



## An investigation of the effects of game difficulty on player enjoyment

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### ABSTRACT

Motivated by the controversial debates on the subject of static difficulty and dynamic difficulty adjustment (DDA), we investigate the effects different difficulty settings have on different types of players (i.e. casual or experienced). By doing this, we can help to deduce an important question: what difficulty does the player want? An experiment was conducted with 90 participants, each playing the same experimental game exhibiting either static difficulty or DDA mechanics. The results indicate that players enjoy a game more, if the difficulty provided is reflective of their gaming experience, rather than their actual gaming ability.

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### 1. Introduction

“Once upon a time, games were competitors. Now, primarily, they’re entertainers. They aimed to beat you. Now, to be beaten” [1].

The video game industry has evolved considerably, introducing a whole new set of consumers. The Nintendo Wii especially, piloted this change by providing a more accessible experience to the casual market. Consequently, different difficulty methods have been imposed in a variety of games to help ensure that both casual and hardcore players with varying skill levels stay engaged throughout their gaming sessions. *Mario Kart Wii* for instance, bridged the gap between the two audiences via its rubber-banding mechanics and the *Wii Wheel*. A common issue illustrated when creating a game for different audiences varying in ability, is that a game too hard causes frustration, whereas a game too easy causes boredom. The aim of the game designer therefore is to help the player reach their “sweet spot”, by balancing the effects produced by poor difficulty management; commonly referred to as Flow [2].

Generally there are two approaches used to resolve this problem. Either to provide the player static difficulty options to choose from (i.e. easy, medium or hard) or to adapt the game’s difficulty to the player’s ability using dynamic difficulty adjustment (DDA) methods. The subject of the “correct” difficulty approach to use

has sparked controversy between game designers and writers alike [3–6].

Commonly, DDA is referred to as the system to prevent the player from becoming bored from finding the game too easy, or becoming too frustrated because of the game’s high difficulty [5,3]. However, Passive DDA disregards the fact that not every individual wants to be challenged at the highest of their ability continuously; in fact, by doing so the player may “become physically and/or mentally tired after sustained play” [7]. They may instead wish to play at their own pace [8], because each individual has their own “physiological motivators” for playing any game [9]. Why the player wishes to play (whether for challenge or enjoyment), in conjunction with the user’s perceived ability establishes their difficulty choice.

Atkinson [10] proposed that negatively motivated individuals prefer to choose tasks that are very easy or very complex, whilst the positively motivated, tend to choose more realistic, yet moderately difficult tasks. In terms of computer games, a casual player tends to look at games as a form of relaxation and pleasure” [11], suggesting that they are more likely to choose an easier difficulty, thus demonstrating negative motives. Contrarily, an experienced player models the characteristics of someone who has a higher motive to achieve success, since they continuously practice [11] and ultimately play to win, portraying positive motives. Obviously there are other factors that contribute to the difficulty chosen, such as the targeted audience for the game being played. A casual player for instance, would feel more comfortable playing *Farmville* as opposed to *Super Meatboy*.

Kruger and Dunning [12] believed that unskilled performers overestimate their own performance greatly, in comparison with

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skilled performers who tend to underestimate their performance somewhat. Unskilled performers, who were later trained however, were able to be more accurate in their self-assessment. This demonstrates that regardless of ability – whether skilled or unskilled, experience is required in order to have good self-assessment.

Motivated by the controversial debates over game difficulty management systems [3–6] and the different models designed to resolve this debate [8,13], we investigated the effects of game difficulty on player behaviour. In particular, the behaviour of casual and experienced players will be analysed, when playing an experimental game utilising static difficulty and DDA mechanics.

By analysing the behaviour of different types of players, it helps us to discover *what difficulty does the player actually want?* We firstly present our predicted outcomes based on literature we reviewed and then introduce Star-Surf; our experiment. This is followed by an analysis of the results gathered from the test. Finally, we conclude our findings and provide opportunities for future work.

## 2. Hypotheses

The following hypotheses were proposed in consideration of the literature we reviewed, to help us discover trends between different types of players and the reasoning behind these trends.

**Hypothesis 1.** Experienced players will demonstrate better self-assessment

With consideration of Dunning and Kruger's study [12], experienced players should demonstrate the best self-assessment, since they are more likely to be skilled and trained. Therefore they should have better meta-cognitive ability, than casual players. Some casual players will likely be skilled, whilst others will not; therefore the poorest performers in the casual group should demonstrate the poorest self-assessment.

**Hypothesis 2.** Casual players will choose easier difficulties regardless of their ability

Following Atkinson's achievement of motivation [10], casual players will likely select difficulties that are relatively easy regardless of their actual ability, since the casual player profile typically portrays negative motives. Experienced players however, will choose more moderate difficulties, such as medium or hard, since they enjoy the challenge.

**Hypothesis 3.** Casual gamers will enjoy easier difficulty levels, but experienced gamers will not

Gilleade, Dix, and Allanson [9] demonstrated that casual players became frustrated much more easily than experienced players when the game's difficulty increased. Therefore the casual players who pursue easier difficulties will enjoy the game much more, than casual players who pursue harder difficulties. On the other hand, experienced players will not enjoy easier difficulties if it does not match their ability, since they desire to be challenged.

## 3. Creating Star-Surf

We designed Star-Surf to ensure that both casual and experienced players could naturally adapt to the game. It was developed with ActionScript 3.0 to target the Adobe Flash platform. To monitor the effects caused by different difficulty scenarios, the same game is used; however the participant has a random chance of playing the game in static difficulty mode or DDA mode.

### 3.1. The game

In Star-Surf the player takes control of a green square with their mouse cursor and must collect as many orbs/points as possible within a two minute time limit, by moving through red gates. The orbs and gates move from right to left continuously, producing the illusion that the player is moving. The Y position of each orb is chosen randomly and is surrounded by a gate. The size of the gate and the distance between each orb is influenced by the current difficulty level (Fig. 1).

#### 3.1.1. Tutorial

When the player first starts the game, they are requested to select their preferred difficulty by using a slider. The slider uses float values from 0 to 1; where the left of the bar – 0, represents the easiest difficulty and the right side – 1, represents the hardest difficulty. To aid the player's judgement preset static difficulty options appear above the slider, depending on the current float value.

- Very Easy: 0 – 0.2
- Easy: 0.2 – 0.4
- Normal: 0.4 – 0.6
- Hard: 0.6 – 0.8
- Very Hard: 0.8 – 1

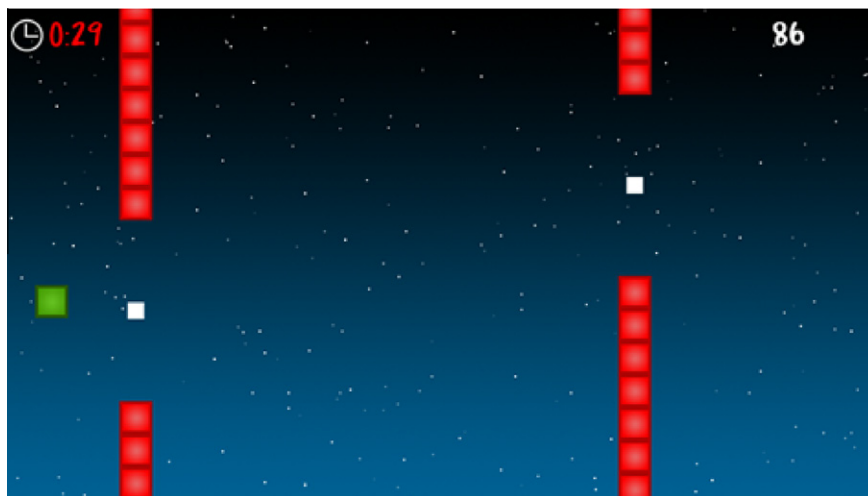


Fig. 1. A screenshot of Star-Surf.

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