How Do Players Experience Win/Loss Patterns? An In-The-Wild Study of a Casual Mobile Game

Timothy Merritt
Aalborg University
Aalborg, Denmark
merritt@cs.aau.dk

Daniel Cermak-Sassenrath
Uppsala University
Visby, Sweden
dace@speldesign.uu.se

Keywords
chance, player experience, casual game, event sequencing

EXTENDED ABSTRACT

The ordering of seemingly random events may have an impact on players' experiences, in both gambling and gaming. For example, early wins and streaks may seem to be an obvious hook that keeps players engaged, yet there is little empirical evidence of how players respond to event order. This study complements prior work in game design through an empirical, quantitative experiment that examines how patterns and sequences affect players' reactions and behaviours. The study's overarching research question is, "How does the sequence of in-game events affect player experience?" In our previous research, we examined theories and design patterns and found very few unique patterns. The "dramatic arc" was identified as a broad model for the strategic ordering of events and signalled the need for empirical research with players (Cermak-Sassenrath and Merritt 2026). The primary contribution to the discourse here is empirical evidence of binary event sequences that suggests categories of patterns that influence player experience and behavior.

Designers often describe choreographing event order as an art, balancing excitement and pacing to sustain interest (Cockburn, Quinn, and Gutwin 2017, 93). Yet, clear guidance on which sequences work best remains elusive, complicating design decisions. Although sporadic studies in game studies, HCI, psychology, and sociology have examined aspects of event ordering (Abbott 1995; Cockburn, Quinn, and Gutwin 2017; Frank and Smith 1989; Gutwin et al. 2016; King, Delfabbro, and Griffiths 2010; Langer 1975; Langer and Roth 1975), insights are typically informal and broad. While designers and researchers have long recognized that event order can shape engagement, systematic study of win/loss sequencing in games is limited. Across artistic and sociological fields, the Japanese principle of merihari—a balanced interplay of contrasts—has been invoked to guide pacing in interactive experiences (Carli-Dorsey et al. 2015; Dimmer 2012). Abbott's foundational work on sequence analysis offers methods for characterizing temporal patterns in diverse domains, from rituals to spatial arrangements, yet its application to game events remains unexplored (Abbott 1995).

Proceedings of The Gam(bl)ing Conference 2026

In game design practice, Zubek recommends alternating "high-intensity challenges" with downtime but leaves implementation to genre conventions (Zubek 2020, 174). Flow theory similarly emphasizes matching challenge to player skill for optimal experience (Csikszentmihalyi 1975), and Cockburn et al. identify mechanisms such as primacy, recency, duration neglect, and the peak–end rule as influential but do not prescribe concrete sequences (Cockburn, Quinn, and Gutwin 2017; Gutwin et al. 2016). Narrative frameworks—Aristotelian dramatic arcs and the Hero's Journey—suggest rising and falling tension, yet they address story beats rather than discrete binary outcomes (Taylor 2013; Wesolowski 2009).

Adaptive systems like Dynamic Difficulty Adjustment (DDA) automatically steer challenge by tweaking parameters in real time, indirectly affecting event order without generating predetermined win/loss patterns (Denisova and Cairns 2015; Hunicke 2005). Tabletop role-playing games, in contrast, rely on game masters to craft emergent sequences that balance player agency and narrative flow on the fly (Acharya, Mateas, and Wardrip-Fruin 2021; Four 2022).

Operant conditioning research highlights that reinforcement schedules—more than overall reward rates—drive engagement (Schüll 2012; Skinner 1953). Early wins in chance tasks can induce an illusion of control, biasing expectations of future success and underscoring the power of sequence position (Herman 2001; Langer 1975; Langer and Roth 1975). King et al. classify video-game reward structures alongside gambling mechanics but stop short of examining sequence effects directly (King, Delfabbro, and Griffiths 2010). The "hot hand" phenomenon further illustrates how perceived streakiness influences player beliefs and behaviors (Kou et al. 2018).

To advance this area, we report an empirical investigation using a casual mobile game deployed in the wild, focusing on how win/loss patterns influence play duration, level progression, and in-game ratings. Together with a game studio, we designed *Pizza Time!*, a casual single-player mobile game in which each level comprises ten pseudo-random win/loss events. The in-the-wild study employs a custom-made, casual, mobile game that was designed together with a professional game studio, and released in one national market. The game is a (pseudo-random) chance-based game; each level contains ten in-game events, in sequences comprised of 50% wins and 50% losses. Analysis of the gathered data from 94 players was examined in relation to three sequence categories: prefix/suffix, streaks, and alternations.

Our between-subjects evaluation shows that prefix/suffix patterns replicate primacy and peak–end effects, with sequences beginning or ending in wins yielding higher continuation (Cockburn, Quinn, and Gutwin 2017; Gutwin et al. 2016, 92). Loss streaks – but not win streaks – significantly affect play duration and continuation, suggesting that clustered defeats deter players from continuing. Early-win bias may foster an illusion of control (Frank and Smith 1989; Langer 1975; Langer and Roth 1975), while streak-breaking events could exploit peak-end salience. Finally, recency effects should be further studied in future work to further explore the effects of late wins or losses on the willingness to continue playing (Cockburn, Quinn, and Gutwin 2017). The analysis shows that streakiness correlates with players' willingness to continue, echoing sequence effects observed in prior research. Our key contribution is the gathering of empirical evidence for a tentative taxonomy of binary event sequences that suggest categories of patterns that influence player experience and behavior including – prefix/suffix, streaks, and alternations.

Future work should (1) experimentally manipulate these categories to test causal impacts, (2) apply the taxonomy in richer, skill-based games and diverse cultural settings, and (3) incorporate finer-grained behavioral and self-report measures.

Ultimately, these insights can guide pacing, dynamic difficulty, and the sequencing of rewards across interactive experiences.

BIO

Timothy Merritt is Associate Professor in Human-Centered Computing at Aalborg University where he leads the Physical and Embodied Interaction research group and conducts research on human-computer interaction with intelligent, embodied, and AI-supported systems, with a particular focus on human-drone interaction, multi-robot systems, and intelligent swarms. His work explores how people understand, interact with, and make decisions with AI systems in complex physical and social contexts. He has developed and studied technologies for supporting play with children and families. More info is available at ixd.net.

Daniel Cermak-Sassenrath is a player, designer and academic. His specific areas of expertise are Game Studies and the philosophy of play. Daniel's research centres on artistic, analytic, explorative, critical and subversive concepts and practices of play. He is author of a monograph about play as a perspective in everyday computer use (transcript, 2010), editor of a volume on the playful disruption of digital media (Springer, 2018), and author of a textbook for non-tech people to learn programming through making games (Routledge/CRC, 2024). Daniel is Associate Professor and Docent at the Department of Game Design at Uppsala University. More info is available at dace.de.

FUNDING

This research was supported in part by the Innovation Fund Denmark in the Innobooster project, “PlayXperience.”.

CONFLICTS OF INTEREST

The authors declare no competing interests.

ACKNOWLEDGMENTS

We thank our collaborators from Niila Games for their help in developing the game and conducting the user study with us.

BIBLIOGRAPHY

Abbott, Andrew. 1995. “Sequence Analysis: New Methods for Old Ideas.” Annual Review of Sociology 21: 93-113. https://doi.org/10.1146/annurev.so.21.080195.000521.

Acharya, Devi, Michael Mateas, and Noah Wardrip-Fruin. 2021. “Story Improvisation in Tabletop Roleplaying Games: Towards a Computational Assistant for Game Masters.” In Proceedings of the IEEE Conference on Games (CoG) 2021, Copenhagen, Denmark, August 17-20, 2021.

Carli-Dorsey, Alex, James Jackman, Nicholas Massa, Bengisu Tulu, and Emmanuel Agu. 2015. “An Assessment of Mobile Fitness Games.” PhD Dissertation.

Cermak-Sassenrath, Daniel and Timothy Merritt. 2026. “The dramatic arc as a conceptual model for understanding the strategic ordering of game play events”, Computational Humanities Research, 2, p. e21. doi:10.1017/chr.2026.10040.

Cockburn, Andy, Philip Quinn, and Carl Gutwin. 2017. “The Effects of Interaction Sequencing on User Experience and Preference.” International Journal of Human-Computer Studies 108: 89-104. https://doi.org/10.1016/j.ijhcs.2017.07.005.

Csikszentmihalyi, Mihaly. 1975. Beyond Boredom and Anxiety. San Francisco: Jossey-Bass.

Denisova, Alena, and Paul Cairns. 2015. “Adaptation in Digital Games: The Effect of Challenge Adjustment on Player Performance and Experience.” In Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '15), 97-101. New York: Association for Computing Machinery. https://doi.org/10.1145/2793107.2793141.

Dimmer, Christian. 2012. “Re-imagining Public Space: The Vicissitudes of Japan's Privately Owned Public Spaces.” In Urban Spaces in Japan, 74-105. Routledge.

Four, Johnn. 2022. “My Phases of GMing.” Roleplaying Tips Newsletter #0865, July 13. www.roleplayingtips.com/running-games/my-phases-of-gming.

Frank, Michael L., and Crystal Smith. 1989. “Illusion of Control and Gambling in Children.” Journal of Gambling Behavior 5, 2: 127-136.

Gutwin, Carl, Christianne Rooke, Andy Cockburn, Regan L. Mandryk, and Benjamin Lafreniere. 2016. “Peak-End Effects on Player Experience in Casual Games.” In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16), 5608-5619. New York: Association for Computing Machinery. https://doi.org/10.1145/2858036.2858419.

Herman, Jodi. 2001. “Modifying Adolescents' Illusion of Control: A Manipulation of Reinforcement Schedules.” Master's thesis, McGill University. www.collectionscanada.gc.ca/obj/s4/f2/dsk4/etd/MQ79011.pdf.

Hunicke, Robin. 2005. “The Case for Dynamic Difficulty Adjustment in Games.” In Proceedings of the 2005 ACM SIGCHI International Conference on Advances in Computer Entertainment Technology (ACE '05), 429-433. New York: Association for Computing Machinery. https://doi.org/10.1145/1178477.1178573.

King, Daniel, Paul Delfabbro, and Mark Griffiths. 2010. “Video Game Structural Characteristics: A New Psychological Taxonomy.” International Journal of Mental Health and Addiction 8, 1: 90-106. https://doi.org/10.1007/s11469-009-9206-4.

Kou, Yubo, Yao Li, Xinning Gui, and Eli Suzuki-Gill. 2018. “Playing with Streakiness in Online Games: How Players Perceive and React to Winning and Losing Streaks in League of Legends.” In Proc. of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18), 1-14. New York: Association for Computing Machinery. https://doi.org/10.1145/3173574.3174152.

Langer, Ellen J. 1975. “The Illusion of Control.” Journal of Personality and Social Psychology 32, 2: 311-328.

Langer, Ellen J., and Jane Roth. 1975. “Heads I Win, Tails It's Chance: The Illusion of Control as a Function of the Sequence of Outcomes in a Purely Chance Task.” Journal of Personality and Social Psychology 32, 6: 951-955.

Schüll, Natasha Dow. 2012. Addiction by Design. Princeton University Press.

Skinner, Burrhus Frederic. 1953. Science and Human Behavior. New York: Free Press.

Taylor, Dan. 2013. “Ten Principles of Good Level Design (Part 2).” Game Developer, October. www.gamedeveloper.com/design/ten-principles-of-good-level-design-part-2-.

Wesolowski, Jacek. 2009. “Beyond Pacing: Games Aren't Hollywood.” Game Developer, May. www.gamedeveloper.com/design/beyond-pacing-games-aren-t-hollywood.

Zubek, Robert. 2020. Elements of Game Design. MIT Press.