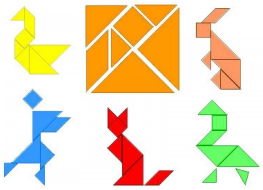
House, Remax, and Alfred Place. "Quantifying the experience of immersion in games."

This paper aimed to develop objective measures of immersion. They describe a study into switching from immersive gaming experience to another task, not in the game world. Immersion is measured with a questionnaire and the objective measure is the time taken to complete a task.

There were two conditions, control condition participants perform a simple button clicking activity and the experimental condition participants play the opening section of a first-person shooter game. The task is intended to require both cognitive efforts and be physically based so that the participants really do have to switch from the game world into the physical, real-world in order to complete the task. The task chosen was a tangram task.



The main measures were a questionnaire with 32 questions, time taken to complete the task before the experimental activity, and time taken to complete the task after the experimental activity. 40 participants: 10 males, 30 females, and ages ranging from 18 to 36 years. Participants first played the “hazard training course” [which takes about 10-15 minutes] which required players to train their character through a series of tasks enabling them to become familiar with all the controls. The control task was minimal engaging and was to demonstrate whether it was the computer game or any form of computer interaction that caused immersion.

Immersion questionnaire - five dimensions of cognitive absorption [related to particular task]: temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity; emotional involvement (empathizing with a game’s purpose or characters, wanting to speak out loud to the game, suspense about the games events), transportation to a different place (how far was disbelief about the game was suspended and how far participants felt that they were no longer attached to the real world), attention, (distractibility by other thoughts, awareness of external events), control and autonomy (ease of controls, using the controls as traveling somewhere and interacting with a world).

Two questionnaires were developed, with two pairs (positive and negative version) of related questions developed for each target area. These were then counterbalanced so that both questionnaires contained a question from each pair. In the control task, the questionnaire was exactly the same, except the word “game” was replaced with “task”. [1-5 scale; disagree-agree]

The experimental mean was higher than the control mean 69.6 and 52.5 respectively (and corresponding standard deviations of 18.2 and 17.2). To test for the effect of immersion on task performance, the difference between the pre-test and post-test times was found. As expected, apart from two participants, the time to complete the task the second time was less than the first

time. The hypothesis predicts that the more immersed a person is, the smaller the difference between the two task times.

The results suggest that being increasingly immersed in a game decreased one's ability to reengage with the "real world", supporting to some extent the idea of a transitional period between coming out of immersion in the "world of the game", and returning to the "real world". This effect however is not observed in the simple computer task.

They set out hypotheses for a similar experiment with the aim of exploring whether eye-tracking and body motion provide better indicators of the degree of immersion. As time progresses one might predict that as a gamer becomes more immersed in the game and attempts to take in the whole scene while meeting the demands of the task eye movements will increase. In contrast, for a non-immersive game one might predict that an individual's eye movements will decrease over time; not necessarily because the person is focusing on the task but because they are more likely to "drift off" as they become bored.

Questionnaires -

- Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive Absorption and beliefs about information technology usage. MIS Quarterly, 24(4), 665–694.
- Brown, E., & Cairns, P. (2004). A grounded investigation of game immersion. CHI 2004, ACM Press, 1279–1300.