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Fiona Fui-Hoon Nah
Missouri University of Science and Technology, nahf@mst.edu

Brenda Eschenbrenner
University of Nebraska at Kearney, eschenbrenbl@unk.edu

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Flow Experience in Virtual Worlds: Individuals versus Dyads

Fiona Fui-Hoon Nah
Missouri University of Science and Technology
nahf@mst.edu

Brenda Eschenbrenner
University of Nebraska at Kearney
eschenbrenbl@unk.edu

ABSTRACT

Flow is a state of mind in which one is deeply absorbed and immersed in an activity to the point where nothing else matters. Although flow can occur in solitary and social contexts, which context fosters greater flow is unclear. Consistent with self-determination theory, dyads working collaboratively achieved higher states of flow than individuals working alone. In other words, dyads achieved higher states of focused concentration and experienced greater temporal dissociation than individuals working alone. Surprisingly and contradictory to previous findings, dyads did not experience greater enjoyment than individuals working alone. We attributed this surprising finding to the hedonic nature of the virtual world environment which afforded an intrinsically rewarding experience; hence, adding a social dimension may not further increase heightened enjoyment. Our findings provide theoretical and practical implications on the use of virtual worlds for individual versus collaborative tasks.

Keywords

Flow, virtual worlds, self-determination theory, virtual teams, social flow.

INTRODUCTION

Flow is a mental state where one is completely absorbed and immersed in an activity to the point where one loses track of time and nothing else seems to matter other than the activity itself (Csikszentmihalyi, 1990, 1997). Flow has been studied in many contexts including human-computer interaction, information systems, psychology, and marketing (Finneran and Zhang, 2005; Hoffman and Novak, 2009; Moneta, 2012; Nah, Eschenbrenner, DeWester and Park 2010; Nah, Eschenbrenner and DeWester, 2011). Flow can occur in both solitary and social settings (Bachen and Raphael, 2011; Hong, Hwang, Chen, Lee, Lin and Chen, 2013; Nah, Eschenbrenner, Zeng, Telaprolu and Sepehr, 2014; Walker, 2010). Most of the existing research has studied flow in an individual (or solitary) context and little has been done to examine flow in a team (or social) setting. It is unclear if individuals experience higher flow in the solitary or social context. Hence, we propose a research to address this question.

Considering businesses continue to innovate with and adopt emerging technologies to complete tasks both individually and collaboratively, it is vital to understand the phenomenon of flow in a computer-mediated environment, such as virtual worlds, because of the implications it has on employee engagement and teamwork. In a review of virtual team research, one of the domains identified as being in need of additional inquiry and focus was new and emerging technologies (Gilson, Maynard, Young, Vartiainen and Hakonen, 2015). Related questions of inquiry include understanding factors associated with motivation, positive virtual environments, and positive task outcomes. Therefore, exploring the flow experience in virtual worlds during individual task completion versus collaborative task completion will contribute toward a better understanding of virtual teamwork.

To better understand whether individuals experience greater flow states in online collaborative versus online solitary contexts, we conducted a review of the literature that follows next.

LITERATURE REVIEW

Flow is a state of optimal experience where one is highly engaged and absorbed in an activity. During the state of flow, one loses track of time and is immensely focused on the activity. Csikszentmihalyi (1990) has identified the following elements of flow: (i) a challenging activity that requires flow, (ii) clear goals, (iii) immediate feedback, (iv) merging of action and awareness, (v) concentration on task at hand, (vi) sense of control, (vii) loss of self-consciousness, (viii) distorted sense of time, and (ix) self-rewarding or autotelic experience. When one is in flow, one generally experiences intense concentration, time distortion, and a greater sense of self-rewarding and intrinsic satisfaction. As mentioned earlier, one can experience the state of flow in both the individual and team/social context.

In reviewing the literature on individual versus team/social flow, we identified several articles that have addressed the topic. Bachen and Raphael (2011) conceptualized the construct of social flow in the game-based learning context by proposing it as an individual level construct in the social context. In our research, we adopt their perspective by examining the flow state of individuals in a team or social setting. Since social interaction and coordination are part of our daily activities, it is important to understand flow in such

settings. Although social flow has been reported to be more enjoyable than solitary flow in Walker's (2010) study, other aspects of flow were not examined. Weibel, Wissmath, Habegger, Steiner and Groner (2008) found that playing online games against a human-controlled opponent generated greater experiences of presence, flow, and enjoyment than playing against a computer-controlled opponent. They also found high correlations between presence, flow, and enjoyment. Sweetser and Wyeth (2005) proposed that social interaction is an important game design element that can contribute to flow. Using the survey approach, Choi and Kim (2004) demonstrated a relationship between social interaction and flow, and Animesh, Pinsonneault, Yang and Oh (2011) identified a relationship between social presence and flow. Although these studies have established a relationship between interpersonal relatedness and flow, we have not come across any studies that have controlled for tasks or activities in comparing flow across solitary versus social context.

Previous research has cited contexts such as sports and artistic expressions in which enjoyable social flow experiences were present (Walker, 2010). Notably, research has identified individuals having different behaviors, feelings, and thoughts when they were in a social context versus an individual context. Suggestions have been made that individuals can be "agents of flow for each other" (Walker, 2010, p. 4) when significant interdependencies and collaboration are necessary. Hence, we assessed flow in both individual and group contexts in this research to understand the effect of social interaction and collaboration on flow.

THEORETICAL FOUNDATION AND HYPOTHESES

Self-determination theory (SDT) suggests that autonomy, competence, and interpersonal relatedness enhance one's intrinsic motivation, which is a key element of flow. Although individuals may possess intrinsic motivational tendencies, conditions need to support its continuation and refinement (Ryan and Deci, 2000). Previous studies have found that students who lacked interpersonal relatedness with an adult were less intrinsically motivated. According to SDT, interpersonal relatedness is a basic psychological need (Deci and Ryan, 1985; Ryan, Rigby and Przbylski, 2006) and previous studies have found flow to be positively related to interpersonal relatedness (Animesh et al., 2011; Choi and Kim, 2004; Kowal and Fortier, 1999). Individuals can be "proactive and engaged...largely as a function of the social conditions in which they develop and function" (Ryan and Deci, 2000, p. 68). In this research, we are looking at the optimal state of user experience of engagement called flow. When individuals work with one another or collaborate in teams, their motivation and involvement are heightened (Ryan et al., 2006), which brings about higher states of flow experience (Ackerman and Bargh, 2010). Hence, we propose that:

H: Dyads working collaboratively experience higher states of flow than individuals working alone.

Three key characteristics that are associated with flow experiences are focused concentration, temporal dissociation, and enjoyment (Chen, 2006; Chen, Wigand and Nilan, 2000; Ghani and Deshpande, 1994; Koufaris, 2002; Li and Browne, 2006; Shin, 2006; Skadberg and Kimmel, 2004). Flow has been found to be positively related to intrinsic motivation (Kowal and Fortier, 1999). Of the flow components, focused concentration and temporal dissociation, as well as merging of action and awareness were found to be positively related to intrinsic motivation. Also, focused concentration as well as merging of action and awareness were positively related to interpersonal relatedness. In addition, Walker (2010) has demonstrated that people working collaboratively exhibited higher levels of enjoyment than people working alone. Given that focused concentration, temporal dissociation, and enjoyment are three characteristics associated with flow, we have broken down the above main hypothesis into three sub-hypotheses:

H1: Dyads working collaboratively experience greater focused concentration than individuals working alone.

H2: Dyads working collaboratively experience greater temporal dissociation than individuals working alone.

H3: Dyads working collaboratively experience greater enjoyment than individuals working alone.

RESEARCH METHODOLOGY

A between-subject experiment with two levels was carried out in a virtual world, Second Life. The two conditions are: (i) individuals working alone, and (ii) dyads working collaboratively. Undergraduate students from several sections of an introduction to MIS class at a Midwestern university were recruited to participate in the experiment. Each section was randomly assigned to one of the two experimental conditions: individual or dyad condition. In the dyad condition, subjects were randomly assigned to groups of two. Subjects worked either individually or collaboratively with a partner to complete the design of a showroom for a major furniture company in Second Life.

The subjects were first provided with training to navigate and manipulate (i.e., move) objects in Second Life. After the training was completed, they were given 15 minutes to complete the task of designing a virtual showroom with the furniture provided to them in Second Life. After the subjects were done with the design task, they filled out a post-study questionnaire that assessed their focused concentration, temporal dissociation, and enjoyment during the design task. We adapted the measurement items for focused concentration and temporal dissociation from Agarwal and Karahanna (2000), and the measurement items for enjoyment from Nah et al. (2011). A 7-point Likert scale, with 1 being strongly disagree and 7 being strongly agree, was used.

FINDINGS

218 subjects (138 male, 80 female) participated in the experiment. 82 subjects participated in the individual condition and 136 subjects participated in the dyad condition, resulting in 68 dyads. We collapsed and averaged the scores for each dyad in our data analysis for comparison with the individual condition.

Factor analysis (i.e., principal component analysis using varimax with Kaiser normalization) confirmed that the measurement items for focused concentration, time distortion, and enjoyment loaded on their respective constructs, and showed very high convergent and discriminatory validity (see Table 1). The Cronbach's alpha coefficients are 0.94 for time distortion, 0.92 for enjoyment, and 0.93 for focused concentration.

	Component		
ITEM	1	2	3
TD4	**.896**	.154	.179
TD5	**.854**	.073	.217
TD1	**.847**	.257	.179
TD3	**.837**	.194	.273
TD2	**.829**	.118	.263
ENJ2	.160	**.925**	.233
ENJ3	.172	**.904**	.227
ENJ1	.156	**.884**	.290
ENJ4	.143	**.766**	.113
FC3	.223	.270	**.870**
FC1	.360	.292	**.819**
FC2	.367	.273	**.813**
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.			

Table 1. Factor Analysis Results

The descriptive statistics for the dependent variables are presented in Table 2. The results indicate that H1 and H2 are supported ($p<0.05$) but H3 is not supported ($p>0.05$). Dyads working collaboratively experienced greater focused concentration ($p=0.027$) and time distortion ($p=0.047$) than individuals working alone. However, dyads did not experience greater enjoyment than individuals working alone ($p=0.807$).

The results suggest that users' flow experiences can be enhanced when using a virtual world for collaborative design tasks. Based on the results, focused concentration of users can be enhanced when working collaboratively in the virtual world than when working alone. In addition, time flies when working collaboratively such that users are less aware of the passage of time and hence, experience time distortion or temporal dissociation. Interestingly and contradictory to some of the findings in the literature, users working collaboratively in our study did not experience greater enjoyment than those working alone. We attribute this observed phenomenon to the hedonic nature of the virtual worlds which afforded an intrinsically rewarding and satisfying experience for users; hence, adding a social collaboration dimension may not further increase enjoyment.

		N	Mean	Std. Dev.
Focused Concentration	Ind.	82	4.44	1.20
	Dyad	68	4.84	.909
	Total	150	4.62	1.09
Time Distortion	Ind.	82	4.64	1.38
	Dyad	68	5.03	.885
	Total	150	4.82	1.20
Enjoyment	Ind.	82	5.11	1.05
	Dyad	68	5.15	.840
	Total	150	5.12	.956

Table 2. Descriptive Statistics

DISCUSSIONS AND CONCLUSIONS

Flow is an optimal state of experience in our daily life. It is generally considered a desirable and favorable phenomenon because of its positive effects on creativity (or exploratory behavior), learning, attitude, and performance (Choi, Kim and Kim, 2007; Ghani and Deshpande, 1994; Ho and Kuo, 2010; Korzaan, 2003; Shin, 2006; Skadberg and Kimmel, 2004; Zaman, Anadarajan and Dai, 2010). Individuals can achieve a state of flow in both the solitary and social contexts. In this research, we assessed focused concentration, time distortion, and enjoyment in completing a design task individually versus collaboratively. Our research indicates that collaborating with a partner can lead to greater concentration on the task at hand as well as being less conscientious of the passage of time. Because flow has been associated with increased creativity and performance in the literature, organizations can encourage collaborative work to facilitate greater flow experiences in order to drive better results or outcomes. Virtual worlds can also be used to accomplish organizational tasks in a collaborative context. Although some work tasks inherently require individual completion, the structure of many work tasks in organizations are collaborative in nature and organizations rely on effective team performance. Therefore, utilizing virtual worlds may assist in enhancing team performance which can be explored in greater depth in future research.

Our research findings also suggest, however, no difference in the enjoyment experienced between individuals and dyads. Employees completing tasks in the virtual world may experience no less of an enjoyable

experience if they work alone versus in collaboration. These findings are inconsistent with previous research in which solitary flow was less enjoyable than social flow (Walker, 2010). A plausible explanation is that the hedonic environment afforded by the virtual worlds creates an enjoyable experience regardless of whether one experiences interpersonal relatedness, i.e., from the presence of or interaction with another individual in the virtual world.

In conclusion, the adoption of emerging technologies to facilitate the completion of individual and collaborative activities generates a need to understand the flow experience which can facilitate more effective performance outcomes. This study has shed light on the variation in flow experiences between individual flow versus social flow, which can be leveraged in future studies and considered by practitioners when selecting an appropriate platform and structure for task completion.

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