The Effects of Videogame Achievements on Player Motivation

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Abstract—**Achievements in games are assumed to be extrinsic motivators yet this has not been shown to be the case experimentally. This study attempts to determine whether achievements exhibit characteristics more closely related to intrinsic or extrinsic motivators. An experiment was conducted in order to examine the effects of Achievements in a controlled environment. It was found that Achievements show no strong correlation with intrinsic motivation. The game itself had more of an effect on intrinsic motivation than Achievements, but Achievements may cause an increase in the returning rate of players.**

Keywords-videogames, games, achievements, achievement systems, motivation

I. INTRODUCTION

A. Achievements

Games can be considered to be simply a series of challenges presented to a player [1] [2] [3]. In addition to the intrinsic reward players experience from overcoming challenges, most games provide some form of additional reward for completion of key challenges or at semi-regular intervals throughout the gameplay [4] [5] [6]. These additional rewards could either be intrinsic or extrinsic and can be:

- tightly linked to the gameplay, such as new features becoming available to the player (eg. levels, weapons, powers, characters, vehicles, etc.);

- cosmetic (eg. new costumes, new graphical styles, etc.);

- external to the gameplay (eg. concept art, additional story materials, character models, etc.); and/ or

- simply recognition that the challenge has been completed (ie. like a tick on a check-list) [7].

In addition to the above, one further relatively new reward given to players is the concept of Achievements (also known as trophies) [8], badges [9], or, rarely, accomplishments [10]) [7]. Much like simple check-lists, Achievements are awarded for the completion of specific in-game challenges, but differ in their reliance on a centralized Achievement System [7] that enables players to track their earned Achievements across a collection of titles.

Large scale gaming platforms such as Valve's Steam, Microsoft's Xbox Live, and Sony's PlayStation Network (65, 48, and 69 million users respectively [11] [12] [13]) as well as smaller systems such as Kongregate [9] and Newgrounds [14] all provide an Achievement System. All of these systems provide a consistent look and feel to their users with Microsoft and Sony also mandating achievements across all titles released on those platforms [7].

Achievements have been shown to improve game longevity and add more depth to a game [15], guiding players in directions that may not be immediately obvious, such as highlighting tertiary or extraneous goals to the players. For example, in the game Team Fortress 2 [16] players are able to kill enemies with certain taunt moves and this is never taught to the player through gameplay or tutorials but simply alluded to in the Achievements list.

The industry sees Achievements as a feature and believes that it is a 'value-add' for their product. This sentiment is backed by a report published by the [10], claiming that a higher volume and diversity of Achievements correlate with a higher Metascore — a rating given by users for games and other products on the site Metacritic [17] — and gross sales in the United States.

The pervasiveness of Achievement Systems makes Achievements a familiar concept to contemporary gamers, but very little academic research has been done on their effects on the playerbase. The prevalent view is that they are a positive addition to games, but in respect to psychological theories, particularly Self-Determination Theory (SDT) [18] both the short and long-term effects are not clear cut.

B. SDT

While there has been little academic work specifically into the effects of Achievements, much prior work to examine the motivation in games used Self-Determination Theory (SDT) as the psychological basis [6]. The SDT model distinguishes between different types of motivation based on the different reasons or goals that give rise to an action [18]. The most basic distinction is between intrinsic motivation, which refers to

doing something because it is inherently interesting or enjoyable, and extrinsic motivation, which refers to doing something because it leads to a separable outcome [18].

Intrinsic motivation is defined as the undertaking of an activity for its inherent satisfactions rather than for some separable consequence. It plays a large part in our cognitive, social, and physical development because it acts on inherent interests in order to grow our knowledge and skills [18]. While many tasks may be inherently interesting, external factors may undermine and sabotage an individual's desire to perform a task [19].

Extrinsic motivation is a construct that pertains whenever an activity is done for the sake of some separable outcome. SDT proposes that there are varying degrees of autonomy within extrinsic motivation that dictates how much an individual has internalized and accepted the purpose of the task [18]. At worst, extrinsic motivators will undermine the intrinsic desire to perform a task and cause the individual to lose interest in an otherwise interesting task [19].

C. Critique of Achievements

Achievements serve primarily as a means to communicate information to the player about their performance [20]. In most cases, the Achievements inform the player about their progress through the game, highlighting the progress that the player has made. However, some game developers, critics, and players have voiced doubts on the effects of Achievements based on psychological theory or purely personal anecdotal observation. It is difficult to judge if the opinions expressed are simply the loud minority or a sentiment shared throughout the gaming community as these have not been formally documented by the industry, or explored from an academic perspective.

Burgun [21] considers Achievements to be an external motivator, and one that the developer has not accounted for in the game design process. A well-designed game should have a finely-tuned set of rules to influence player behaviour, and the addition of Achievements, another *external* system, can upset this balance and undermine the intrinsic experience intended by the developer altering the player's perception of the game.

Achievements appear to be a strong enough extrinsic reward for some players that multiple independent internet communities [22] [23] have grown up to facilitate this maximization of their individual Gamerscores (the cumulative total of points awarded to users for their Achievements [24]). These communities provide:

- lists of games recognised by players as having easy Achievements [25] [26], and these titles are often obtained (often just rented) for the sole purpose of quickly increasing Gamerscore, without regards for whether the games are intrinsically fun or not;

- guides for other players to obtain Achievements efficiently without needing to work out for themselves the required steps [27] [28] (shortcutting the process to obtaining an external reward); and

- a central meeting place to facilitate the creation of ad hoc groups with the aim of working together to obtain Achievements and possibly subverting the normal rules of competitive play.

Jakobsson explored this gaming subculture and likened Achievement Systems to being a meta-MMO (Massively Multiplayer Online game) where the obtaining of Achievements themselves are the primary goal of playing games [29] with the Achievement tasks being thought of like MMO-quests. This emergent behaviour is perhaps a subtle, but large shift from the traditional motivation of players, essentially turning the games they are playing into stepping stones towards the true objective of the players: a higher Gamerscore [29].

Chris Hecker [30] states: "for interesting tasks: tangible, expected, contingent rewards reduce free-choice intrinsic motivation, and verbal, unexpected, informational feedback, increases free-choice and self-reported intrinsic motivation" and that Achievements are likely to be the former as they provide an external reward that is separate from the game. This theory is supported by SDT [18], and the view of Achievements being separate to the game being played is widely accepted ([31] [29] [32] [21]). This implies that in the worst case, the presence of an Achievement System may reduce players' intrinsic desire to play [30], their enjoyment of games, and ultimately lead to less overall interest in playing.

Supporting these predications, some gamers are beginning to question the amount of enjoyment that have had and time they have spent performing repetitive actions with the sole purpose of unlocking an Achievement [33]. Games such as Dead Rising and Resistance 2 [34] have single Achievements that require 10s if not 100s of hours of normal play and instead players reduce the game to its most monotonous form to reduce the amount of time required [33] [35].

The previous discussion raises possible important issues surrounding Achievements, but as previously stated there has been little Academic study in this area with what little there is generally attempting to broadly classify behaviour rather than exploring the effects on gamers directly.

II. METHODOLOGY

An experiment from the field of SDT was selected as the basis of an experiment that sought to frame the impact of Achievements in a manner that was comparable to pre-existing data.

A. Original experiment

The original experiment chosen was conducted by Ryan, Mims and Koestner in 1983 [19], on 96 introductory psychology students, using hidden figure puzzles. Each hidden figure puzzle had one or more occurrences of the word "NINA" concealed within it (these puzzles were drawn by the cartoonist Al Hirschfeld and Nina was his daughter [36]).

Figure 1. Hidden Figure Puzzle as drawn by Al Hirschfeld

An example of a hidden figure puzzle used in this research in shown in Figure 1 and this puzzle has three hidden "NINA"s (two in the bow-tie and one in the creases of the sleeve).

Discovering such hidden words or shapes has been historically considered to be an intrinsically interesting task [19]. The study found that all monetary rewards undermined intrinsic motivation in participants while feedback (whether it was informational or controlling) increased intrinsic motivation.

B. Modified Experiment

The original experiment was modified to feature the use of Achievements instead of monetary rewards or feedback as the experimental variable with the hypothesis being that motivation will decrease in the presence of Achievements and the null hypothesis being that motivation will increase in the presence of Achievements. If the hypothesis holds true, Achievements could be thought of as a form of external reward and if the null hypothesis is supported, as feedback (with a further experiment needed to determine which kind).

There were two phases to the modified experiments, with the first Phase using the hidden figure puzzles from the original experiment but in a digital medium. Instead of participants using printed versions of the figures and circling the hidden "NINA"s with a pencil, they were presented with the images on a screen and could click on the general region with the mouse.

The second Phase featured a more modern 'game-like' task for the players within the same experimental framework as Phase 1. This game involved pushing coloured blocks into their correspondingly coloured goal positions. The game was created to be completely mouse-controlled so that different means of interaction wasn't a confounding factor compared to Phase 1.

An example of a puzzle in this game is shown in Figure 2. Each movable block (shown as a numbered black square) needs to move to its corresponding goal location (shown as a numbered white square with a heavy black outline). Players click and drag (in any of the four cardinal directions) on a block and it will move as far as it can in that direction until it
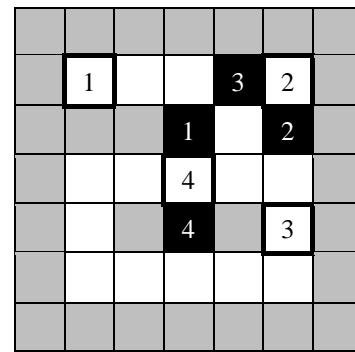

Figure 2. A Block Pushing Puzzle Used in Phase 2

encounters an obstacle – i.e. another block, or a wall (shown as grey squares). This example can be completed in no fewer than 11 moves and to do so requires a precise order of actions.

C. Participant Selection

Students attending the University of Tasmania were invited to participate in the study through the use of posters, callouts in lectures, and bulk-email to students. Participants were alternately assigned to either the control or experimental group based on the time that they took part in the study until the pool of participants was exhausted as a means of randomly distributing people across the two groups. Anyone who took part in Phase 1 was invited to return for Phase 2 where they would retain the group that they had been placed in (control or experimental).

D. Experimental Procedure

Both phases featured the same experimental procedure with different tasks. Participants were seated in front of a computer with the game loaded with the experimenter sitting nearby giving verbal instruction. This was modified from the original experiment's [19] use of intercoms and one-way mirrors, due to a lack of facilities.

The first task presented to participants was a 'tutorial'-esque task to introduce the concept of the puzzles. For that and every puzzle after, participants were given two minutes to complete the puzzle before the experiment moved on and in the event that the puzzle was not completed, the solution was withheld.

Next, participants were shown 6 different puzzles and instructed as to which puzzle to attempt. After 3 of the 6 puzzles were attempted, the experimenter left on the excuse of compiling data and obtaining questionnaires while the participant is left alone with the puzzles for six minutes. The amount of time in seconds spent by participants working on the puzzles was automatically recorded by the system (where the original experiment simply used a second impartial observer).

The experiment was single-blind with the participants unaware of the experimental procedure, but the experimenter having full knowledge of which group the participants were placed in.

III. RESULTS

A. Phase 1

Phase 1 attracted 31 participants that were split evenly across the control and experiment groups, with the mean and standard deviation play times shown in Table 1 and Figure 3. For this phase, Achievements did not significantly impact the amount of free time that participants spent playing the game (Mann-Whitney $U = 288.00$, $n1 = 16$, $n2 = 15$, $p = 0.1729$ two tailed).

In the original experiment, it was found that providing rewards of any kind decreased the amount of free time spent on the puzzle while informational feedback increased the amount of free time spent by participants on the puzzle relative to the control group by a significant amount [19] – implying a decrease in intrinsic motivation. In Phase 1 of our experiment, Achievements did not cause a change in free time play similar to that of rewards or feedback from the original experiment. With a non-significant result, we can conclude that the inclusion of Achievements had no effect on motivation.

Three results from the 'No Achievement' group could be considered outliers, and so the data was tested again with these removed (as shown in Figure 4). It was found that there was a significant amount of time spent on the puzzles as compared to the control group (Mann-Whitney $U = 277.00$, $n1 = 16$, $n2 = 12$, $p = 0.0191$, < 0.05 two tailed). Thus, it can be inferred that the 'Achievement' group in Phase 1 displayed more intrinsic motivation than the 'No Achievement' group.

We are cautious about this result, as removing outliers discards one fifth of the 'No Achievement' group, but it is interesting that in doing so, Achievements resemble the effects of informational feedback in the original experiment. Greater confidence in this result could be obtained with a larger sample size.

B. Phase 2

Phase 2 saw fewer participants with an uneven split between the two groups (the vast majority of participants were returnees). The Phase 2 results suffered in terms of participants as it only had 14 participants across both groups compared to Phase 1 which had 31 participants across both groups.

The Phase 2 results found that Achievements did not impact the amount of time spent by participants in their free time and no significant difference existed between the groups (Mann-Whitney $U = 71.00$, $n1 = 10$, $n2 = 4$, $p = 0.6056$ two tailed). The amount of free time players spent might as well have been random.

Keeping in mind that the sample size is very small in this case, it is hypothesized that if the set were expanded significant differences between the two groups may begin to arise. Extrapolating the data here seems to imply that the Achievement group would show a lower mean score. This would imply that the results of Phase 2 seem to indicate that Achievements cause a decrease in intrinsic motivation which is in line with the results of the original experiment when comparing rewards (of any kind) with no rewards.

TABLE I.   FREE PLAY TIME IN SECONDS PER PHASE

No Achievements		Achievements	
Phase 1	*Phase 2*	*Phase 1*	*Phase 2*
0	360	0	360
0	237	322	335
0	350	87	360
0	360	0	360
		360	360
		96	312
		292	280
		17	335
		0	0

TABLE II.   FREE PLAY TIMES IN SECONDS PER PHASE

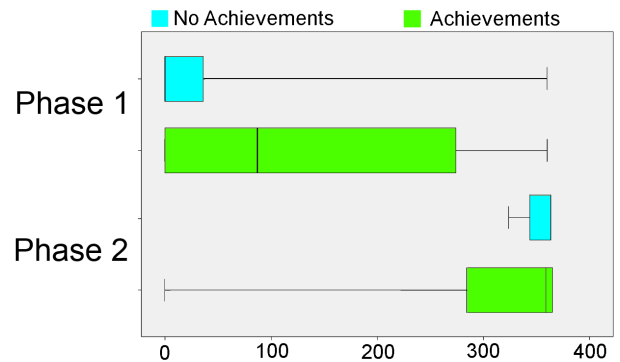|	No Achievements			Achievements		
	Count	*Mean*	*Std. Dev.*	*Count*	*Mean*	*Std. Dev.*
Phase 1	15	60.13	116.81	16	124.56	146.90
Phase 2	4	326.75	60.019	10	270.20	144.73

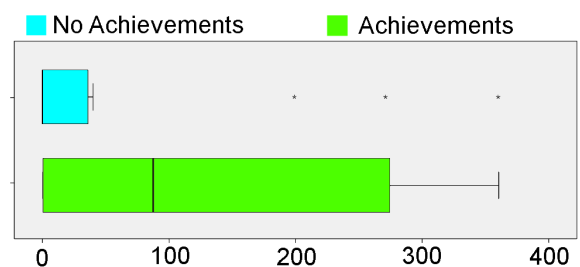
Figure 3. Box and Whisker Plot of Phase 1 and Phase 2

Figure 4. Box and Whisker Plot of Data Collected in Phase 1 with Outliers Shown

C. Proportion of Returnees Between Groups

The data from Phase 1 and Phase 2 were placed side by side for comparison and it was found that the experimental (Achievement) group had a significantly better return rate than the control (No Achievement) group (Z = 2.1246, p < 0.05). Thus, we infer that the presence of Achievements acted as a motivator for participants to return to the experiment.

It seems clear due to the prevalence of Achievement Systems across most major platforms that the platform holders have identified that they are considered a strong driver in players choosing which games to play [10] and what platform to play a particular game on. It may be that the effect witnessed here speaks to the strong pull of Achievements in this regard.

D. Comparing Play Time Between Phases

The amount of free time an individual participant spent on the game (as shown in Table 2) was compared between the phases and in every case the amount of time spent by the participant had increased or stayed a comparably similar amount from Phase 1 to Phase 2. A truly random distribution should have shown occurrences where the amount of free time spent on the game also dropped in Phase 2 and it was in fact found that there was a significant difference (with P = 0.0005, < 0.01) in play time between the phases. From this, we infer that the amount of free time spent on the game was more contingent on the task itself rather than the presence of Achievements.

IV. CONCLUSION AND DISCUSSION

Neither Phase showed a significant difference between the presence or lack of Achievements suggesting that they have no effect on player motivation. However, removing outliers for Phase 1 suggests that Achievements resemble the effects of informational feedback.

Cross comparison between Phases highlights that participants were significantly more likely to return if they had been exposed to Achievements in the first Phase. In light of the non-significant results for individual Phases, this suggests that Achievements have little immediate effect but have a longer term effect on motivation. Further experimentation is required to verify this result and to determine if this holds over longer time periods.

Further cross comparison shows that freeplay times significantly increased in the second Phase, highlighting that the task itself it the biggest variable affecting motivation, and suggesting that Achievements themselves may have only a small comparative effect. Further research is needed to determine if different types of tasks coupled with Achievements have different motivational effects.

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