Losing Track of Time in the GLS Arcade:

How does a player's perceived game-playing time compare to a player's actual game-playing time?

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This "Real Time Research" (RTR) study was conceived at the May, 2009 Games, Learning, and Society (GLS) conference at the University of Wisconsin-Madison. Our inquiry started when one of our group members (Betrus) read the description of the RTR session on the way to the conference. After some thought, he brought the idea of observing GLS attendees as they played a game to our randomly chosen group at the RTR session. The group expressed a mutual interest in Csíkszentmihályi's (1990) theory of flow and discussed how we could do some basic measurement and observation to determine whether players had entered a flow state while playing.

Just as we were thinking about which game we would set up and where, one of the conference organizers (Steinkuehler) made the timely suggestion to use the games already set up in the conference arcade. Our UW-Madison hosts had set up a giant dream arcade with games of every different shape, size, and variety (along with free flowing kegs and unlimited ice cream). We all agreed that observing people in the arcade was a good idea.

For our RTR experiment, we decided it would be relatively easy to ask some simple questions about players' perceptions of their experiences and to gather some basic demographic information after they finished playing a game. We found, among other things, that players were miscalculating their time played 95% of the time – a significant amount even for a quick test like ours.

Literature Review & RTR Questions

Csíkszentmihályi's (1991) book, Flow: The Psychology of Optimal Experience, is the seminal work in the area of flow. In it, Csíkszentmihályi describes "flow activities" as supporting enjoyment, and gave examples of play, art, pageantry, ritual, and sports. He then explained that flow activities "...transformed the self by making it more complex. In this growth of the self lies the key to flow activities."

The achievement of flow through an appropriate balance between Anxiety and Boredom has since become a commonly accepted goal among researchers and scholars interested in improving the teaching/learning environment through the use of games. Csíkszentmihályi stated that:

"Although the operationalizations of flow diverge from one another, almost all flow measuring instruments include the challenge–skill dimension that has been argued to be the most important flow antecedent " (Csíkszentmihályi, 1991, p.191).

Kiili (2006) divided the conditions described by Csíkszentmihályi (1991) into antecedents and the experience itself. Kiili (2006) outlined the antecedents as, "...challenges matched to the skill level of a player, clear goals, unambiguous feedback, a sense of control, playability, gamefulness, focused attention, and a frame story." He sought to correlate these antecedents with the indicators of flow experience: "...concentration, time distortion, autotelic experience, and loss of self-consciousness" He concluded that that:

"The flow antecedents studied—challenges matched to a player's skill level, clear goals, unambiguous feedback, a sense of control, and playability—should be considered in game design in order to produce engaging and enjoyable experiences for players" (Kiili, 2006).

In other words, he concluded that the basic descriptive characteristics of flow outlined by Csíkszentmihályi (1991) could be used as prescriptions for creating learning games that support flow

experiences. In his conclusions he went on to state that:

"The results of the study supported the assumption that the concentration, time distortion, autotelic experience, and loss of self-consciousness dimensions can be considered indicators of the flow experience. The interplay of these dimensions facilitates the flow level experienced by players. Furthermore, the results indicated that the flow experience was independent of gender, age, and prior gaming experience" (Kiili, 2006).

Csíkszentmihályi (1991) described losing track of time as a common description of flow experience. He explained that most people mentioned time went faster than it actually did, but there is also the opposite case, and used an example of a ballet dancer who thought time went slower while performing a difficult turn. He concluded from his observation that, "The safest generalization to make about this phenomenon is to say that during the flow experience the sense of time bears little relation to the passage of time as measured by the absolute convention of the clock."

Based on our understanding of flow, we suspected that some people would enter a flow state in which time perception becomes distorted. For our study, we focused somewhat narrowly on this particular aspect of flow, which is about losing track of time. Our primary research question was "How does a player's perceived game-playing time compare to a player's actual game-playing time?" We further compared that to basic information about the person playing and the game he or she was playing. We looked at whether they lost track of time, the game was challenging, and whether players had fun while playing.

We hypothesized that as players played for longer periods of time, they would be more likely to enter a flow state and would therefore evidence a correspondingly greater discrepancy between perceived time and actual time played. We also wondered if the aggregated data would reveal some sort of statistical "break point," where before that point there would be less time distortion and after it there would be greater time distortion.

Research Methodology

We conducted our research in the GLS arcade throughout the conference (2 days, 2 evenings). Participants were a convenience sample chosen from those playing in the GLS arcade. They were observed without their knowledge and clocked from the time they started playing a game until they quit the game. Immediately afterward the players were asked to estimate the amount of time they had just played the game. Then they were interviewed based on a short seven-item protocol (Appendix A) that included questions about whether they enjoyed the game and whether they found it challenging, as well as their age, gender, and prior game experience. We also asked whether they had checked the time during game play to know whether their estimate was a true guess or based on a clock.

Results

Given the limits of the study and the difficulty in controlling variables, over-analyzing the data would not be appropriate or useful. We looked mainly for general patterns.

Here is some basic data about the participants:

• 25 males & 15 females participated

• Age range was 8 to 54 with a mean of 33.2.

• Games played: Rock Band, Dance Dance Revolution, Conspiracy Code, Flower, Samba De Amigo, Guitar

Hero, Team Fortress 2, & Left 4 Dead.

• 50% were playing a game they had never played before.

• On average, players rated them- selves a 3.0 on a 5-point Likert scale, with 1 being a non-gamer and 5 being a hardcore gamer.

We found that most players (84%) estimated time played by guessing, while 16% used some other reference to help estimate time such as counting how many songs played in Rock Band and multiplying it by average pop song length of three minutes and thirty seconds, glancing at time during or just after play, or estimating based on when a previous conference session ended and the next started. So for most players, the time reported reflects their own perception of time.

In regards to our main research question of "How does a player's perceived game-playing time compare to a player's actual game-playing time?" 47.5% of participants underestimated the time they played, 47.5% of them overestimated, and 5% of them answered exact playing time (Figure 1). The range of difference in perceived time went from an underestimate of 15 minutes to overestimates of 70 minutes, and the average player was off in their estimation by 39%. We found the average absolute time difference between perceived and actual time was 9 minutes 4 seconds. However, we did not see any pattern between actual played time and this time distortion (longer play did not seem to correspond with greater or less distortion).

Of the three most commonly played games, Rock Band players underestimated time played by 17%; Conspiracy Code players underestimated 23%; on the other hand Dance Dance Revolution players overestimated by 22%. Players who did not think the game was challenging underestimated time played by 2%. On the other hand, those who found the game challenging overestimated time played by 11%.

Other findings: 75% of participants were playing in a group (2 or more), 75% percent of participants rated their game as fun, and 75% rated their game as challenging. 57.5% found their game to be both challenging and fun.

Conclusions & Future Research Questions

Although our initial goal was to investigate whether players experience a flow state while playing games, we are limited in what we can conclude. There were so many uncontrolled variables in our study that it is hard to attribute errors in time reporting necessarily to flow. While some players seemed to engage in the games, the testing environment hampered this possibility for others. Players had constraints of upcoming sessions or social distractions from colleagues or others in the gaming environment. Additionally, half were playing the game for the first time, which may affect ability to reach a flow state. Finally, we do not know how well participants would be able to estimate time passage during other activities. Correctly estimating time might just be a difficult thing to do regardless of the activity.

We were hoping to observe whether players entered into a state of flow, primarily comparing their perception of time played with their actual time played. We found in general that players did not accurately report their time played (95% of participants), and they did have a distorted sense of time. We found it surprising that only 5% accurately estimated time played and those players' time estimates were an average of 39% off. These findings may have been inflated somewhat due to some shorter game play times for which estimates were often rounded to the nearest 5-minute increment. However, even in longer playing situations, there were similar differences between times played and estimated time played. Either people entered a state of flow rather quickly in game play and lost track of time or else people have a poor sense of time in general.

It is interesting that the game that required moderate physical activity (e.g., Dance, Dance, Revolution) was also the game that had the highest overestimation of time played (by 22%), and that in general as players rated games more challenging they overestimated their time played. We wonder if this is

similar to the case Csíkszentmihályi (1991) described in which a ballet dancer's perception of time was slower while performing a difficult turn.

Although all players who played Dance, Dance, Revolution reported that the game was challenging, there were mixed reports from players on overestimation and underestimation compared to their actual play time. It would be interesting to see if there is a relationship between overestimation of time and increasing challenge level of an activity. In future studies one might start with the assumption that flow is not an absolute, but a relative concept. In other words, a player could be at the very limits of flow, just before the challenge of the game increases to the point where it pushes the player from a flow state to a state of anxiety. Alternatively a player could be in a flow state on the verge of boredom. In any case, the intersection and relationships among skill level of the player, the challenge of the activity, and time distortion is certainly an interesting area to examine in future research.

We are also interested in finding if there are differences in the people we talked to, such as background, immediate contextual variables, or personality that, if measured, could predict whether someone would overestimate or underestimate their time played.

"Do people engaged in video games lose track of time?" "Does the time distortion change (increase or decrease) if they enter a flow state?"

"Does a person's perception of time while playing video games differ any more or less than their perception while doing other more mundane activities?"

We would also observe players in more natural settings. We would control for variables in our sample, such as game genre, actual amount of time played, and prior experience with game. We would also need to determine how accurately participants keep track of time doing other activities.

To finish this study, our RTR team met every day during conference, informally in the morning and afternoon, and formally in the evening. We spent one particularly long night analyzing data and preparing our presentation. While this was not what any of us had in mind when we went to the conference, somehow, the sense of accomplishment we got from working together made it worth the time and effort.

We focused on generating research questions and producing results that could lead to future research. For you, the reader, we hope the process worked. Through our reflections of the deficiencies in our research process, we are in turn identifying potential areas of inquiry to be explored. Ultimately, in our inquiry we were seeking to determine the circumstances and factors responsible for getting people into a flow state and similarly to look at what keeps it from emerging. In the end we hope that our study helped to accomplish the muse-like goals of the RTR project itself –that is, to foster dialogue and conversation about research in the domain of learning games and to propose next-step research questions and areas of inquiry.

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