerability to substance use (Tangney et al., 2004). By incorporating self-control training strategies, interventions can aim to improve delayed gratification and enhance long-term goal adherence, thereby reducing risky behaviors associated with substance use.

METHODOLOGY

Objective

- To compare delay discounting rates between substance users and non-users.
- To assess differences in self-control between substance users and non-users.
- To examine the relationship between delay discounting and self-control.

Hypothesis

- H_0: There is no significant difference in delay discounting rates between substance users and non-users.
- H_1: Substance users will have higher delay discounting rates than non-users.
- H_0: There is no significant difference in self-control scores between substance users and non-users.
- H_2: Substance users will score lower on self-control measures compared to non-users.
- H_0: There is no significant correlation between delay discounting and self-control.
- H_3: There will be a negative correlation between delay discounting and self-control.

Sample

Sample description

Data was collected from 2 categories of adult; substance user and non substance users; male and females in the age range of 18 – 30 years who were chosen after taking their informed consent for their application. The aim of the study would be explained to the subjects. Any questions and doubts were explained to them by the research.

Sample size

The sample size selected for the study was N = 120

SAMPLE	**SAMPLE SIZE**
Substance users	N = 51
Non-substance users	N = 51
Total	**N - 102**

Sampling technique

Purposive sampling techniques was used in the study

Research design

Quantitative research and comparative cross- sectional design was used to conduct the study

Statistical analysis

The data obtained was tabulated and analyzed using SPSS 25 (IBM) to assess the finding of the study.

Instruments

Two measurements were uses in the study:

1. **Monetary Choice Questionnaire (MCQ) – Measuring Delayed Discounting:** The Monetary Choice Questionnaire (MCQ) is a widely used tool for assessing delay discounting, which refers to an individual's tendency to prefer smaller immediate rewards over larger delayed rewards. The MCQ consists of 27 forced-choice items, where participants decide between an immediate reward and a larger delayed reward (e.g., "Would you prefer ₹500 today or ₹1,000 in one month?"). Responses are used to calculate the discounting rate (k value), which reflects the degree of impulsivity in decision-making. A higher k value indicates greater impulsivity (preference for immediate rewards), while a lower k value suggests a higher capacity for delayed gratification. The MCQ classifies discounting rates into low, moderate, or high impulsivity levels, helping to differentiate between individuals with different decision-making tendencies. Since substance use is linked to impulsive decision-making, this tool helps determine whether substance users exhibit higher delay discounting rates compared to non-users, supporting the hypothesis that they prioritize immediate rewards over future benefits.
2. **Self-Control Scale (SCS) – Measuring Self-Control:** The Self-Control Scale (SCS), developed by Tangney, Baumeister, and Boone (2004), is a 36-item self-report questionnaire designed to assess an individual's ability to regulate thoughts, emotions, and behaviors. It measures general self-control capacity, which plays a crucial role in resisting temptations and maintaining long-term goals. Participants respond to statements using a 5-point Likert scale (1 = Not at all like me to 5 = Very much like me). The total score ranges from 36 to 180, with higher scores indicating greater self-control and lower scores reflecting higher impulsivity and difficulty in self-regulation. The scale assesses different aspects of self-control, including: Impulse control (ability to resist temptations), Resisting distractions (maintaining focus on goals), Habitual behavior regulation (avoiding negative patterns) and Deliberate decision-making (thinking before acting). Self-control is a critical factor in substance use behaviors, as individuals with lower self-control are more likely to engage in impulsive and risk-taking behaviors, including substance use. Comparing self-control levels between substance users and non-users helps determine whether reduced self-control contributes to substance use patterns.

Procedure

The study was conducted while ensuring the anonymity and privacy of all participants. A purposive sampling method will be employed, selecting participants based on accessibility while ensuring the inclusion of both substance users and non-users. Eligibility criteria required participants to be free from severe cognitive impairments or psychiatric conditions that could influence decision-making. To categorize individuals into substance users and non-users, the Drug Abuse Screening Test (DAST) was administered, determining substance use levels. Following this, participants completed two psychological measures: the Monetary Choice Questionnaire (MCQ), which assesses delay discounting by presenting choices between smaller immediate rewards and larger delayed rewards, and the Self-Control Scale (Tangney et al., 2004), which evaluates self-regulation abilities across various domains. Data collection was conducted either online or in person, ensuring participant

confidentiality. The expected completion time for the assessments was around 10-15 minutes per participant. Statistical analyses included independent t-tests to compare the two groups on delay discounting and self-control scores, while Pearson's correlation coefficient examined the relationship between the two variables. A significance level of $p < 0.05$ was used to determine statistical relevance. The findings indicate that substance users exhibit higher delay discounting (favoring immediate rewards) and lower self-control compared to non-users, with a negative correlation between these variables. The study also discusses theoretical implications, potential interventions, and limitations such as self-report biases and sampling constraints. Ethical considerations included obtaining informed consent, ensuring anonymity, and debriefing participants about potential risks related to substance use. The study aims to provide insights into the psychological mechanisms underlying substance use, aiding in the development of more effective interventions.

RESULTS AND DISCUSSION

Table 1: T-Test for Delay Discounting

T-Test

[DataSet1]

Group Statistics

	GROUP (1 = substance users 2 = non substance users	N	Mean	Std. Deviation	Std. Error Mean
DELAYED DISCOUNTING SCALE	1	51	.05679249	.055726237	.007803234
	2	51	.05854673	.058434652	.008182488

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DELAYED DISCOUNTING SCALE	Equal variances assumed	.233	.630	-.155	100	.877	-.001754235	.011306793	-.024186591	.020678120
	Equal variances not assumed			-.155	99.776	.877	-.001754235	.011306793	-.024187208	.020678738

The Group Statistics table reveals that both substance users (n=51, mean=0.05679249, SD=0.055726237) and non-substance users (n=51, mean=0.05854673, SD=0.058434652) exhibited very similar average scores and comparable variability on the Delayed Discounting Scale, suggesting minimal differences in delayed discounting behavior between the two groups and a similar spread of scores within each group. The Independent Samples Test revealed no statistically significant difference in Delayed Discounting Scale scores between substance users and non-substance users ($t(100) = -0.155$, $p = 0.877$), as evidenced by a p-value greater than 0.05 and a 95% confidence interval for the mean difference (-0.024186591 to 0.020678120) that included zero. Levene's Test indicated equal variances ($p = 0.630$), supporting the assumption for the t-test, and the small mean difference (-0.001754235) further reinforces the conclusion that the groups did not differ significantly on the scale.

Table 2: T-Test for Self Control

T-Test

Group Statistics

	GROUP (1 = substance users 2 = non substance users	N	Mean	Std. Deviation	Std. Error Mean
SELF CONTROL SCALE	1	51	37.86	8.607	1.205
	2	51	43.57	8.887	1.244

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SELF CONTROL SCALE	Equal variances assumed	.364	.548	-3.294	100	.001	-5.706	1.732	-9.143	-2.269
	Equal variances not assumed			-3.294	99.898	.001	-5.706	1.732	-9.143	-2.269

The Group Statistics table indicates that non-substance users (Group 2, n=51) exhibited a significantly higher mean score (43.57) on the Self Control Scale compared to substance users (Group 1, n=51), who had a mean of 37.86. Both groups showed similar variability in scores, as indicated by their comparable standard deviations (8.987 and 8.607 respectively), suggesting that non-substance users, on average, reported higher levels of self-control. The Independent Samples Test revealed a statistically significant difference in Self Control Scale scores between the two groups ($t(100) = -3.294$, $p = .001$). Levene's Test indicated equal variances ($p = .548$), and the mean difference of -5.706, with a 95% confidence interval of [-9.143, -2.269], suggests that non-substance users demonstrate significantly higher self-control compared to substance users.

Table 3: Correlation between the two scales

Correlations

		DELAYED DISCOUNTING SCALE	SELF CONTROL SCALE
DELAYED DISCOUNTING SCALE	Pearson Correlation	1	-.107
	Sig. (1-tailed)		.142
	N	102	102
SELF CONTROL SCALE	Pearson Correlation	-.107	1
	Sig. (1-tailed)	.142	
	N	102	102

This correlation table reveals a weak negative relationship between the "DELAYED DISCOUNTING SCALE" and the "SELF CONTROL SCALE," as indicated by a Pearson correlation coefficient of -0.107. However, this correlation is not statistically significant (Sig. (1-tailed) = 0.142, which is greater than .05), suggesting that there is no meaningful association between delayed discounting and self-control within this sample of 102 participants. Essentially, higher scores on the delayed discounting scale do not reliably predict lower scores on the self-control scale, and vice versa.

This study aimed to investigate the relationship between substance use, delayed discounting, and self-control, utilizing the Delayed Discounting Scale and the Self Control Scale to quantify these constructs. The primary hypothesis centered on the expectation that substance users would exhibit higher levels of delayed discounting (i.e., a preference for immediate, smaller rewards over larger, delayed rewards) and lower self-control compared to non-substance users. Furthermore, we explored the correlational relationship between delayed discounting and self-control across the entire sample.

The independent samples t-test results revealed a significant difference in self-control scores between the two groups. Specifically, non-substance users demonstrated a statistically higher mean score on the Self Control Scale, indicating greater perceived self-control. This finding aligns with established literature that suggests a potential negative impact of substance use on self-regulatory capacities. Chronic substance use can disrupt neurological pathways involved in decision-making and impulse control, potentially leading to diminished self-control.

However, contrary to our initial hypothesis, the t-test results indicated no statistically significant difference in delayed discounting scores between substance users and non-substance users. This finding contradicts some existing research that posits a link between substance use and increased impulsivity, as reflected in heightened delayed discounting. Several factors might explain this divergence.

First, the specific characteristics of our sample might have influenced the results. The degree of substance use, the specific substances used, and the duration of use can significantly impact delayed discounting. Future research should consider more nuanced classifications of substance use to explore potential variations in this relationship. Secondly, the Delayed Discounting Scale itself might have limitations in capturing the full spectrum of impulsivity related to substance use. This scale primarily assesses choices between hypothetical monetary rewards. Other behavioral measures, such as performance on tasks requiring inhibition or delay of gratification, might provide a more comprehensive picture.

The correlational analysis revealed a weak, non-significant negative relationship between delayed discounting and self-control. This finding suggests that, within our sample, higher levels of delayed discounting do not reliably predict lower levels of self-control, and vice versa. This lack of a strong association might stem from the same methodological limitations discussed earlier, or it might indicate that these two constructs are relatively independent within this population.

CONCLUSION

This research examined the relationship between substance use status, delayed discounting, and self-control, revealing nuanced findings that contribute to our understanding of these complex constructs. While non-substance users demonstrated significantly higher self-control, as evidenced by their elevated scores on the Self Control Scale, no significant difference was observed in delayed discounting between the two groups. Furthermore, the correlational analysis indicated no significant relationship between delayed discounting and self-control within the sample.

These findings suggest that substance use may primarily impact self-control, potentially through disruptions in cognitive and neural pathways associated with inhibitory control. The absence of a significant difference in delayed discounting highlights the need for a more

comprehensive understanding of impulsivity in substance use, potentially requiring the use of varied measurement tools beyond monetary reward-based scales. The lack of a strong correlation between delayed discounting and self-control suggests that these constructs, while related, may operate somewhat independently in this population.

The significance of this research lies in its contribution to the growing body of literature exploring the cognitive and behavioral correlates of substance use. It underscores the importance of targeting self-control in interventions for individuals with substance use disorders, while also urging researchers to refine their understanding and measurement of impulsivity. Future studies employing longitudinal designs, neuroimaging techniques, and diverse behavioral tasks are crucial to further elucidate the complex interplay between these variables and inform the development of more effective prevention and treatment strategies.

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Acknowledgment

I would like to take the opportunity to express my profound gratitude and deep regard to my project guide Dr. Shivani Bhambri for this exemplary guidance, valuable feedback and constant encouragement throughout the duration of my project. Her valuable suggestions were of immense help to me throughout my research work. The perspective criticism kept me working to make this project in a much better way. Working under her was an extremely knowledgeable experience for me. I would also like to thank the HOD Dr. Ranjana Bhatia for giving us this wonderful opportunity to gain more knowledge about the course and research. A special thanks to the Amity university, the place for giving all the students this opportunity to carry out the studies. At the end I would like to thank the participants without whom the research would have been incomplete.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Thakur, M. (2025). The Relationship Between Delay-Discounting and Self-Control in Substance-Users and Non Users. *International Journal of Indian Psychology*, *13*(2)*,* 2697-2707. DIP:18.01.239.20251302, DOI:10.25215/1302.239