A RESEARCH PROPOSAL

Dopamine-Driven vs. Oxytocin-Driven Game Design: A Comparative Research Proposal

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Introduction

Modern video games often leverage neuropsychological triggers to maximize player engagement. In particular, many successful games employ dopamine-driven design – reward systems and feedback loops engineered to release dopamine in players' brains, generating excitement and reinforcing compulsive play. Classic "compulsion loops" (e.g. completing a quest to get a loot drop) operate on principles similar to Skinner's operant conditioning, where variable rewards create anticipation and pleasure, encouraging repetition. This dopamine-focused approach has been credited with keeping players hooked, but also criticized for leading to addictive behaviors and "gaming disorder"-like symptoms in extreme cases. Players caught in a dopamine reward cycle may exhibit "stim lock," losing track of time and neglecting other needs as they chase the next reward. Overstimulation via constant dopamine hits can increase stress and fatigue, potentially causing burnout and diminished long-term enjoyment【1】【2】【3】【4】【5】.

Recently, game designers and researchers have begun exploring an alternative model centered on oxytocin-driven design, which emphasizes social connection, trust, and positive community interaction. Oxytocin, often nicknamed the "bonding hormone," is released during affectionate touch and social bonding; it lowers anxiety and increases feelings of trust when we interact with those we consider part of our tribe. Oxytocin-driven game design seeks to foster cooperation, empathy, and friendship between players – for example through collaborative gameplay, persistent social networks, and supportive player communities – in order to evoke feelings of connection and well-being rather than just adrenaline-fueled excitement. Industry experts like game economist R. Shokrizade have argued that games relying solely on dopamine loops are a "dead end," and that the future of sustainable game engagement lies in harnessing oxytocin-mediated dynamics. Shokrizade suggests that while dopamine rewards give a quick "high," oxytocin-driven interactions can produce a deeper, more enduring form of player satisfaction【6】【7】【8】【9】【10】【11】.

Research Problem: There is, so far, limited empirical research comparing these two design philosophies side by side. Most of what we know about dopamine-driven design comes from behavioral economics and psychology studies of reward schedules (e.g. casino-style random rewards) and their well-documented effect on the brain's reward circuitry. In contrast, oxytocin-driven design is a relatively new concept, primarily proposed in industry whitepapers and thought experiments rather than tested in academic settings. This study aims to fill that gap by comparing dopamine-based and oxytocin-based game design models in a controlled experiment, examining how each affects player engagement, compulsive play tendencies, and emotional or social outcomes. Understanding these differences could inform healthier game design practices, balancing engagement with player well-being.

Significance: As concerns grow about video game addiction and the ethical use of "dark patterns" in game UX (designs that exploit psychological biases to keep players hooked), exploring oxytocin-driven models offers a potential path to games that are compelling and socially beneficial. If oxytocin-oriented design can maintain player interest without the negative side effects of purely dopamine-fueled compulsion, it could point toward a more sustainable, prosocial future for game development. This proposal outlines a small-scale study to systematically investigate these

questions, with the hope of guiding both theory (in neuroscience and game studies) and practice (in HCI and game design) toward a deeper understanding of how games can engage us in positive ways.

Literature Review

Dopamine Loops and Compulsive Engagement in Games: Dopamine is a neurotransmitter heavily involved in the brain's reward and reinforcement learning systems. Seminal research by Koepp et al. (1998) provided the first direct evidence that playing a video game triggers dopamine release in the human striatum【16】. In game contexts, dopamine surges are associated with the anticipation and receipt of rewards, from earning points to opening "loot boxes." Game designers have capitalized on this by creating compulsion loops – cycles of anticipation, activity, and reward that closely mimic the conditioning experiments of B.F. Skinner. Random reward schedules (unpredictable loot drops or bonus events) are especially effective at producing dopamine-driven excitement and repeated behavior【2】【3】【4】. Such mechanics underlie many free-to-play and mobile games, where players are enticed to keep checking in for the next possible reward. Developers intentionally tune the timing of notifications and in-game events to optimize dopamine "hits," using near-randomized intervals to sustain engagement throughout the day. These strategies can indeed increase time spent in-game and revenue, but they have drawn criticism for potentially fostering addictive play patterns. Players hooked on a dopamine loop often report losing track of time or feeling unable to quit, akin to the behaviors seen in gambling addiction. Over-reliance on dopamine reward loops can also lead to diminishing returns – players may become desensitized or burnt out if constantly overstimulated. Shokrizade notes that games which push "quick stims" and high-intensity reward bursts usually see fast initial engagement but then a sharp drop-off as players fatigue or churn out, sometimes within weeks. This pattern aligns with industry observations that purely extrinsic, reward-centric games often struggle to retain users long-term, as the stress and exhaustion catch up with the player【5】【5】【6】【7】【18】.

Oxytocin and Prosocial Game Design: Oxytocin, by contrast, is a hormone/neuropeptide linked to social bonding, trust, empathy, and emotional connection. It has been called the "love hormone" because it is released during moments of intimacy such as hugging, as well as during cooperative or caring social interactions. In the context of games, an oxytocin-driven design emphasizes mechanics that promote positive social interaction – for example, cooperative gameplay where players must rely on each other, meaningful player communication, guilds or teams that foster friendship, and narrative or gameplay elements that elicit empathy. The hypothesis is that such features could stimulate oxytocin release or at least engender similar feelings of trust and camaraderie among players. Neuroeconomist Paul Zak's work implies that even online social stimuli (like receiving a supportive message or a "like" on social media) can trigger small oxytocin releases, increasing our sense of connection. Shokrizade has gone so far as to argue that "oxytocin is the most powerful drug we know" in games – in his view, a strong social high can trump the rush of a dopamine hit. He points out that many of the most commercially successful, long-running games in the industry (e.g. MMOs like World of Warcraft or socially rich games like EVE Online) succeed because they cultivate social bonds and communities that keep players invested for years. In these environments, players often form friendships, teams, or even romantic relationships, creating an emotional attachment to the game world and its community that extends beyond the pursuit of the next reward.

Indeed, Shokrizade observes that when players feel "bound to a product" through social fulfillment rather than just skinner-box mechanics, they tend to enjoy the experience without the same level of fatigue, playing consistently for longer periods【8】【9】【12】【20】【21】.

Recent Studies and Emerging Perspectives: Academic research is beginning to catch up with these industry insights. In neuroscience, there is growing interest in the interplay between oxytocin and dopamine in regulating behavior and motivation【22】. For instance, Petersson and Uvnäs-Moberg (2024) highlight that oxytocin–dopamine interactions can modulate stress and reward-seeking behaviors, suggesting a biochemical basis for why social interaction might counterbalance addictive reward loops in healthy ways. In game studies and psychology, a few recent works have shifted focus toward positive outcomes of gaming. A groundbreaking study by researchers at Oxford University found that time spent playing video games was actually associated with greater well-being, especially when players reported feeling socially connected and intrinsically motivated during play【23】【24】【25】. In that study, players of Animal Crossing: New Horizons and Plants vs Zombies who genuinely enjoyed the social or cooperative aspects of the games had higher self-reported well-being. This challenges the conventional narrative and aligns with the idea that games can provide "healthy" engagement when they fulfill social and emotional needs (which we might liken to oxytocin-driven engagement) rather than solely hooking players with artificial rewards.

Another line of research in HCI and communication has examined how cooperative gameplay can lead to prosocial outcomes. For example, Grizzard et al. (2013) attempted to directly measure oxytocin release in players and found some perplexing results – while cooperative play was expected to boost oxytocin and generosity, the initial findings suggested the dynamics are complex and context-dependent, highlighting that simply adding co-op isn't a magic bullet for prosocial behavior【26】【27】. (Notably, technical issues prevented full hormonal analysis in that study, pointing to a need for further research.) Nonetheless, the very undertaking of such a study reflects an increasing academic interest in the oxytocin angle of gaming.

In the game design community, the ethical discussion around "dark patterns" versus "human-centric design" also maps onto our dopamine vs. oxytocin debate. Dark patterns in games refer to design techniques that are intentionally manipulative – for example, exploitative microtransaction schemes or excessive notifications – essentially leveraging our dopamine-driven impulses against our long-term interest. Hodent (2021), a UX researcher, notes that dark patterns prioritize short-term monetization over player well-being, exploiting cognitive biases to lock players in at the expense of their enjoyment or financial health【28】【29】【30】. In contrast, a more human-centric or "benevolent" design approach would prioritize meaningful engagement, fairness, and the player's emotional experience. This ethos aligns closely with oxytocin-driven design: it's about fostering genuine social connection and fun, rather than tricking players into habitual play. There is a parallel here with concepts of "nudges" in design – gentle encouragements that benefit the user (like a game reminding friends to check in on each other), as opposed to dark patterns that purely benefit the company. Post-2020, we've seen a rise of "cozy games" and design discussions around games for mental health, indicating a cultural shift toward valuing the emotional and social quality of game experiences, not just their addictive pull. This literature review underscores a key point: dopamine-driven and oxytocin-driven models are not merely buzzwords, but represent fundamentally different philosophies of engagement. One is externally motivating and potentially compulsive, the other is

socially fulfilling and potentially sustainable. However, empirical evidence directly comparing their effects remains sparse – which is exactly the gap this proposed study will address.

Research Questions and Hypotheses

Drawing on the theory and observations above, the study will investigate the following questions:

- **RQ1:** How does player engagement differ between a dopamine-driven game design and an oxytocin-driven game design? Specifically, do players in a dopamine-focused game show higher immediate engagement (time spent, frequency of interactions) but also higher signs of compulsive play, compared to those in a socially-oriented (oxytocin-focused) game?
- **RQ2:** What are the differences in emotional and social outcomes for players between the two design models? For instance, do players of an oxytocin-driven design report greater enjoyment, trust, or social connectedness and lower stress or guilt than players of a dopamine-driven design?
- **RQ3:** Can short-term exposure to an oxytocin-driven game experience mitigate some of the negative effects (e.g. urge to keep playing, frustration) induced by a dopamine-driven game experience? (This exploratory question examines if the order of exposure matters: does playing the social/oxytocin-rich game first vs. second influence the outcomes?)

Based on prior literature and theory, we propose the following hypotheses:

- **H1:** The dopamine-driven game will elicit more intense but short-term engagement metrics (e.g. a higher number of quick interactions or clicks, greater difficulty stopping on cue) than the oxytocin-driven game, but it will also score higher on measures of compulsiveness and stress. For example, we expect participants in the dopamine condition to be more likely to continue playing past an allotted time and to report stronger urges to keep playing "just one more round," reflecting a compulsive engagement loop.
- **H2:** The oxytocin-driven game will produce higher positive social and emotional responses relative to the dopamine game. We anticipate that players in the oxytocin condition will report greater feelings of enjoyment, relaxation, and connection (e.g. feeling "closer to others" or part of a team) and lower negative affect (such as frustration or guilt about time spent). They may also exhibit equal or better longer-term engagement* intention – for instance, indicating they would like to return to the game in the future – even if the immediate compulsion is lower.
- **H3:** When the same individual is exposed to both game types, the oxytocin-driven experience will moderate the effects of the dopamine-driven experience. If a player plays the high-dopamine game and then the high-oxytocin game, we expect a "buffering" effect: the cooperative/social play may reduce stress or arousal levels from the previous dopamine

session, leading to a more balanced overall experience. Conversely, if a player goes from the oxytocin-rich game to the dopamine-rich game, we hypothesize the contrast might make the dopamine loops feel more hollow or overly intense, potentially making the player more aware of the manipulative nature of the second game. (This hypothesis is more exploratory and will be examined in an optional within-subject analysis if applicable.)

Methodology

Study Design: This research will use an experimental, mixed-design approach to compare the two game design models. We plan to develop or utilize two simple game prototypes (or modified existing games) that exemplify each design philosophy: one dopamine-driven game and one oxytocin-driven game. The dopamine-driven game prototype will be designed with classic compulsion loop elements – for example, a repetitive task or challenge (simple puzzles or clicking activities) with frequent random rewards, points, and stimulating feedback (bright animations, sound effects) to trigger excitement. It will emphasize individual achievement and have built-in variable reward schedules (e.g. a "slot machine" style loot drop every few minutes). The oxytocin-driven game prototype, on the other hand, will be designed to require cooperation or social interaction. For instance, it could be a two-player or multiplayer puzzle that can only be solved with teamwork, or a small virtual world task where participants must communicate or share resources to succeed. This game will de-emphasize scores and rewards, focusing instead on collaboration (e.g. a shared goal or a trust exercise in-game). It will incorporate features like real-time chat or shared decision-making to foster a sense of connection. Both game scenarios will be kept simple and of similar genre/complexity (to control for genre bias) and each session will be of limited duration (~15 minutes) to manage exposure.

We will recruit $N \approx 30$ participants, ideally university student volunteers with moderate gaming experience (to ensure they can operate the games but are not highly biased by prior preferences). Participants will be randomly assigned to one of two groups: Group A will play the dopamine-driven game first, then the oxytocin-driven game; Group B will play the oxytocin game first, then the dopamine game. This counterbalanced within-subject design (each participant experiences both conditions in different order) allows us to capture comparative data from the same individuals while controlling for order effects. A short break will be given between sessions to minimize carry-over arousal. (If logistical constraints arise, a between-subject design could be used instead, with separate groups each playing only one game type; however, the within-subject approach is preferred for sensitivity given the small sample.)

Data Collection: We will use a combination of behavioral logging, self-report questionnaires, and observational measures:

- **Engagement Metrics:** Both game prototypes will automatically log quantitative data such as time spent in each game, number of voluntary actions (clicks, moves, etc.), number of optional rounds/levels completed, and whether the participant chooses to continue playing when prompted to stop. For example, in the dopamine game we might measure how many

times a participant opts to retry the challenge for another random reward. In the oxytocin game, we might log instances of helping behavior or communication messages sent.

- **Psychological Questionnaires:** After each game session, participants will complete a brief survey including:
    - *Compulsiveness/Urge to Play:* A few items adapted from the Internet Gaming Disorder scale or similar (e.g. "I had a hard time stopping play when time was up" or "I felt a strong urge to continue playing") rated on a Likert scale.
    - *Enjoyment and Affect:* Questions from the Positive and Negative Affect Schedule (PANAS) to gauge mood, plus custom questions about enjoyment ("I found this game fun") and frustration or stress ("I felt tense or anxious while playing").
    - *Social Connection (for oxytocin game):* Items measuring the sense of social presence or bonding (if applicable). For instance, using a Social Presence in Gaming Questionnaire if playing with a confederate or an imaginary partner, or simply asking "I felt connected to another person while playing" for the cooperative condition.
    - *Perceived Reward Satisfaction (for dopamine game):* Items like "The rewards I earned in the game felt satisfying" or "I kept playing to get more rewards" to see if the manipulation worked.
- **Qualitative Feedback:** We will also ask open-ended questions such as "How did you feel while playing each game? Describe your experience." This can provide insight into what aspects of each design stood out to players (e.g. "exciting but stressful" vs "relaxing and engaging with others").

Additionally, we may collect physiological or observational data if feasible. For example, we could monitor facial expressions or body language (signs of stress or enjoyment) via video recording (with consent), or even simple physiological measures like heart rate using a fitness tracker to see arousal levels in each game. Given the small scale, advanced biometrics (like hormone assays for oxytocin/dopamine) are beyond scope, but we aim to approximate their effects through the self-reports and behaviors.

Procedure: Participants will be tested individually or in pairs (for the co-op game) in a controlled lab setting. After providing informed consent, a participant in Group A will first be introduced to the dopamine-loop game. They will receive standardized instructions on how to play, but no information about our hypotheses (to avoid biasing their behavior). They will play the game for a fixed base period (e.g. 10 minutes) and then be given an opportunity to continue for a few more minutes ("You can play a little longer if you want") to observe voluntary engagement. The session will then be stopped, and the participant will immediately fill out the post-game questionnaire about that game. Next, after a short rest (~5 minutes), the participant will play the oxytocin-driven game under the same protocol (with either a computer-simulated partner or another participant, depending on implementation). Again, they'll play ~10 minutes with an option to extend, then fill out the second questionnaire. Group B will follow the same steps in reverse order (oxytocin game first, then dopamine game). The entire study for one participant is expected to last about 1 hour. Throughout the sessions, a researcher will unobtrusively observe or note any remarkable behaviors (e.g.

“Participant smiled/laughed when cooperating” or “Participant tried to negotiate for more time to keep playing the dopamine game”).

Data Analysis: We will analyze the data both within subjects (comparing each participant’s responses between the two game conditions) and between conditions overall. Key dependent measures like time spent, number of extra rounds, urge-to-play scores, enjoyment ratings, etc., will be compared using paired-sample t-tests or Wilcoxon signed-rank tests (if data are non-normal), since each participant yields a pair of data points (dopamine vs. oxytocin). We expect to see statistically significant differences aligned with H1 and H2 – e.g., higher compulsive urge scores in the dopamine condition, higher social satisfaction in the oxytocin condition. We will also test for any order effects by comparing Group A vs Group B on the first-played game metrics (using independent t-tests); if order effects are negligible, we can pool the data, but if significant, we will report those and interpret H3 accordingly. Qualitative feedback will be coded for common themes using a simple content analysis – for instance, noting how often words like “addictive, exciting, tense” appear for the dopamine game versus “relaxing, friendly, boring” (if that occurs) for the oxytocin game. This qualitative insight will help contextualize the numerical results.

Overall, the methodology is designed to isolate the impact of game design philosophy on player experience in a short-term setting. By controlling the game content (making both games of similar difficulty and topic, differing mainly in reward vs. social mechanics) and using a within-subject comparison, we aim to directly observe how the same person’s engagement and feelings change under dopamine-driven versus oxytocin-driven design. This controlled approach, while artificial in some respects, can provide causal evidence of the effects that have so far been mostly hypothesized in theory.

Ethics Summary

This study will adhere to all relevant ethical guidelines for research with human participants. Prior to participation, individuals will receive an informed consent form describing the study’s procedures, the types of tasks they will do (playing two short games), and any potential risks. They will be informed that participation is voluntary and that they can stop or withdraw at any time without penalty. To protect participants’ well-being, the game prototypes are designed to be low-risk and moderate in content (no graphic violence or disturbing themes). The primary ethical consideration is the potential for mild psychological discomfort – for example, participants might feel brief frustration or heightened urge to continue playing, especially in the dopamine condition. We mitigate this by limiting each gameplay session to a short duration and by debriefing participants afterwards. Debriefing: After all sessions and questionnaires are completed, the researcher will explain the purpose of the study (including the focus on dopamine vs. oxytocin design) and discuss any questions the participant has. We will also provide resources about healthy gaming habits in case the study raises personal questions about game use, reassuring participants that feeling a pull to keep playing is a normal reaction to certain game designs (thus avoiding any unintended shame or concern).

All data collected will be kept confidential. We will assign ID codes to participants so that no personally identifying information is attached to the gameplay logs or survey responses. The data will be stored securely (e.g. on an encrypted drive) accessible only to the research team. In reporting results, we will aggregate data and anonymize any quotes. The study will be reviewed and approved by the University's ethics review board (IRB) before commencement, ensuring that our procedures meet the required standards for safety and informed consent. Given the small-scale, lab-based nature of the study, we anticipate minimal risk to participants – comparable to playing a typical video game for a short period – and we have measures in place to address any issues that might arise (for example, if a participant becomes upset or overly anxious, the session will be stopped immediately). Overall, our ethical approach prioritizes participants' autonomy, privacy, and emotional safety throughout the research.

Expected Outcomes and Limitations

Expected Outcomes: We anticipate the study will provide evidence supporting the idea that dopamine-driven and oxytocin-driven game designs lead to measurably different player experiences. In concrete terms, we expect the dopamine-centric game to yield higher immediate engagement intensity and signs of compulsion – participants might click rapidly, show reluctance to quit, and report feelings of adrenaline or "addictive" excitement. However, we also expect these same participants to report more negative side effects, such as stress, mental fatigue, or guilt after playing (e.g. "I feel a bit exhausted" or "I probably could have stopped earlier but didn't want to"). In contrast, the oxytocin-centric game is expected to produce a calmer form of engagement: participants may not be as intensely focused on "getting the next reward," but they might describe the session as enjoyable or emotionally satisfying (for example, "It was fun to work together with someone"). We predict they will have lower scores on compulsive urge and stress, and higher scores on positive emotions and social connection. If our hypotheses hold, one particularly interesting outcome would be that players might actually prefer or intend to return to the oxytocin-driven game more than the dopamine one, despite the latter's initially flashier appeal. This would suggest that while dopamine hooks grab attention, oxytocin bonds foster loyalty. The study could thus demonstrate that an oxytocin-oriented design can sustain engagement in a healthier, more sustainable way – a valuable insight for game designers seeking alternatives to the status quo. Additionally, from the exploratory angle (H3), we might find that when players experience both designs, many express a clear contrast in how each made them feel (e.g. "Game A was exciting but stressful, Game B was mellow and pleasant"). Such subjective comparisons could be very illuminating, highlighting that players do notice the difference and perhaps validating the notion that these two models engage different motivational systems.

Limitations: It is important to acknowledge the limitations of this study. First, the sample size and composition (e.g. mostly college students, N ~30) means findings will be preliminary. A small-scale lab experiment cannot fully capture the vast diversity of game players and game genres. What holds in a short play session might differ in long-term real-world play. Second, our game prototypes are simplified representations of dopamine- vs. oxytocin-driven design. In reality, commercial games often blend both elements (for instance, even a very social game might have some rewards and vice versa). Our dichotomization helps research isolation but at the cost of ecological validity – actual games and player responses are more nuanced. Third, we rely heavily on self-report measures for internal states like compulsion or connection. Players might not accurately self-assess phenomena

like “urge to play” or may be influenced by demand characteristics (though our counterbalanced design and careful wording aim to minimize this). We are not directly measuring neurotransmitters or hormones (which would be ideal but impractical here), so our inference that a game is “dopamine-driven” or “oxytocin-driven” is based on design principles rather than biological confirmation. It’s possible that our oxytocin condition still triggers some dopamine (likely it will, as any enjoyable activity does), or that our dopamine game could have minor social elements. Thus, interpretation of results will be cautious – we will say the findings apply to these operationalized models rather than blanketly to all dopamine or oxytocin situations.

Another limitation is the short duration of exposure. Long-term engagement patterns (e.g. whether oxytocin-driven design truly retains players for months) cannot be observed in a lab in one hour. We also cannot simulate community-building fully in such a short time – real oxytocin effects might come from sustained social play over days or weeks as trust builds. Moreover, participant pair dynamics could vary (if two friends play together vs strangers, the cooperation feeling could differ greatly). We plan to mostly use strangers to simulate typical online matchmaking, but this might yield less oxytocin effect than friends would – an uncontrolled variable to note. Additionally, order effects and novelty might influence results: the first game played by participants might always have a novelty advantage. We counterbalanced to mitigate this, but if one game is inherently more novel or fun, that could skew results irrespective of dopamine/oxytocin focus. Finally, when interpreting results, we must be careful not to overgeneralize. If we find, say, that the dopamine game caused more stress, that doesn’t mean all reward-based games are “bad” – factors like game content, player personality, and context matter a lot (Hodent (2019) emphasizes that not every engaging design is an unethical dark pattern【31】【32】). Similarly, a failure to find differences would not necessarily disprove the theory; it might mean our implementation didn’t fully capture the hormonal dynamics.

Despite these limitations, this study will provide valuable initial data and insight. It could pave the way for more extensive research – for example, future studies might include physiological measurements (like heart rate variability as a proxy for stress vs. social calmness) or longitudinal designs where participants play at home over a week. It might also inspire testing with different genres (imagine comparing a loot-box-heavy mobile game to a cooperative board game or VR experience). In summary, while modest in scope, the expected outcomes of this project will contribute to the conversation about game design and well-being, offering empirical support (or refutation) for the idea that how a game engages the brain – via dopamine or oxytocin pathways – makes a meaningful difference in the player experience.

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(Note: All embedded citations (【】) in the text correspond to the sources listed above. APA references have been provided for academic completeness, while web sources and interviews are included to credit industry insights by Shokrizade and others.)

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