

## Chapter 6

# A Study to Further Understand the Link Between Immersion and Flow

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### ABSTRACT

*Flow and immersion are states of extreme concentration on an activity. For serious games, that is games, which focus on achieving learning effects in players, high flow and immersion during gameplay can help to improve these learning effects. Both flow and immersion are currently only measured using questionnaires, which is both delayed and subjective. This work introduces a study, which aims to further the understanding of how flow and immersion are linked and to ease future work towards a new measurement method using physiological data.*

### INTRODUCTION

The design of Serious Games still presents an active field of research. Especially important are techniques to increase the learning rate of these games. Previous studies find in their research that high focus helps to transmit learning material through Serious Games (Deci and Ryan, 1985; Krapp, 2009). Two terms used to measure high focus are Flow and Immersion. These terms describe states of great focus on an activity or game. They are currently measured using questionnaires (Nordin, Denisova, and Cairns, 2014), which have a range of problems. A participant cannot fill out a questionnaire without interrupting the concentration state, meaning there must be a delay when gathering data. Additionally, questionnaires are inherently subjective, adding additional bias to the measured results. The solution to this problem would be to measure changes in the player's body and derive Flow and Immersion from that. This work in progress tries to present a step towards this solution. In order to better understand how Flow and Im-

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mersion interact, a combined model is established. Afterwards, based on previous work (Atorf et al., 2016; Kannegieser et al., 2018), a study is presented, which attempts to validate the model and link it with physiological measurements taken from players.

## **BACKGROUND**

Flow was first described by Csikszentmihalyi as the state of the optimal experience of an activity (Csikszentmihalyi, 1991). When entering a state of Flow, even taxing activities like work no longer feel taxing, but rather feel enjoyable. However, the Flow state cannot be achieved for every activity. Csikszentmihalyi bases Flow on the model of extrinsic and intrinsic motivation. Only intrinsically motivated actions, which are not motivated by external factors, can reach the Flow state. Flow is reachable when the challenge presented by such an intrinsically motivated action is balanced with the skill of the person performing the task. All this makes Flow an interesting point of research concerning games, as playing games usually is intrinsically motivated. Flow is mapped to games in the GameFlow questionnaire (Sweetser et al., 2005).

There exist two concurrent definitions of Immersion (Zhang et al., 2017). The first definition is called presence-based Immersion and refers to the feeling of being physically present in a virtual location. The second definition is known as engagement-based Immersion. It defines Immersion based on the strength of a player's interaction with the game. The model given by Cairns et al. in their series of papers (Cairns et al., 2006; Jenett et al., 2008), defines Immersion as a hierarchical structure, with different barriers of entry. The lowest level, Engagement, is reached by interacting with the game and spending time with it. Engrossment is reached by becoming emotionally involved with the game. During this state, feelings of temporal and spatial dissociation are starting to appear. The final state, Total Immersion, is reached by players having their feelings completely focused on the game. Cheng et al. improve upon this hierarchical model by adding dimensions to the three levels of the hierarchy (Cheng et al., 2015). The Engagement level is split into the three dimensions: Attraction, Time Investment and Usability. The second level, Engrossment, is split into Emotional Attachment, which refers to attachment to the game itself, and Decreased Perceptions. Finally, Total Immersion is defined by the terms Presence and Empathy.

Flow and Immersion share many similarities (see Table 1). Both have similar effects, such as decreased perceptions of both time and the environment, and refer to a state of focus. Georgiou and Kyza even take the empathy dimension in the immersion model by Cheng et al. and replace it with Flow (Georgiou and Kyza, 2017). There are two main differences between the two: First, Flow does not define an emotional component, while Immersion is focused heavily on the emotional attachment of players to the game. Second, while Flow refers to a final state of complete concentration, Immersion refers to a range of experiences, ranging from minimal engagement to complete focus on the game. This is reflected in how those two psychological states are described in their introduction. Csikszentmihalyi describes Flow as the “optimal experience of an activity”, while Cairns et al. describe Immersion as the “sub-optimal experience of an activity”.

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