# Group Play – Determining Factors on the Gaming Experience in Multiplayer Role-Playing Games

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Role-playing games (RPGs) are a well-known game form, existing in a number of formats, including tabletop, live action, and various digital forms. Despite their popularity, empirical studies of these games are relatively rare. In particular there have been few examinations of the effects of the various formats used by RPGs on the gaming experience. This article presents the results of an empirical study, examining how multi-player tabletop RPGs are affected as they are ported to the digital medium. Issues examined include the use of disposition assessments to predict play experience, the effect of group dynamics, the influence of the fictional game characters and the comparative play experience between the two formats. The results indicate that group dynamics and the relationship between the players and their digital characters, are integral to the quality of the gaming experience in multiplayer RPGs, with the first being of greater importance to digital games and the latter to the tabletop version.

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## 1. INTRODUCTION

Role-playing games (RPGs) form one of the core genres of games, and are found across a variety of formats from tabletop to digital environments, physically embodied to mobile and even enhanced/augmented reality. The basic role-playing game concept has proven both extremely portable and widely popular, possibly due to its embodiment of character-based storytelling, which forms the heart of role-playing games.

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The games link directly into the myths and legends of earth's cultures, with settings inspired by traditional western fantasy as well as Asian, Arabic, Nordic, and many other cultural backgrounds. As well as traditional sources role-playing games have drawn upon science-fiction, horror, and contemporary backgrounds for their settings.

Despite their culturally embedded nature and the substantial market for RPGs [Hallford and Hallford 2001; King and Borland 2003], the game genre has historically been relatively unexplored outside the games, simulation, and education industries, although this situation has changed rapidly in recent years. One of the notable venues is research into the collaborative, interactive storytelling process of pen-and-paper (PnP) role-playing games, currently unsurpassed by any digitally based system [Aylett and Louchart 2006]. Similarly, the operation of nonplayer characters (agents) in these games is of interest in agent-based systems [Trappl and Petta 1997]. This generates interest in RPGs as a source for insight applicable to interactive storytelling systems and to the next generation of interactive entertainment.

RPGs vary substantially between formats and even within formats [Hallford and Hallford 2001; Tychsen 2006]. For example, in terms of the flexibility of the game story, which for technological reasons is more restricted in digital games relative to tabletop role-playing games (see e.g., Crawford [2005]). As noted by Crawford [1984]:

"Every transplanted game loses something in the translation […] this is because any game that succeeds in one technology does so because it is optimized for that technology; it takes maximum advantage of the strengths and avoids the weaknesses".

Studies of the gaming experience from the perspective of the players are uncommon, and even more so for multiplayer games. A variety of variables could plausibly be expected to impact on the gaming experience (e.g., age, gender, the interaction between players, and previous experience with the game form), making such studies challenging to undertake. Similarly, there have been few studies of the effect of porting games between formats, with a few exceptions exploring cross-platform versions (e.g., Lindley [2004]; Eladhari and Lindley [2005]). Additionally, there is a relative dearth of knowledge about how presence [Fontaine 1992]: the feeling of being transported to another reality; and immersion: the feeling of being engaged with the playing activity to the exclusion of the real world (also termed engagement), is affected by game format in multiplayer PC games.

As demonstrated by Witmer and Singer [1998]; Ermi and Mayra [2005]; and Takatalo et al. [2006], immersion can be broken down into different factors, for example, imaginary and challenge-based immersion; and it is not well explored whether the factors determining presence and immersion vary between tabletop and digital formats. Most studies on presence and immersion are focused on single-user environments (e.g., Kraus et al. [2001]), furthermore, the many significant contributions to the study of presence tend to focus on immersive virtual environments, For example, CAVE (Cave Automatic Virtual Environment) systems [Cruz-Neira et al. 1991], often using stereoscopic goggles and head-mounted displays, whereas less attention has been given to cross-media studies [Lessiter et al. 2001]. Similar studies of presence and engagement in the common desktop monitor situation are uncommon, with some notable examples, including Bracken et al. [2005; Pinchbeck [2005]; and Takatalo et al. [2006]. Presence has also been found to be an important element in the design of gaming environments [Pinchbeck 2005]. In CAVE-environments, a mainframe drives a series of projectors that display a contiguous visual image across all screens to produce a virtual landscape (e.g., stereo images) in a cubic

room. In the desktop monitor situation, the virtual reality has a much more limited interface with the user with which to operate.

Data from empirical experiments of multiplayer role-playing games across two formats (tabletop and digital) is presented in this article. It focuses on the pen-and-paper RPG format (PnP) and the computer RPG (CRPG) formats, and combines a range of approaches to examine how the traditional PnP RPG is affected as it is ported to the digital medium in the form of a CRPG. Previous work on these experiments has focused on comparing the gaming experience across RPG formats [Tychsen et al. 2007a] and on the relationship between players and their fictional characters within a multiplayer framework and the impact of this relationship on the quality of the gaming experience [Tychsen et al. 2007b]. Here, the data and conclusions of these works are combined with new data on group dynamics and player interaction, in a detailed examination of some of the key factors determining the quality of the gaming experience in multiplayer RPGs across the digital and tabletop formats.

Furthermore, this study assesses whether methods for predicting player experiences in single-user situations hold predictive power in multiuser situations, that is, if it is possible to use player predispositions towards immersion and engagement to predict how they will experience a gaming experience.

## 2. APPROACH

A primary challenge in defining the empirical experiments was the need for a joint framework in addressing the research topics and to develop reliable measures of, for example, the overall quality of the gaming experience, which operate across game formats. Empirical work in communication studies, gaming environments, and so on [Heide-Smith 2006; Pagulayan et al. 2006; Pagulayan and Keeker 2007] utilizes a variety of methods in evaluating user experience, including transcript analysis, audio/visual recordings, game data and logs, interviews and questionnaire-based data gathering. In this article these methods are utilized, however the focus is on questionnaire-based data, interviews, and recordings.

### 2.1 Assumptions

Of the various RPG formats, the PnP and CRPG provide the best basis for cross-platform study, as they share a variety of features and a limited number of players in comparison to most live action RPGs [Söderberg et al. 2004] and massively multiplayer online RPGs. The limited number of players enables experiments of PnPs and CRPGs to take place under controlled laboratory conditions with all participants included.

However, RPGs vary substantially even within the PnP and CRPG formats, leading to a basic problem with empirical experimentation that assumes any sample is representative of the population. PnPs vary across a broad spectrum, from improvisational theatre to simulation play [Fine 2001; Mackay 2001; Edwards 2001; Young 2005a; 2005b]. Even within a specific PnP type, the way these games are played can vary from player group to player group, and this phenomenon was observed in the experiments. In the current study, a series of measures were therefore taken to provide as generic game formats as possible. For example, a game master (GM) was utilized in the PnP games, as this is the norm rather than the exception, despite the variable role of the GM in these games [Edwards 2001]. It is important to note, however, that RPGs produced in the western cultural sphere were utilized. CRPGs produced in Asia (e.g., the *Final Fantasy* series) can vary in style, theme, and execution as compared to games produced in western countries (e.g., *Neverwinter Nights),* although all are character-based games involving storytelling to a greater or lesser degree.

## 2.2 Controlling Variables

In evaluating the effect of the game format on the chosen variables (gender, age, experience, player-character relationship, player communication and interaction, etc.), it is necessary to employ game setups that are as similar as possible with respect to other variables of possible impact (e.g., group composition and size). By aligning variables across formats, they are reduced in effect, which adds to the reliability of results derived from experiment data.

In addressing the research subjects outlined above, it was necessary to impose a high level of detail on the experimental conditions. This made a large-scale study logistically impractical, as the participating players needed to play both PnPs and CRPGs for a long enough period to ensure that the player groups had stabilized. This was also important in the study of player-character relationships, where it was expected a certain amount of time would be necessary for the players to "get in character". Irrespective of these constraints, over 50 players were included in the study, which ensures a degree of statistical validity of the results and a large spread of player statistics ( e.g., age and experience).

## 3. METHODOLOGY AND EXPERIMENT DESIGN

Experiences from CAVE and similar environments have led to the development of methods for predicting the presence/immersion of users in these environments on the basis of their predispositions [Witmer and Singer 1998; Lessiter et al. 2001]. In comparison, there has been limited work on utilizing the predictive power of disposition-based methods for predicting immersion and the gaming experience, outside of CAVE and similar environments in a PC-based gaming context. A notable exception is Newman [2005], who investigated single users interacting with role-playing-based digital content across various online formats and adapted research on predicting the user experience based on individual predispositions in virtual environments [Witmer and Singer 1998] to monitor-based interaction environments.

The framework utilized by Newman [2005] is based around the *FUN unification model,* which provided a means of measuring and evaluating a range of user experiences in a joint framework, including: Absorption [Tellegen and Atkinson 1974; Agarwal and Karahanna 2000]; immersion [Witmer and Singer 1998]. also investigated specifically in gaming contexts [Bracken et al. 2005; Lessiter et al. 2001; Pinchbeck 2005; narrative engagement [McNeil 1996; Newman 2004]; emotional usability [Logan 1994; Kim 1997]; hedonic quality [Hassenzahl et al.]; foundational elements of experience [Marsh 2003]; fun-scale rating [Read and MacFarlane 2000]; and humor mechanisms [Meyer 2000]; and playfulness [Webster and Martocchio 1992]. The questionnaires were tested across three different interactive digital environments and held predictive power, with different predispositions being better predictors for the user experience in different experimental setups [Newman 2005]. The approach is based on two questionnaires, one designed to measure individual predispositions (*Predisposition Questionnaire*, PQ), the second designed to provide a measure of the user experience as a function of five defined features, for example, temporal dissociation and heightened enjoyment (*Response Questionnaire*, RQ) [Tables I  and II].

In the current study, the approach of Newman [2005] was modified and utilized as a tool in investigating the factors that influence the quality of the gaming experience in multiplayer cooperative games. The PQ and RQ were modified to suit the multiplayer situation, and combined with questionnaires specifically developed for this study, focused

on evaluating the potential impact of the player-character relationship, group dynamics, and previous experience with playing the games being examined (Figure 1).

The questionnaire items were grouped into various compilations of questions that focused on the same aspect of the gaming experience. These groups are referred to as constructs or sub-constructs (Figure 1). When calculating the value of a construct or subconstruct, the average of the values of the individual questionnaire items was utilized, which were all ranked on a Likert scale from 1-5 or 1-4.

| | **Constructs** | **Sub-constructs** |
|---|---|---|
| **Predisposition Questionnaire (PQ)** | **IT:** Immersive tendencies <br> **NT:** Narrative tendencies (of experiment participants) <br> Calculated from the average values of the component sub-constructs. | **FT:** Focus Tendency <br> **IV:** Involvement <br> **GT:** Gaming Tendency <br> **HN:** Hearing Narrative <br> **TN:** Telling/Creating Narrative <br><br> {FT, IV, GT} = IT <br> {HN, TN} = NT |
| **Response Questionnaire (RQ)** | **FUN:** Multi-component measure of the gaming experience. <br><br> Calculated from the average value of the five sub-constructs. | **TD:** Temporal Dissociation <br> **FI:** Focused Immersion <br> **HE:** Heightened Enjoyment <br> **NE:** Narrative Engagement <br> **IR:** Intention to Revisit <br><br> {TD, FI, HE, NE, IR} = FUN |
| **Player-Character Questionnaire** | **SYMPA:** Multi-component measure of the relationship between the player and the game character. | |
| **Experience Questionnaire** | $PnP_{exp}$: Experience with playing tabletop role-playing games <br> $CRPG_{exp}$: Experience with playing digital role-playing games <br> $Exp_{tot}$: Experience with playing role-playing games (both above combined) | |
| **Group Dynamics Questionnaire** | **Group Dynamics (GD):** Measure of the quality of interaction between the players, how well the groups of players functioned internally. | |

Fig. 1. Overview of the questionnaires utilized in the current study and the subconstructs associated with them.

In order to evaluate whether there was any connection between, for example, the group dynamics of the participating player groups and the level of engagement in the playing activity, various statistical analysis tools were employed.

Notably, Pearson's product moment correlation (*Pearson's correlation*, or *r*) was utilized to correlate the individual player responses to their respective subconstruct/constructs, as well as correlating between subconstructs and constructs.

Pearson's correlation is a common method of correlating questionnaire-based measures. The coefficient reflects the degree of linear relationship between two variables and ranges from +1 to -1. A correlation of +1 is a perfect positive linear relationship between the variables; conversely -1 means there is a perfect negative linear relationship, with a value of 0, indicating no linear relationship. The statistical significance $\{p\}$ of a Pearson's relationship depends on the number of variables $\{n\}$ (here, experiment participants), and is located in precalculated tables of significance. $p$ was in the current study typically defined at values of $p<0.05$, $p<0.01$, and $p<0.001$.

A range of other statistical analysis methods were utilized, and described in full detail in the below.

## 3.1 The Predisposition Questionnaire

The 20-item PQ breaks down the individual predispositions of players into immersive tendencies and narrative tendencies [Table I]. The questions are designed along a unipolar five-point scale and assigned to one of five subconstructs: focused immersion (FI); involvement (IV); gaming tendency (GT); hearing narrative (HN); and telling (creating) narrative (TN).

The first three subconstructs comprise the *immersive tendencies* construct (IT), the last two the *narrative tendencies* construct (NT); see Table I.

The **IT** *construct* attempts to measure the individual player's predisposition towards playful behavior, becoming engaged in a continuous stream of stimuli (e.g., a movie), as well as the tendency to become engaged in adversarial activity as a participant or spectator. Immersive tendencies describe a mix of individual cognitive, physiologica, and sensory motor conditions. Players with high scores in the IT construct are likely to be receptive to watching movies and playing computer games, able to block out external distractions and be focused on their current activity. While it is an assumption that such immersion is enjoyable to everyone, a construct that is intended to be an indication of the all-round gaming experience would not be complete without a measurement of immersion.

The *NT construct* is an attempt to measure the predisposition for creating, finding, and participating in narratives (the term here is used in a general sense; see Juul [2005] for a discussion on games and narratives), describing individual cognitive functions. Players with high scores in the NT construct are likely to be interested in gathering details about the imagined (PnP) or virtual (CRPG) environment, the characters and events of encounters. They will be inclined to filter and organize detail into cognitive structures and to compare them with already stored templates in a continuous pattern recognition process [Newman 2004]. Players with low NT construct scores are expected to be less focused on detail, less willing to suspend disbelief, and will tend  not to engage in the pattern-matching process of memory and imagination.

## 3.2 The Response Questionnaire

The RQ is designed to evaluate the gaming experience as a feature of five constructs, which are related to the PQ constructs (Table II).

*Temporal dissociation* (TD): The degree to which the player felt that time passed quickly, suggesting a high level of engagement in the activity; also utilized by Agarwal and Karahanna [2000].

*Focused immersion* (FI): The degree to which the player felt immersed in and focused on the gam; FI is also utilized in the predisposition questionnaire.

*Heightened enjoyment* (HE): The degree to which the player enjoyed the gaming experience. The questions associated with the HE subconstruct directly allowed the players to state their enjoyment of the experience.

*Narrative engagement* (NE): The degree to which players felt they were actively engaged with and joined in the game.

*Intention to revisit* (IR): Intention to revisit the experience in question.

The original RQ of Newman [2005] includes 16 questions formatted in a fashion similar to the PQ. As the current study incorporates multiplayer RPGs, the questionnaires needed modification, notably the questions were reworded to accommodate the multiplayer, character-based situation, while retaining the overall direction of the questions of the original RQ. Furthermore, the two questions that dealt with HCI were removed from the questionnaire used in conjunction with the PnP sessions, as these do not include a computer component (questions 7 and 8). Finally, as story is a primary driver in RPGs, four questions were added to the questionnaire to add detail to the evaluation of the game story and how the players engaged with it. Three of these questions were added to the NE subconstruct (questions 15, 16, and 17) and one to the HE subconstruct (14); see Tables II and III.

Note that in Newman [2005] the IR subconstruct was not included in the FUN construct]; but it was decided to include it here, since intention to revisit (IR) an experience demonstrated correlations with FUN, both in the original study and the current one.

## 3.3 The FUN Construct

The FUN unification model assumes that narrative is an essential ingredient of human engagement. As RPGs are story-based games, this assumption seems valid for the current experiments. The predisposition/response model does not presume that players are predisposed towards either IT or NT. The two constructs were shown by Newman [2005] to measure different sensory, physiological, and cognitive predisposition attitudes, and this study lends credence to this result, with the two constructs being uncorrelated in the PQ (Pearson's correlation coefficient = 0.064). However, in the responses there is a strong correlation between these two constructs, indicating that the gaming experience is affected by both immersive and narrative factors (Pearson's correlation coefficient = 0.589 (PnP); 0.663 (CRPG); 0.814 (GM-mediated CRPG), $p < 0.001$).

The FUN construct is derived from the averaged value of five sub-constructs, which are each composed of the averaged values of a specific number of questions (Tables II and III). A distinct advantage of using the FUN construct is that due to the breath of the component questions, any signal that emerges from a study utilizing the FUN construct has to be very strong: For a variable to register in correlation with FUN it has to impact on a variety of measures related to the gaming experience, with a majority of the players.

Table I. The Individual Predisposition Questionnaire

| | Statements | Construct | Sub-construct | Correlation to sub-construct | Correlation to NT/IT |
|---|---|---|---|---|---|
| 1 | I easily become deeply involved in movies or TV dramas. | IT | FT | 0.52*** | 0.46** |
| 2 | I sometimes become so involved in a television program or book that people have problems getting my attention. | IT | FT | 0.73*** | 0.42** |
| 3 | I frequently find myself closely identifying with the characters in a story line. | IT | IV | 0.45** | 0.39** |
| 4 | I am good at blocking out external distractions when I am involved in something. | IT | FT | 0.65*** | 0.40** |
| 5 | When watching sports, I sometimes become so involved in the game that I react as if I were one of the players. | IT | GT | 0.46** | 0.28 |
| 6 | I sometimes become so involved in a daydream that I am not aware of things happening around me. | IT | IV | 0.46** | 0.31** |
| 7 | When playing sports, I become so involved in the game that I lose track of time. | IT | GT | 0.78*** | 0.50*** |
| 8 | I am able to concentrate well on enjoyable activities. | IT | FT | 0.62*** | 0.43** |
| 9 | I often play arcade or video games. (OFTEN should be taken to mean every day or every two days, on average.) | IT | GT | 0.43** | 0.36** |
| 10 | I sometimes get excited during a chase or fight scene on TV or in the movies. | IT | IV | 0.61*** | 0.45** |
| 11 | I sometimes get disturbed by something happening on a TV show or in a movie. | IT | IV | 0.70*** | 0.37** |
| 12 | I sometimes remain apprehensive or fearful long after watching a disturbing movie. | IT | IV | 0.74*** | 0.44** |
| 13 | I sometimes become so involved in doing something that I lose all track of time. | IT | FT | 0.54*** | 0.39** |
| 14 | I enjoy hearing funny stories. | NT | HN | -0.01 | -0.07 |
| 15 | I enjoy making people laugh with my stories. | NT | TN | 0.76*** | 0.38** |
| 16 | I do not enjoy a story with cliché plots or characters. | NT | HN | 0.72*** | 0.74*** |
| 17 | I enjoy telling stories. | NT | TN | 0.72*** | 0.34** |
| 18 | My best stories are about things that have happened to me. | NT | TN | 0.67*** | 0.40** |

| 19 | I often exaggerate a little to make my stories more entertaining. | NT | TN | 0.79*** | 0.51*** |
|----|---|----|----|----|----|
| 20 | When I am part of a spontaneous humorous conversation I would rather listen than join in. | NT | HN | 0.61*** | 0.11 |

Pearson correlation coefficient probabilities calculated from correlation r-values with 49 degrees of freedom (n=51): * $p<0.05$ / ** $p<0.01$ / *** $p<0.001$.

*Notes*: Question 8: Originally assigned to IV (Pearson's r = 0.13), but a combined cluster analysis (paired linkage and Ward's method) and a PCO analysis revealed this question correlate better with the FT subconstruct (Pearson's r = 0.49). It was therefore reassigned to FT. Question 14: Assigned to the HN construct (Pearson's r = -0.01), the factor analysis shows no substantial correlation between this question and any sub-construct. A weak correlation (Pearson's r = 0.26) is evident for the TN construct; however this is not significant and the question was eliminated from the analysis.

*Construct key*: IT = immersive tendencies; NT = narrative tendencies.

*Subconstruct key*: focus tendency (FT) = predisposition to maintaining focus on the current activity; involvement (IV) = predisposition to becoming involved in activities; gaming tendency (GT) = predisposition to participate in competitive or adversarial activities; hearing narrative (HN) = predisposition to listening to, or finding narrative; telling narrative (TN) = predisposition to telling or creating narrative.

Table II. Correlation of Modified Response Questions to Response Constructs for RPG Experiments

| Statements | | Sub-construct | Correlation to Sub-construct | | |
|---|---|---|---|---|---|
| | | | PNP | CRPG | CRPG GM |
| 1 | Time went by very quickly while I was playing the game | TD | 0.92*** | 0.93*** | 0.96*** |
| 2 | I lost track of time while I was playing the game | TD | 0.93*** | 0.94*** | 0.97*** |
| 3 | I was absorbed in what I was doing while playing the game | FI | 0.74*** | 0.74*** | 0.84*** |
| 4 | I noticed things going on around me while I was communicating with the other players/the GM | FI | 0.78*** | 0.82*** | 0.63*** |
| 5 | I had fun playing my character | HE | 0.81*** | 0.62*** | 0.77*** |
| 6 | The interaction with the other participants gave me a lot of enjoyment | HE | 0.91*** | 0.51*** | 0.85*** |
| 7 | *The chat system in Neverwinter Nights is relatively easy to comprehend and use* | HE | NA | 0.76*** | 0.64*** |
| 8 | *I prefer talking to the other players, rather than using text and chat systems* | HE | NA | 0.48*** | 0.52** |
| 9 | I felt I was joining in with the story of the game | NE | 0.85*** | 0.81*** | 0.79*** |

| | | | | | |
|---|---|---|---|---|---|
| 10 | I was able to participate in and contribute to the collaborative story | NE | 0.83*** | 0.85*** | 0.84*** |
| 11 | I was able to be spontaneous and imaginative communicating with the other participants | NE | 0.81*** | 0.74*** | 0.69*** |
| 12 | I found it difficult to participate with the other players | NE | 0.71*** | 0.54*** | 0.62*** |
| 13 | I would like to play this kind of game again in the future | IR | 0.78*** | 0.68*** | 0.74*** |
| 14 | **I enjoyed just watching and listening to the other players** | HE | 0.58*** | 0.63*** | 0.71*** |
| 15 | **I enjoyed the conflict solving elements of the game** | NE | 0.65*** | 0.62*** | 0.79*** |
| 16 | **I was one of the players that really drove the story forward** | NE | 0.80*** | 0.67*** | 0.62*** |
| 17 | I could easily become interested in the adventures of the group of characters | IR | 0.72*** | 0.78*** | 0.90*** |
| 18 | **I enjoyed the inter-personal aspects of the game story** | NE | 0.65*** | 0.66*** | 0.81*** |
| 19 | I found the whole idea of playing a fictional character a bit silly | NE | 0.35* | 0.41** | NA |
| 20 | I am not really interested in what happens to my character | IR | 0.82*** | 0.78*** | 0.78*** |

Pearson correlation coefficient probabilities calculated from correlation r-values with n=51 for PnP, n=50 for CRPG, n=34 for CRPG GM: * p>0.05 / ** p<0.01 / *** p<0.001.
*Notes*: Note the relatively low correlation of question 19 to the NE sub-construct (best subconstruct for correlation with question 19 and significant with p<0.05 PnP and p<0.01 CRPG, and therefore retained within its sub- Questions in bold are the four that have been added to the Response Questionnaire in this study to increase the evaluation of narrative engagement in RPGs. Questions in italics assess the use of chat-based communication in *Neverwinter Nights*.

*Subconstruct key*: temporal dissociation (TD) = lost track of time while engaged in the current activity; focused immersion (FI) = felt immersed in the current activity; heightened construct). Questions 4, 8,12,19, and 20 are reversed questions (negative). Enjoyment (HE) = enjoyed the current activity; narrative engagement/play (NE) = felt they engaged with the role- playing and narrative aspects of the current activity; intention to reuse (IR) = If given the chance the user would want to re-visit the current activity.

## 3.1 Further Questionnaire Design

Four questionnaires were developed in order to evaluate features of the RPG experience not covered by the PQ and RQ. The questions were again based on unipolar five-point scales, with neutral reply options, as recommended by Cox [1980] and Birkett [1986], for example, 1=strongly disagree, 3=neutral, 5=strongly agree. The only exception is the Experience Questionnaire, which was based on a four-point scale, as there were no neutral reply options necessary. The questionnaires were formatted to avoid "response fatigue" using construct-specific response options [Blankenship 1940; McClendon 1989]. Finally, the rating points were fully labeled, with extreme options to help anchor the scale down [Lichtenstein and Newman 1967; Cass et al. 1974; Albaum and Murphy 1988].

3.1.1 *Experience Questionnaire*. A ten-item questionnaire was designed to evaluate the experience of the players with PnPs and CRPGs respectively, as well as their game-mastering experience. The questionnaire was divided into two subconstructs: $PnP_{exp}$ (six questions) and $CRPG_{exp}$. (four questions), each calculated as the average of the component questions. The average score for the entire questionnaire was used as a general expression of the individual player's experience, with the game formats referred to as $Exp_{tot}$.

3.1.2 *Group Dynamics*. In a multiplayer gaming situation, the dynamics of the group is a possible impact factor on the enjoyment of the individual players. For example, if the players have very disparate aims when playing the game, this might result in confrontations, disagreement, and/or frustration, and thus lower enjoyment. On the other hand, a well-functioning group might find the game sessions to be more enjoyable due to the positive group dynamics. An eight-item, unipolar questionnaire was designed to provide a measure of the quality of the group dynamics from the perspective of the individual player, allowing for variations in the perceived group dynamics.

The group dynamics construct (GD) is comprised of eight questions covering different aspects of the cooperation and communication of the group of players, as well as the responsiveness the individual player felt from the other participants (see Table III). The construct is also influenced by any confusion the player might feel in relation to the game, typically a feature of the players not communicating about game progress, and the balance between in-game and out-of-game talk [Tychsen et al. 2006].

Table III. Correlation of Group Dynamics (GD)

| Question text | | Construct | Correlation to construct | | |
|---|---|---|---|---|---|
| | | | PNP | CRPG | CRPG GM |
| 1 | I felt that the other participants responded to my actions | GD | 0.71*** | 0.64*** | 0.71*** |
| 2 | I did not communicate well with the other participants | GD | 0.61*** | 0.68*** | 0.80*** |
| 3 | The group of players did not cooperate well | GD | 0.45*** | 0.82*** | 0.68*** |
| 4 | The players would generally agree on how to approach a given event or situation | GD | 0.31* | 0.60*** | 0.58*** |
| 5 | I was often in doubt about what exactly was going on | GD | 0.51*** | 0.68*** | 0.74*** |
| 6 | I did not feel I had sufficient air time | GD | 0.71*** | 0.58*** | 0.74*** |
| 7 | There was often a need for me to take control of the story in order to progress the game | GD | -0.08 | -0.13 | -0.04 |
| 8 | There was too much of out-of-game talk | GD | 0.49*** | 0.44** | 0.16 |

Pearson correlation coefficient probabilities calculated from correlation r-values with n=51 (PnP), n=49 (CRPG) and n=34 (CRPG GM): * $p>0.05$ / ** $p<0.01$ / *** $p<0.001$.
*Notes*: Question 7 was eliminated from the study due to its lack of correlation with the GD construct for nay of the three RPG formats. See also the low correlation of question 8 in CRPG GM.

3.1.3 *Player-Character Dynamics.* The fictional character of RPGs is the main vessel through which the player interacts with the game world. It is therefore possible that the character design will impact the player's experience of the game in question, and thus this is a variable that needs to be considered in the current experiment.

The actual integration and detail of player-characters vary substantially in PnPs and CRPGs, both within and across the two platforms. In PnPs, characters are as a general rule more developed in terms of personality than in CRPGs, where characters (or avatars) are commonly relatively two-dimensional constructs in appearance, name, and possibly a bit of background. In an attempt not to interfere with the immersion of the player in the character [Gard 2001], some contemporary digital games do apply emotionally-driven behavior and similar principles to express character personality [Isbister 2006]]. Computer RPGs such as *Planescape Torment* and the *Final Fantasy* series are examples of digital games with more well-developed character personalities, although,  due to game story requirements [Hallford and Hallford 2001], they place limitations on the freedom of players to design their characters. Two reasons for this disparity are that in PnPs the players often create the characters themselves using the game rules while CRPGs have to cater to a wider audience. Perhaps more importantly, the virtual environment of CRPGs makes it challenging to use personality profiles and similar character features commonly used in PnPs [Tychsen et al. 2006b] even when, in terms of the characters' rules-based components, players are given the freedom in character design as in PnPs,. This can be seen in, for example, in the *Icewind Dale* and *Neverwinter Nights* series.

The characters utilized in the PnP experiments were designed to include comprehensive background histories, personalities, and ethical values in addition to the statistics required by the rules system. In order to avoid bias, characters of similar depth were developed for the CRPG modules. This also provided an opportunity to investigate the functionality of complex characters in a virtual environment, a subject covered in Tychsen et al. [2007b]. For all the game modules involved, the fictional characters utilized by the players were written specifically for the game modules and integrated into the game world and story. The characters were written based on the Extended Personality Assessment Questionnaire [Helgeson and Fritz 1998; Fritz and Helgeson 1999], and while the characters varied between the three game formats, the same five basic personality profiles were utilized in all three setups in order for them to be comparable.

In order to evaluate whether the relationship between the player and the fictional character is correlated with or impacts on the enjoyment derived from the games experience (i.e., the FUN construct and its subconstructs), a questionnaire was developed to assess the character-player dynamics, for instance in terms of how interesting the player found the character to be, how much fun it was to play, the ease of engagement with the character, and so on. This was summed up under the SYMPA (player-character sympathy) construct, (Table IV). As with the FUN and GD constructs, this was designed to cover a broad range of relationships. The disadvantage of this approach is that a signal linking, for example, SYMPA and FUN, has to be very strong in order to be statistically significant. On the other hand, this also means that any significant pattern in the data is likely to be strong (and repeatable in comparable experiments).

The questionnaire data was evaluated by Tychsen et al. [2007b], and the results correlated with the FUN construct data. The data-driven substructure of the SYMPA construct was evaluated and the construct refined from its original 12 component questions to 8, which, using factor analysis, was found to be a strongly coherent construct. The degree of variance in the dataset explained by a one-factor solution,

calculated using PCO analysis, is 43.53% (PnP), 45.47% (CRPG), and 52.60% (GM-mediated CRPG). The modified SYMPA construct was found to correlate positively and significantly with FUN across all three RPG experiment setups, with Pearson's correlation coefficients at 0.54 (PnP); 0.64 (CRPG); 0.74 (GM-supported CRPG), significant for $p<0.001$, with the strongest correlations occurring in the two digital formats. The scores of the individual players in terms of the modified SYMPA construct varied across a wide range of values, from 2.13-4.88 (PnP, average 3.97); 1.25-4.63 (CRPG, average 3.32); 1.75-5.00 (CRPG GM, average 3.68).

    Tychsen et al. [2007b] concluded that complex characters appear to be linked to the quality of the gaming experience and that the strength of the correlation indicates that this is a core feature of RPG play. The correlation strengths indicate that the character-player relationship is especially strong in the digital formats, which indicates that the character plays a larger influence on the gaming experience in this format. This is supported by the observation that the verbal player communication was drastically reduced in the CRPG experiments when compared to the PnP experiments. Emphasis was placed instead on avatar-based communication, the virtual world acting as a form of barrier between the players communicating directly as in the PnP format, even if placed around the same table. Furthermore, Tychsen et al. [2007b] reported a lack of correlation between questions A and B (Table IV) FUN and SYMPA, indicating that the personality difference perceived by the player between the player and the character does not impact significantly on the gaming experience or the player's interest and or engagement with the character. These results are further evaluated in the current study and examined in the context of the data on group dynamics.

Table IV. Question items of the SYMPA Construct (player-character sympathy)

| | Question text | Construct |
|---|---|---|
| **1** | I had fun playing my character | SYMPA |
| **2** | I found my character to be easily understandable | SYMPA |
| **3** | I played the character as true to the description as possible | SYMPA |
| **4** | I found my character to be very interesting | SYMPA |
| **5** | It was difficult for me to engage in my character | SYMPA |
| **6** | I experienced the emotions of my character during play | SYMPA |
| **7** | My character was easy to enact/play | SYMPA |
| **8** | I mostly made decisions/took actions in the game according to my understanding of my character | SYMPA |
| **A** | The personality of my character is similar to my own | - |
| **B** | I do not share the moral and ethics of my character | - |

Note that questions A and B do not form part of the SYMPA construct, but are independent sources of information about the player-character relationship dealing with similarity of personality. Source: [Tychsen et al. 2007b].

3.1.4 *General Evaluation*. The players were asked a series of questions to evaluate their experience of the GMs in the PnP and CRPG GM sessions, and to assist in evaluating the impact of using a GM in conjunction with *Neverwinter Nights* (see below). In addition, there were questions that focused on the players evaluating the pros and cons of the specific game format, which were not divided into subconstructs but used directly. A 20-item pen-ended questionnaire was included to provide players a chance to express themselves freely. The questionnaire covered various aspects of player-character relations and game session evaluation. The data derived from these questionnaires was qualitatively assessed to catch any abnormalities.

While not a part of the questionnaire process, a postgame group of interviews was conducted which were guided by predefined questions and provided a means for players to freely express their experiences with gaming. Group interactions and dynamics were evaluated as were the pros and cons of the RPG formats.

## 3.2 Considering the Design of the Experiment

Three different experiment setups were established: (1) PnP; (2) CRPG, and (3) CRPG mediated by a human GM using the *Neverwinter Nights AURORA*-toolkit.

Two different PnP modules were utilized because the players (Australian and Danish, respectively) required that the modules be in their native language. However, the Danish players were comfortable with English in a games context and did not have any problems with playing a CRPG in English. The PnP modules both utilized the *D20* rules system (originally developed for the *Dungeons & Dragons* PnP; 3$^{rd}$ edition rules were used). Both game modules also featured similar story themes of reversal and revenge and were based on existing and play-tested PnP game modules; the modules were however heavily modified to suit the experimental conditions.

The CRPG utilized in the experiments was *Neverwinter Nights* (currently in its second edition) which permits both standard multiplayer setups and incorporates a game master toolkit that permits one of the players to take control of the game entities and objects in a similar, but comparatively limited, capacity to game masters in PnPs. A range of player-developed upgrades and tools developed by the *Neverwinter Nights* player community further extends the usability of the GM toolkit.

Utilizing the same CRPG for both the CRPG and GM-mediated CRPG experiments alleviates bias introduced by using two different CRPGs (e.g., in terms of varying game-play, HCI graphics, and audio quality). *Neverwinter Nights* is a typical representative of the CRPG genre – featuring a fantasy game world, character-based development, integrated *Dungeons & Dragons* 3$^{rd}$ edition rules (the D20 system), and making it a good fit for the PnP modules. The CRPG modules featured story themes similar to the PnP games, and were developed utilizing the *Neverwinter Nights* AURORA engine and associated toolset. The toolset is a flexible module-building software package, and has had substantial use among the CRPG player community (a second edition was recently released with *Neverwinter Nights II*).

Examination and play-testing of a range of other CRPGs such as the *Might and Magic* series, *Baldur's Gate, Morrowind, Knights of the Old Republic, Sacred, Diablo,* and *Return to Krondor* did not show major deviations from the overall RPG style of character-based storytelling (although the complexity of the game story varies substantially in these games). The evaluation indicates that *Neverwinter* Nights is a fairly typical example of the genre, and is a good proxy for CRPGs in general. CRPGs such as *Fallout*, *Final Fantasy*, and *Planescape Torment* contain features that are unusual to the

CRPG genre (e.g., the unique character restrictions imposed by *Planescape Torment*), but the games are built on similar principles as the games mentioned first.

Participants were divided into ten groups, each consisting of five players as well as an assigned GM in the PnP and GM-mediated CRPG experiments. The GMs were all highly experienced volunteers who were thoroughly briefed about the experiments prior to running the game sessions. Fifteen Danish and 26 Australian players participated (one group had six participants). The groups of players carried over between the three game formats to avoid bias caused by changes in group composition. Eight groups (seven Australian, one Danish) participated in the CRPG GM experiments. All game participants were adults (18-54 years of age, 28.8 average); none had any prior knowledge of the game experiments.

In summary, the PnP and CRPG experiment setups were designed to provide conditions as similar to each other as possible in order to limit the bias due to differences in the game framework (e.g., story, rules, etc.) between the two overall RPG formats. However, as outlined above, RPGs vary across a huge range of features, and in all likelihood there are aspects that were not captured in the current study, despite the broad scope of the empirical framework in terms of variables. It must be stressed that the conclusions presented here will not be the final word on the issues under investigation.

### 3.3 Experiment Procedure

A pilot test of all three experimental setups was performed prior to running the experiment game sessions in Australia and Denmark. This allowed testing of the setup and provided valuable feedback on the procedures from the volunteer players. Procedures for the experiments were finalized based on the pilot tests.

The experiments were conducted at the ICT Innovations Center at the Macquarie University (Sydney), and at the Center for Computer Games Research, IT University (Copenhagen,). In brief, the game sessions were run over two days, with the PnP sessions run one day and the CRPG sessions the second day; however, to allow evaluation of the effect of the experiment order, the game sessions were run in reverse order for the Danish sessions. Because a game session lasted between three to seven hours, players did not become fatigued; breaks were also included as per the discretion of the players. A research assistant was present during the entire duration of the game sessions to assist players with any technical difficulties such as the HCI of *Neverwinter Nights*. The assistant kept out of sight when not needed by the players, and also provided each of the player groups with a comprehensive introduction to the game controls before the start of the CRPG experiments, thus minimizing frustration caused by interface problems.

In all three game setups, the players were situated around a table with full verbal and visual communication access; in the CRPG and CRPG GM games each player had his or her own computer. Before and after each game session, the players were asked a series of questions in questionnaire format, as outlined above. The player groups were also interviewed about their experiences during the game sessions, and these experiences were discussed by the participants and the investigators together.

The game sessions were recorded on video using two to three cameras; the audio was captured using high-quality wireless tabletop microphones. In both the laboratories, cameras were placed behind one-way mirrors or outside glass walls in order to minimize interference. The DM client tool bundled with *Neverwinter Nights* was used to capture screen action during the CRPG sessions (note that DM = dungeon master, a *Dungeons & Dragons* term for a GM).

Fig. 2. Screenshots from the CRPG *Neverwinter Nights* in the experiments. Left above: view of the game avatar, with character inventory (top). Right above: screenshot from one of the in-game cutscenes created with the game graphics engine.



Fig. 3. Camera still from one of the PnP game sessions at the Center for Computer Games Research. The session game master is at the far end of the table.

## 4. DATA EVALUATION

The data evaluation and analysis process was comprised of two steps: (1) evaluation of the questionnaire data and assessment of the strengths of the component constructs; (2) analysis of the questionnaire-based data (see Section 5). The SYMPA questionnaire data was evaluated in Tychsen et al. [2007b], and is not included here.

### 4.1 Evaluation of the Predisposition Questionnaire Data

The 20 questions in the predisposition questionnaire should ideally correlate significantly with their assigned subconstruct [Witmer and Singer1998; Newman, 2005]; and generally this was the case. Barring the exceptions noted below, all questions correlate (using Pearson's correlation coefficient) to their subconstructs with $p<0.001$; in four cases $p<0.01$ (see Table I).

Question 8 was originally assigned to the involvement (IV) construct in Newman [2005]. However, a combined cluster and ordination analysis (paired linkage, Ward's method, PCO), indicate that this question correlates better with the FT subconstruct (Pearson's $r = 0.49$), and hence it was reassigned. Question 14 did not show any

substantial correlation to any of the subconstructs nor to the IT and NT constructs, and factor analyses did not indicate a correlation. A weak correlation (Pearson's r = 0.26) is evident for the TN construct; however this was not statistically significant and the question was eliminated from the analysis. Questions 8 and 14 are two for which Newman [2005] also reports low correlations with subconstructs and/or constructs. This study shows that question 14 should indeed be eliminated from the questionnaire; question 8 can be reassigned to the FT construct, although it is possible that other game formats may affect the factoring structure of the questions.

In general, the correlations of the Predisposition Questionnaire items to their respective subconstructs are strong; and do not contain the negative correlations reported by Newman [2005]. Furthermore, the correlations between the subconstructs, calculated as the average value of the component question items, and the IT and NT constructs are also significant to p<0.001, as follows: FT-IT: 0.733; IV-FT: 0.657; GT-IT: 0.691; HN-NT: 0.672 and TN-NT: 0.559.

The individual questions generally correlate significantly with the construct they are assigned to (IT or NT), albeit at generally smaller p-values than to the subconstructs; this is to be expected, as the IT and NT constructs are composed of a larger number of questions. Only two questions (apart from question 14) do not show significant correlations to, respectively, the IT and NT constructs, but both correlate significantly with their respective subconstructs. They were therefore retained in the analyses of the questionnaire data. In this type of analysis, it is vital that enough questions are utilized, so that the research subject is covered. Removing questions from subconstructs can be problematic, as it weakens their ability to measure comprehensively the respective components of the scale in question.

Newman [2005] reported a negative correlation between the TN and HN subconstructs, and this was also found here. However the strength of the correlation (-0.239) was not significant for the sample size. The negative correlation does however indicate that the two subconstructs measuring hearing and listening, respectively, are somewhat opposite, which to some degree cancels these two questions out when they are assembled into the NT construct.

The strong correlations between the subconstructs and their relevant constructs, as well as the insignificant degree of correlation between them (IT-NT = 0.072), gives validity to the claim that the NT and IT constructs measure two discrete features of predisposition.

In summary, with the reassignment of question 8 and the removal of question 14, following correlation and factor analysis, the PQ component constructs and subconstructs appear to be a strong method for measuring the individual players' predispositions. Whether these predispositions hold any predictive power on the later gaming experience is investigated below.

## 4.2 Evaluation of the Response Questionnaire Data

While it is expected that there would be some similarities in the results of the PQ in the current study and that of Newman [2005], as both studies involved mainly young adults and adults, the results of the RQ should vary, as the experimental setups are different. Notably, the presence of multiple players was expected to impact on results. The RQ data (Table II) was investigated by Tychsen et al. [2007a], who also evaluated the internal consistency of the dataset, although only in relation to the FUN construct not to the subconstructs.

*Questionnaire items correlations with subconstructs* (Table II). In general, a high degree of correlation between the scale items and their assigned subconstruct was observed: 18 of 20 questions correlate across all three experiment cycles with $p<0.001$. There are variations in the correlation strengths between the three RPG experiment setups, notably in questions 7 and 8, which deal with the HCI of *Neverwinter Nights*. Question 19 shows significant correlations to the PnP and CRPG sessions, but at a lower level of significance than the remaining questions (not included in the CRPG GM questionnaire as it would be repeating the same game format). Some of the volunteer players noted that they had played: "silly game characters," but did not find the act of doing so "silly" in itself.

*Questionnaire items' correlations with FUN* (Table II). There were 12 out of 20 questions that correlated with $p<0.001$ across all three formats; the majority of the remainder correlated significantly, although at lower significance values [Tychsen et al. 2007a]. Question 4 was the only one that did not correlate significantly in any of the three experiment datasets. It did correlate with the FI subconstruct, which would be reduced to one question if question 4 were removed. As the effect of question 4 on FUN was negligible but important to FI, it was retained in the analysis. Furthermore, the question item correlates roughly equally with all three game formats, minimizing the possible bias in relation to FUN. The result indicates that the overall gaming experience does not depend on being completely absorbed in communicating with the other players and/or the GM. Newman [2005] also found this question's correlation with FUN to be insignificant.

Questions 7, 8, 14, and 19 had insignificant correlations with one of the three formats, but were strongly correlated with the corresponding subconstructs. Hence they were retained in the analysis, following the procedure of Newman [2005].

*Subconstruct correlations with FUN*. The relations of the subconstructs to the FUN construct were calculated by Tychsen et al. [2007a], who also evaluated the internal consistency of the data. With one exception, they were all significant for $p<0.001$; the exception was the NE subconstruct, which correlated with just $p<0.05$ (in the PnP sessions only). This was the result of the low correlation of question 19 to NE. Removing question 19 from the NE subconstruct increases the correlation between NE and FUN to 0.800, at $p<0.001$. Question 19 was, however, retained in the NE subconstruct as it does not correlate better with any other subconstruct.

The IR subconstruct in Newman [2005] was not included in the FUN construct. However, the strong correlation reported between FUN and IR in the original study, as well as the strong correlations in this study, indicate that IR should indeed be included in the FUN construct. Intention to revisit an experience is apparently directly related to the degree of enjoyment derived from that experience. The correlations between the subconstructs and FUN were also run for a FUN construct without IR, with generally similar results, indicating the IR is closely correlated with the other subconstructs.

The generally high degree of correlation between the various sub-elements of the RQ scale and the FUN construct observed across the three RPG experiment cycles lend credit to the notion that the FUN construct measures a range of features in the gaming experience that are highly correlated (at the subconstruct and question level).

The FUN responses were across a range varying from 1.66 to 4.86, with scale-acceptable standard deviation values (Table V). The mean FUN values above the average for scale (3.0), varied among the experiment setups.

Table V. The FUN Construct Range and Mean Values for theThree Experimental Setups
(StDev = Standard Deviation. Source [Tychsen et al. 2007a]).

|  | $FUN_{min}$ | $FUN_{max}$ | StDev | Mean |
|---|---|---|---|---|
| **PnP** | 2.13 | 4.7 | 0.55 | 3.98 |
| **CRPG** | 1.79 | 4.38 | 0.68 | 3.22 |
| **CRPG GM** | 1.66 | 4.86 | 0.81 | 3.44 |

On a final note: We investigated whether the players who gave low or high FUN ratings in any or all of the three game experiment cycles did so according to any common pattern. But no significant relations between very high or very low FUN ratings in any of the formats that impacted on a different formats (tabletop PnP and digital CRPG, GM-mediated CRPG) were seen, which is consistent with the apparent lack of correlation between the FUN ratings.

## 4.3 The Group Dynamics Questionnaire

This questionnaire had eight questions (Table III), whose combined and averaged sum comprises the GD construct. The questions generally showed the same high degree of correlation as the predisposition and response constructs ($p < 0.001$); but question 7 did not correlate in any of the three game formats and was eliminated from subsequent analysis. The question focused on the need for players to take control of the game story in order to progress the game, but apparently did not relate to the actual quality of the group interactions. In RPGs, especially PnPs, there are multiple ways for players to take control of the story and progress the game, meaning that the strength of the question was watered down. In the group interviews, one player mentioned that his group was happy to be led through the game story by the GM, so there was no need for anyone to actively progress the game story, rendering the question invalid. In hindsight, the question should probably have specified that there was a disagreement component: *"The players were often in disagreement about whether or not to progress the game story"*. This would have provided an indication of a typical problem in RPGs, where some players want to delve into a specific scene or explore a specific area, while others are eager to get to the next event in the game story.

Questions 4 and 8 showed correlations with a significance below $p < 0.001$ but above $p < 0.05$ in the PnP and CRPG formats, respectively. Question 8 also showed no correlation with the CRPG GM format, for which there is no clear explanation, but may be explained by the relatively heavier use of the *Neverwinter Nights* chat system in the CRPG GM sessions as compared to the CRPG sessions. This puts a natural boundary on the amount of out-of-game talk, as a greater degree of focus is required for the player character to survive. Both questions were kept in the GD construct because a significant correlation was evident in all but one case (Q8-CRPG GM).

The strong correlations shown by the component questions to the GD construct across all three game formats indicate that the questionnaire measures a single, coherent construct, similar to FUN. The correlations for the GD construct occur across a range of responses from 1.57 to 5.00, with standard deviations below any critical level (see Table VI). The mean GD values are above the average for the scale (3.0), however the degree varies between game formats (discussed in more detail below).

Table VI. Range and Means of the GD (Group Dynamics) Construct for Three
Experimental Setups (StDev = standard deviation)

|  | $GD_{min}$ | $GD_{max}$ | StDev | Mean |
|---|---|---|---|---|
| **PnP** | 1.71 | 5.00 | 0.69 | 3.80 |
| **CRPG** | 1.86 | 4.57 | 0.70 | 3.13 |
| **CRPG GM** | 1.57 | 4.57 | 0.75 | 3.45 |

Although the primary goal of the GD questionnaires was to build a scale to measure a coherent construct from individual items that seem to contribute to the construct, it was also interesting to assess the data-driven factor structure of the two questionnaires and the differences across the three game formats.

Cluster analysis (utilizing paired linkage, single linkage, and Ward's method) were done on the GD data set, using the modified versions of the questionnaires (Table III). A series of ordination analyses (PCOs) were run in order to add validity to the cluster-derived subscales. As mentioned in Section 5.2, the results of the factor analyses are tentative due to the sample size, but the consistent results across the different measures (correlation, cluster, and PCO-analysis) and game formats, indicate that the results in this section represent data-driven patterns.

There were no coherent data-derived subscales across the cluster and PCO plots for any of the three game formats. A question-question correlation lends some credit to this conclusion because there is no consistent pattern of correlation coefficient values across the game formats. So it appears that the GD construct used here as a single and coherent measure of group interaction quality is valid for the three experiment cycles.

## 5. ANALYSIS AND RESULTS

### 5.1 Predictive Power of the Predisposition Questionnaire (PQ)

Unlike the studies of Newman [2005], the individual predispositions subconstructs, as well as IT and NT, generally show no clear pattern of correlation with the response sub-constructs or FUN (Table VII). This suggests that the multiplayer situation – compared to single-user situations – is markedly different in terms of the influence that individual predispositions have on the gaming experience, to the point where it is not possible to make any predictions.

For both the CRPG and CRPG GM experiments, only a single sub-construct-subconstruct link is evident (Table VII)]. The link between FT and TD is, however, consistent across all three game formats for $p<0.05$, suggesting a general tendency for players with a high-focus nature to also feel temporal dissociation in multi-player games, irrespective of the game format.

For the PnP games, the FT subconstruct and the IT aggregate construct each correlate with the same two response subconstructs (TD and NE), as well with the FUN construct. Additionally, a link is observed between NE and IV, which, although not significant for IV and TD and IV and FUN, appear related to the NE and FT correlation. While the significances of the individual correlations between FT/IT and TD/NE/FUN are generally on the scale of $p<0.05$, the consistent patterning for both FT and IT indicates that these correlations are not occurring randomly. This shows, tentatively, that a player's focus impacts on his or her experience in a tabletop multiplayer environment, possibly via a strong focus on the evolving game story (NE) to the level where the real world is zoned out (TD).

The PQ and RQ were developed for experiments in monitor-based virtual environments. So it is surprising that more examples of significant correlations are apparent in the PnP games than in the computer-based experiments, although a predisposition towards becoming engaged in interactive entertainment presumably works just as well in any gaming situation. The lack of predictive power of the PQ constructs in the CRPG and CRPG GM sessions indicates that predispositions are not determining factors relative to the quality of the gaming experience in multiplayer computer game situations. This is in opposition to the experiments with single-player role-playing setups documented by Newman [2005] and the experiences with single-user setups in virtual environments [Barfield and Weghorst 1993; Witmer and Singer 1998]. This data suggests that other factors are in operation that has a greater influence on determining the quality of the gaming experience in multiplayer games relative to single-player games.

Table VII.  Pearson's Correlations Between Predisposition Constructs and Response Constructs for the Three Game

| PnP | GT | IV | FT | HN | TN | NT | IT |
|---|---|---|---|---|---|---|---|
| TD | 0.15 | 0.23 | **0.41\*\*** | 0.05 | 0.02 | 0.06 | **0.38\*\*** |
| FI | -0.04 | 0.06 | 0.07 | 0.20 | -0.01 | 0.17 | 0.04 |
| HE | -0.11 | 0.18 | 0.28 | 0.02 | 0.17 | 0.15 | 0.15 |
| NE | 0.17 | **0.33\*** | **0.33\*** | -0.04 | 0.12 | 0.06 | **0.40\*\*** |
| IR | 0.06 | 0.01 | 0.17 | -0.15 | 0.24 | 0.06 | 0.11 |
| FUN | 0.07 | 0.23 | **0.36\*** | 0.02 | 0.15 | 0.13 | **0.31\*** |
| **CRPG** | **GT** | **IV** | **FT** | **HN** | **TN** | **NT** | **IT** |
| TD | -0.01 | -0.16 | **0.29\*** | 0.14 | 0.15 | 0.24 | 0.04 |
| FI | -0.10 | -0.13 | 0.08 | 0.15 | 0.18 | 0.26 | -0.08 |
| HE | 0.09 | -0.23 | 0.06 | 0.19 | -0.14 | -0.01 | -0.01 |
| NE | 0.13 | 0.17 | 0.14 | 0.03 | -0.02 | 0.02 | 0.21 |
| IR | 0.12 | -0.06 | 0.12 | 0.05 | 0.04 | 0.08 | 0.09 |
| FUN | 0.05 | -0.11 | 0.19 | 0.14 | 0.07 | 0.17 | 0.06 |
| **CRPG GM** | **GT** | **IV** | **FT** | **HN** | **TN** | **NT** | **IT** |
| TD | -0.02 | 0.08 | **0.39\*** | 0.06 | 0.08 | 0.11 | 0.30 |
| FI | 0.15 | 0.07 | 0.28 | 0.15 | -0.08 | 0.00 | 0.22 |
| HE | 0.32 | 0.20 | 0.14 | 0.06 | -0.07 | -0.02 | 0.20 |
| NE | 0.26 | 0.13 | 0.11 | 0.04 | -0.18 | -0.14 | 0.14 |
| IR | 0.26 | 0.10 | 0.25 | -0.11 | -0.10 | -0.15 | 0.22 |
| FUN | 0.20 | 0.13 | 0.28 | 0.05 | -0.06 | -0.03 | 0.25 |

Formats (PnP, CRPG, CRPG GM). For PnP n=51, CRPG n=50, CRPG GM n=34. * $p<0.05$ ** $p<0.01$ (in bold font). Construct abbreviations as in Tables II and III.

*Factor analysis for PQ and RQ data sets.* The correlation pattern between the PQ and RQ data was examined further by analyzing the data-driven substructure of the dataset, in a manner similar to the analysis of the GD and SYMPA scales (cluster and factor analysis). This permitted testing the consistency of the FT and TD correlation across different analysis methods. The analyses did not reveal a consistent pattern in the way the individual questions factored (with one notable exception), across the different methods

of analysis, either within or between RPG formats. This appears to be consistent, which seems to be in line with the high degree of correlation between the question items.

A likely explanation for the lack of consistent structuring in the PQ and RQ data is that the sample size prevents the detection of patterns without a high degree of penetration power in the statistical analysis. As reported by Thorndike [1978], factor analysis for a questionnaire the size of the PQ and RQ would require a large number of participants for an analysis to be statistically significant. In meeting this issue, a range of analysis algorithms (cluster and factor methods) can be employed, which in turn requires a strong pattern in order to be detected across the full range of algorithms applied. It is therefore not possible to evaluate whether the data-driven substructure varies from the predefined constructs of Newman [2005], who does not include an analysis of the data-driven structure of the study data. A larger study will be needed to confirm whether the PQ and RQ constructs could be refined according to data-driven patterns.

The notable exception to the lack of data patterning was formed by RQ items 1, 2, and 3, which factor separately across all three game formats in the four analyses. Correlating this cluster group (containing both TD questions and one of the FI questions, importantly not Q4 of the RQ which did not correlate significantly with FUN) with the FT and IV predisposition subconstructs as well as the IT predisposition construct, provide support for the link between FT and TD indicated above, with Pearson's correlation coefficient values of 0.360 (PnP); 0.315 (CRPG); 0.368 (CRPG GM) for ABC-FT. Additionally, for the PnP format the ABC subscale correlates significantly with IV (0.302) and IT (0.348). This is not the case for the CRPG and CRPG GM formats.

In summary, neither the predefined nor the data-driven constructs or subscales seem to hold any predictive power, except for the link between the FT subconstruct/ABC subscale and the TD response construct.

## 5.2 Correlations with the FUN Construct

In addition to GD and SYMPA, possible correlation between the age, gender, and previous gaming experience and the FUN construct was investigated [Tychsen et al. 2007a]. Age showed no correlation with FUN, which is also the case for gender, although 9 of the 12 players with the highest recorded FUN rating across the game in the PnP and CRPG formats were female (FUN score above 4.0 PnP, 3.5 for CRPG).

Pearson's correlation coefficients between previous gaming experience and FUN varied between the three experimental setups. In the PnP games, previous experience did not appear relevant to the gaming experience. In contrast, prior experience with CRPG did correlate significantly with FUN (Table IIX)], which shows that experience with CRPG interfaces and chat systems is beneficial to the gaming experience. For the GM-mediated CRPG sessions, a similar pattern appears but is not statistically significant. This is possibly related to the ability of a human GM using the *Neverwinter Nights* toolkits to adapt the game-play to the experience level of the players [Tychsen et al. 2007a].

Table IIX. Pearson Correlation (r-values) for the Three RPG Formats and Range of Possible Determinant Factors

|  | $EXP_{pnp}$ | $EXP_{crpg}$ | $EXP_{tot}$ | GD | SYMPA# | GD-SYMPA |
|---|---|---|---|---|---|---|
| $FUN_{pnp}$ | 0.26 | 0.18 | 0.26 | 0.728*** | 0.54*** | 0.45** |
| $FUN_{crpg}$ | 0.18 | 0.39** | 0.34* | 0.572*** | 0.64*** | 0.48*** |
| $FUN_{crpg\ gm}$ | 0.25 | 0.30 | 0.29 | 0.584*** | 0.74*** | 0.64*** |

Game experience ($EXP_{pnp}$, $EXP_{crpg}$, $EXP_{tot}$), group dynamics (GD), character-player sympathy (SYMPA). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Combinations use lowest value of n. #. This is the modified SYMPA construct.

The GD and SYMPA constructs show persistent and strong correlations with the FUN construct ($p < 0.001$). This pattern is evident across all three RPG formats; and GD and SYMPA are themselves significantly correlated (Table IIX).

The values of the SYMPA construct do not correlate between the CRPG and CRPG GM experiments. But this may be because the players controlled characters with a different EPAQ model personalities in each of the three game formats. This procedure was chosen in order to get a high number of player personality-character pairs for analysis of the player-character dynamics [Tychsen et al. 2007b].

With two variables, both correlating significantly with FUN across all three game formats, the question becomes whether either of the two variables accounts for equal amounts of variance in the FUN construct (Table IX). An ANOVA (analysis of variance) of GD, SYMPA (modified), and FUN reveal differences between the three experimental setups: Notably, GD accounts for a substantially higher amount of the variance for FUN in the tabletop format (PnP), while SYMPA accounts for the highest amount in the CRPG and GM-mediated CRPG situations. Because both computer-based games feature similar results, any influence incurred by the GM can largely be ruled out.

Table IX. Results of ANOVA for the Three Game Setups (to determine if GD (group dynamics) or SYMPA (player-character sympathy) accounts for the greatest part of variance in FUN).

|  | F | p | Beta(GD) | Beta(SYMPA) |
|---|---|---|---|---|
| PnP | 41.942 | <0.000 | 0.555 | 0.368 |
| CRPG | 26.455 | <0.000 | 0.283 | 0.535 |
| CRPG GM | 19.185 | <0.000 | 0.175 | 0.618 |

## 5.3 Influence of Previous Gaming Experience

The average values of the five subconstructs in the FUN scale, as well as GD, SYMPA, and FUN, vary between the three game formats (Table X). In general, these values are highest for the PnP experiments, with the exception of the FI sub-construct, which rates slightly higher in the GM-mediated CRPG experiments.

While the PnP format emerges as the most FUN and is the format with the highest SYMPA and GD averages, the differences between the tabletop and the digital formats (CRPG) are not dramatic. Hence an ANOVA was used to test whether the difference in the variables was significant, with the result indicating a high degree of variance except for the FI subconstruct [Tychsen et al. 2007a]. This subconstruct was also the only one showing a significant correlation between the PnP and CRPG formats. However, the correlation was at $p < 0.05$, and was not evident between the PnP-CRPG GM formats, raising some doubts about its validity, as the different variables generally show a strong correlation between the CRPG and GM-mediated CRPG formats ($p < 0.001$ except for FI and HE, where $p < 0.01$).

Table X. Mean Values for FUN, GD, SYMPA and Response Questionnaire Subconstructs

|  | PnP | CRPG | CRPG GM |
|---|---|---|---|
| Temporal Dissociation (TD) | 3.98 | 3.47 | 3.41 |
| Focused Immersion (FI) | 3.33 | 3.16 | 3.47 |
| Heightened Enjoyment (HE) | 4.27 | 2.92 | 3.29 |

| | | | |
|---|---|---|---|
| **Narrative Engagement (NE)** | 4.09 | 3.11 | 3.51 |
| **Intention to Revisit (IR)** | 4.21 | 3.42 | 3.5 |
| **FUN construct (FUN)** | 3.98 | 3.21 | 3.44 |
| **Group Dynamics (GD)** | 3.80 | 3.13 | 3.35 |
| **Player-Character relations (SYMPA)** | 3.65 | 3.22 | 3.49 |

Data from Tychsen et al. [2007a], excluding GD and SYMPA.

## 6. DISCUSSION AND CONCLUSIONS

This article presented the results of three sets of empirical experiments on multiplayer RPGs across two game formats, with a focus on the variables that influence the quality of the gaming experience, including group dynamics and the relationship between players and their fictional characters. Furthermore, methods for predicting the gaming experience based on individual predispositions towards a range of variables, including immersion, utilized in single-user contexts, were tested in a multiuser games context to assess whether individual predispositions are important in determining the quality of the gaming experiences in multi-player games.

(1) *Factors determining the gaming experience.* The analyses presented in the above sections indicate that the gaming experience in multiplayer role-playing games is influenced by specific variables, which, however, vary in relative importance across game formats (tabletop or virtual world). Thus the format of the game itself also plays an important role in determining the factors that impact the gaming experience.

Three factors were found to correlate with the player's evaluation of the gaming experience:

(i) *Character-player relationship.* The fictional character forms the key link between the player and the game in RPGs, and so it is not surprising that the degree to which players found their characters interesting, engaging, and easy to play, correlate with the modified FUN construct which was used as a measure of the overall gaming experience [Newman 2005]. As noted by Tychsen et al. [2007b] in their analysis of the SYMPA data, it appears that in terms of player enjoyment of a multiplayer RPG experience, it is not the similarity between the personality of the player and character that is significant, but whether the player found the character easy to comprehend, engage with, and play.

(ii) *Group dynamics.* The degree to which the players felt the player groups cooperated; communicated well, and interacted appear to correlate positively with the FUN construct as well. This result seems to correspond with the need for player groups to collaborate and communicate when engaged in multiplayer games of the RPG type.

(iii) Prev*ious experience.* While seemingly relevant for digital RPGs only, the degree of previous experience correlates positively with FUN, if at a weaker level of statistical significance than the GD and SYMPA constructs. This result shows that while experience can help a player master the interface of a digital RPG and thus provide greater

enjoyment, previous experience is less of an issue in tabletop games, where there is a greater flexibility in accommodating beginning players.

While the sample size in this study is limited, the broad nature of the FUN construct, which measures five different aspects of the gaming experience, including immersion and temporal dissociation, lends credit to the results.

The GD and SYMPA constructs correlate significantly with FUN across the three experimental setups; but they are not equally important in terms of variance accounted for by FUN. GD appears most important for the tabletop format, SYMPA in the digital format. The difference is likely due to a feature in the tabletop environment for PnP games, where the group dynamics have to work well for the game to progress and run smoothly. In comparison, the virtual environment of a CRPG means that a layer is inserted between the players, which seem to limit the impact of group dynamics (although it is still an important factor). Even while seated around the same table, with full visual and verbal communication, the majority of players in the experiments chose to focus their interactions with the other players through the virtual world. The players with less experience with CRPGs displayed extra difficulty in maintaining nonessential verbal conversation while playing, focusing instead on the game interface. This emphasizes the need for multiplayer CRPGs to ensure well-developed communication interfaces covering as many of the natural interaction forms as possible [Manninen and Kujanpää, 2005].

(2) *Presence and immersion.* The results of the RQ support the conclusions of Pinchbeck [2001] that presence is an important element in the gaming experience. As shown by Ermi and Mayra [2005] and Takatalo et al. [2006], presence in digital gaming is not a homogenous construct, and the data here indicates that for players of both digital and tabletop RPGs the sense of focused immersion (and temporal dissociation) are important to their overall gaming experience; that is, these subcategories correlate very strongly with the other subconstructs of the FUN construct. While studies like those of Takatolo et al. [2006] have begun looking into how presence can be defined and dissected in digital games, this article shows that presence is an important element in the gaming experience. Further study will be needed to gain an overview of how immersion and presence operate in such gaming contexts. This is an area of study that appears to be gaining an increasing amount of international research interest.

(3) *Variations in the gaming experience across RPG formats.* The tabletop RPG experiments emerged as the overall most enjoyable and engaging in terms of the game story, and were rated the highest in temporal dissociation. Furthermore, the average FUN, GD, and SYMPA scores were consistently highest for the PnP format; but this was not the case for the focused immersion subconstruct.

That PnPs are more enjoyable than CRPGs, even in randomly assembled groups of players (only in two of the ten groups had all the players played together before), suggests that the tabletop format is a resource for knowledge for the generation of multiuser interactive entertainment experiences. For example, PnPs appear to combine the interests of disparate players at different levels of experience with much less difficulty than digital RPGs, possibly by virtue of being strongly adaptive.

Such adaptation is in substantial part related to the presence of a human game master, managing the game story and game flow. While FUN and the other variables examined here do not indicate that a human GM will have a substantial impact in a multiplayer CRPG context, the direct evaluations of the players themselves strongly favored the inclusion of a human GM. Concerning GMs in CRPGs, the players in several of the experimental groups noted in the postgame focus groups that they received greater encouragement to role-play their characters when a GM was present, thus providing a game world that was responsive to the actions of the player characters.

(4) *Predispositions and predictions of enjoyment.* Operating under the assumption that empirical experiments are applicable outside the specific framework in the current study, this article gives evidence that the gaming experience in multiplayer RPGs across the tabletop and digital media is generally unrelated to individual immersive and narrative tendencies, as well as to gender, age, and for the tabletop RPGs, previous experience with the game format. We show that the methods employed in single-user immersive environments [Witmer and Singer 1998], as well as monitor-based environments [Newman 2005], to measure and predict (for example) the degree of presence do not appear to be directly applicable to multiplayer gaming situations, where the influence of multiple participating players can supersede individual predispositions, a result supported by the correlation between the GD and FUN constructs. The exception appears to be the individual predisposition towards focused immersion, which correlates significantly with the experience of temporal dissociation if $p < 0.05$ across all three RPG forms. The data-driven structure lends further credit to this link.

(5) *Predicting the gaming experience across RPG formats.* The current study indicates that it is possible to predict the quality of the gaming experience by a group of players within the same game format, but not across game formats. While the CRPG and CRPG GM experiments showed similar patterns in the variables, there were no correlations between the PnP and CRPG/CRPG GM formats. A group of players may function well and enjoy the shared gaming experience in one game format, but that does not necessarily mean that they will function equally well when the RPG is carried to a digital format. It is possible that other predictors than those in the current study will useful in this respect, which is a venue for future research.

Future work will go into more detail in evaluating the player experience from the perspective of player groups, the influence of predispositions on the internal dynamics of the player groups, and how multiplayer groups accommodate varying predispositions, motivations, and ambitions with the gaming experience, as well as more detailed analysis of the communication transcripts and game logs from the experiments.

## ABBREVIATIONS

**ANOVA**: Analysis of variance
**CAVE**: Cave automatic virtual environment
**CRPG**: Computer (digital) role-playing game
**GM CRPG$_{exp}$:** Game-master mediated computer (digital) role-playing game experience
**CRPG GM/GMCRPG**: Game master mediated computer (digital) role-playing game
**EXPtot**: Total experience playing role-playing games
**FI**: Focused immersion subconstruct (in both PQ and RQ questionnaires)
**FT**: Focus tendency
**GD**: Group dynamics construct
**GM**: Game master
**GM CRPGexp**: Game master mediated computer (digital) role- playing game experience
**GT:** Gaming tendency subconstruct
**HE:** Heightened enjoyment subconstruct
**HN:** Hearing narrative subconstruct
**IR:** Intention to revisit subconstruct
**IT:** Immersive tendencies construct
**IV:** Involvement subconstruct
**NE:** Narrative engagement subconstruct
**NT:** Narrative tendencies construct
**PnP:** Pen-and-paper role-playing game
**PnP$_{exp}$:** Pen-and-paper role-playing game experience
**PQ:** Presence questionnaire
**RPG:** Role-playing game
**RQ:** Response questionnaire
**SYMPA:** Player-character sympathy
**TD:** Temporal dissociation subconstruct
**TN:** Telling (creating) narrative subconstruct

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