Why is this happening to me? The value of Attribution Theory for understanding player experience

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Abstract
This position paper aims to illustrate the benefits of understanding player attribution in the context of games user research.

Introduction
Why do some players respond to failure by verbally abusing their teammates while others start helping them? Why do some players want to give up the fight after 20 min when other players feel like they can turn the tides no matter how grim the outcome looks? What makes different users who interact with the same game system react so differently? To make good design choices that have a meaningful and positive impact on games, we need to understand how and why players interact with games.

Recent advances in games user research (GUR) has created an environment in which an incredible amount of data is available to tackle these questions. Game logging allows us to train machine learning algorithms with huge data sets so we can predict and understand player behavior. Physiological measurement allows us to track heart rate, respiration rate, skin conductivity, or brain activity to understand how players experience emotions like stress or joy in games. Psychometric questionnaires measure latent constructs like immersion and perceived autonomy in a game to help us investigate not just how a player behaves in a game but also their attitude towards that play experience. All of these kinds of data contribute different aspects to our understanding of player behavior. Taken together, they can create a robust picture of player experience; however, researchers and practitioners need to figure out how to best triangulate these various data sources. Often, player experience questionnaires are used to contextualize or explain player behaviour. For example, understanding how satisfied players are by the social aspects of an online social network game can help explain their daily login patterns [1]. In this paper, we argue that understanding attribution has importance for contextualizing the vast amounts of player behaviour data and experience measures in GUR.

Understanding Players
There is a large well of experience psychology offers to understand, describe, and predict human behavior, thoughts, and beliefs. The concept of "flow" has long been included in how we talk about game design [8]. Similarly, Rigby and Ryan introduced Player Experience of Need Satisfaction (PENS)[7] based on Self-Determination Theory (SDT). The same group also applied the Intrinsic Motivation Inventory (5) to games
Four dimensions of attribution

Internal vs. External: whether the achievement is caused by the actor (internal) or outside forces, such as the situation or another person (external).

Stability: whether the internal or external cause is stable (cannot change) over time or is unstable.

Controllability: The extent to which future task achievement is under the actor’s control (can the actor influence the cause for their performance).

Globality: whether the cause for this achievement is important in all aspects of the person’s life or is specific to that situation.

These contributions are not just in creating a questionnaire that helps us predict whether or not someone will keep playing, but in furthering our understanding of how games satisfy psychological needs, and in providing a new and informative way for game researchers and designers to understand games and their design. Although the application of these scales can help researchers understand play, e.g., by providing a set of data points that correlate with how many hours a player plays a game or how many times a player clicks on an object in a game, these scales also provide deep insights into how a player experiences the game and how they feel about themselves while playing it. The concepts of flow, psychological need satisfaction or intrinsic motivation are deeply grounded in decades of research on motivational psychology in many different life situations. It is therefore not surprising psychological constructs have been shown to be very relevant in understanding why and how players enjoy games.

Introducing Attribution

Another large area of research in psychology is dedicated to understanding how people create explanations for what happens to them. These ideas about causality help people understand or predict events. Psychologists call this process attribution. Attribution theories try to explain how people assign causes to events in their lives and how these attributions affect peoples’ motivation, behavior and beliefs. According to attribution theories, when people think about what caused them to either succeed or fail, these causes can be described on four dimensions described in the side bar. As an example, the way a student attributes a failed exam has direct impact on how threatening this event is for their self-esteem, how they expect to perform in future exams, and how motivated they are to work for the next exam. A student attributing their failure to not having worked hard enough (internal, controllable, unstable, specific) is much more likely to be more motivated for the next exam than a student attributing their failure to their intelligence (internal, uncontrollable, stable, global). Can attribution theory be applied to games? Could the difference between a player who wants to give up after the first sign of failure and one who keeps trying be explained by how controllable they perceive the cause of their failure to be? Is the feeling of joy and pride after a win connected to how internally the player attributes this win? We are currently investigating attributional styles in the context of games. As an example of how psychometric data can contribute to analyzing user experience, we will present the progress of our research so far.

How to Measure Attribution in Games

Examples of domains in which attribution measures are successfully being used are academia, work, and romantic relationships. Current domain-specific attribution questionnaires measure the construct as a stable trait; however, literature has suggested that attribution is better considered as a changeable state. In the context of games, attribution as a trait would suggest attributional styles to be a player characteristic similar to a player type. Assuming attribution as a state would suggest attributional styles to be an aspect of player experience that can vary over different games and even over time within a game. To investigate which of these assumptions better explains players’ attribution in games, we developed two questionnaires: one was inspired by the established
We conducted a pilot study with 50 participants in which participants played a Bejeweled-style match-3 puzzle game and filled out both of our attribution measures (trait and state) as well as the established PENS and IMI player experience questionnaires. The trait questionnaire exhibited issues of low internal consistency, just as was reported in previous literature (Cronbach’s α<.40). Analyses of the answers showed a wide range of different causes that players attributed the hypothetical game experiences to and suggest differences in attribution between players and between situations. This indicates that variability depends on the situation, implying that attribution be considered as a state. The state questionnaire performed much better. All four scales showed good internal consistency (α>.70) as well as interesting correlations with more established player experience questionnaires.

In order to fully validate the player attribution questionnaire, we added more items and iterated on the items during qualitative interviews with players to identify ambiguities and phrasing issues. In the end, we had a total item pool of 43 statements for all four dimensions. To test our measurement model in different games, we conducted two studies with 120 participants each. In one study, participants played the match-3 game, in the other they played a whack-a-mole game with distractor targets. In addition to our attribution questionnaire, we gathered established player experience measures (PENS, IMI) as well as player characteristics such as personality (Big Five Inventory [4]), self-esteem (Rosenberg Self-esteem Scale [6]), their change in positive and negative emotions (PANAS [9]), and their motivation to play games (DGMS [2]).

We first identified viable items in our item pool using correlation matrixes and exploratory factor analyses (EFA). We then used a Confirmatory factor analysis to evaluate our final 12-item questionnaire measuring Internality (4 items), Controllability (3 items), Stability (3 items) and Globality (2 items).

**Assessing the Quality of the Model**

Using Amos we validated our model. It exhibited a good model fit ($\chi^2$/df = 1.522, p <= .01; CFI & TLI => .96; RMSEA<.05) and it was metrically invariant over the two games. The reliability scores for the subscales were good (CR>.70, $\alpha$>.75) except for Globality ($\alpha$=.68). The convergent validity for all subscales were good (AVE>.50). Discriminant validity tests showed only concern for Internality and Controllability, which was to be expected.

**Criterion-Related Validity:** These results demonstrate the quality of the measurement for player attribution. The more interesting question for this workshop is how attribution is linked to the personality of the player and if attribution can help us understand how players experience the game. Although these first studies were
mainly designed to help us create the validated scale, we can already see interesting relationships between how players attribute their game experience and how much they enjoy it, how much effort they invest, how competent and autonomous they felt, how immersed they were in the game, and how the game affected their mood (see Table 1). These are all relationships that suggest attribution to be highly involved in how playing a game makes a player feel. We can also observe that player attribution seems to be connected to trait characteristics of the player like personality (Conscientiousness, Neuroticism, Openness to new things) as well as the player’s motivation to play (Habit, Escapism, Performance, Social). In line with research on attribution in other domains, self-esteem seems to be associated with higher internal and more controllable attribution styles.

Conclusion

Based on the data gathered so far we have reason to believe that attribution can contribute a valuable perspective on how researchers and designers can look at player experience. This can be in explaining variance in individual player motivation, willingness to endure frustration, or enjoyment of success. When considering toxic group behavior, attributional styles can be useful, as attribution is closely linked to the idea of blame. Before a player starts typing racist, homophobic, sexist or generally disrespectful slurs after an event they experience as frustrating, they arguably ask themselves a few questions first: Is anyone responsible? Who could have prevented this? Who is to blame? These implicit questions all build on one bigger question: What caused this? And thus begins the process of attribution.

References


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Table 1 - B: Correlation coefficients
Stability (S) and Globality (G) subscales with PENS, IMI, PANAS, BFI, DGMS (** = \( p <= .01 \); * = \( p <= .05 \) )
Authors Bio

Ansgar Depping graduated from the University of Trier (Germany) in Psychology. During his studies he focused on social and motivational psychology. His thesis investigated conflicts in small work groups. In 2014 he started his Ph.D. in Human Computer Interaction at the University of Saskatchewan under Dr. Regan Mandryk. His research so far has focused on investigating player experience through the lens of social and motivational psychology. Leveraging his expertise in psychometric evaluation and his data analytics skills for interpreting large data sets of player behaviour data, he brings multiple methodological approaches to address his research questions. Among other things, he is interested in the effects of dynamic player assistance on player experience, how players assess their chances of winning in the example of League of Legends and how player attribution of game achievements affects player experience.

Regan Mandryk is an Associate Professor of Computer Science at the University of Saskatchewan. She pioneered the area of physiological evaluation for computer games in her Ph.D. research on affective computing at Simon Fraser University with support from Electronic Arts. She continues to investigate novel ways of understanding players and player experience in partnership with multiple industrial collaborators, but also develops and evaluates persuasive games, exergames, games for special populations including children with neurodevelopmental disorders, games that foster interpersonal relationships, and ubiquitous games that merge the real world with the game world. She has been the invited keynote speaker at two international game conferences, led the Games theme in the Canadian GRAND NCE, was the papers chair for the inaugural CHI PLAY conference, and is leading the new games subcommittee for SIGCHI.