

Game format effects on communication in multi-player games

Anders Tychsen
Center for Computer Games Research
IT University of Copenhagen
+0045 72505038
anty@itu.dk

Jonas Heide Smith
Danish Film Institute
+0045 3374 3564
jonashs@dfi.dk

ABSTRACT

Communication is a vital component of multi-player game play, constituting a large part of the player interaction in most game formats. In this article, the structure and intensity of the verbal communication between players in three different types of multi-player role-playing games are analyzed. Data is drawn from a series of empirical experiments covering: A) Console gaming; B) Multiple players in a conventional LAN-setup, and: C) non-digital tabletop gaming. The results indicate that there are distinct differences in the overall communication pattern between the three game setups. When players share a single screen they communicate more than when each person has their own monitor, indicating a direct effect of the representation of the game medium on player communication. Additionally, in the digital games, speech intensity varies as a function of the game content: Players communicate the most during non-stressful game segments, and the least during intensive combat scenes, although the latter does require extensive coordination. The implication of this result is that analysis of player communication has the potential to be used as symptoms of boredom or excitement.

Categories and Subject Descriptors

K.8 [Personal computing]: Games; J.4 [Social and Behavioral Sciences]: Psychology.

General Terms

Measurement, Experimentation, Human Factors.

Keywords

Experimentation, Human Factors, Communication, Player behavior, Role Playing Games, Characters, Personality, Online Communication, Interaction

1. INTRODUCTION

Communication is a key component of multi-player game play, forming the means for relaying information, strategies and social details across a vast range of game formats (format here referring to the media of expression), from the digital to the non-digital. As

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

FuturePlay 2008, November 3-5, 2008, Toronto, Ontario, Canada.

Copyright 2008 ACM 978-1-60558-218-4...\$5.00.

a subject of research, the communication of players has received limited attention from the empirical side of games research, and it is therefore not clear how the game format (or medium) affects player communication, nor whether inter-player communication in multi-player games is used mainly for functional purposes (coordination, information sharing, negotiation of collective choices) or strategic purposes (ensuring objectives are met) [28] or alternatively as a backdrop for social interaction.

Advancing current knowledge of player communication would aid the understanding of the social functions and rules of gaming, but the entire topic of inter-player communication during play is under-explored, with studies being limited to a handful, which are focused on the more general functions of language in gaming [e.g. 12,16,21,36], not analysis of player communication directly [34]. From a theoretical perspective, basic descriptions of the communication structure in PnPs is presented in [11,14,23,32,37,38]. Empirically-based games studies are rare. Smith [28] adapted communication coding schemes to the study of multi-player gaming, studying collaboration and conflict patterns between players of different types of multi-player games, including CRPGs. While, in game studies, this work is still somewhat sporadic, group-based communication is a topic explored in other contexts, e.g. human-computer interaction, collaborative design or in organizational or managerial contexts [e.g. 5]. In relation to virtual working environments, and within areas such as architecture, design and software engineering [e.g. 9,20,29]. In this study, a contribution is made to the larger study of player behavior, by addressing the specific issue of how players of multi-player Role-Playing Games (RPGs) communicate. Results from three different sets of interconnected empirical studies are presented: A) Communication between players of a multi-player tabletop RPG (PnP); B) Player groups playing the Computer RPG (CRPG) *Champions of Norrath* on a PlayStation 2 console [28]; and: C) Groups of people playing the CRPG *Neverwinter Nights* on PCs, each with their individual monitors in a typical LAN-setup. The current study aims to provide an analysis of the verbal communication of players in these three different multi-player gaming situations, focusing on the general structure of communication rather than content (which forms a subject for future analysis of the data), i.e. the relative speech intensities, length of individual utterances and the relationship between game content and player communication rates.

Focusing on three different game formats permit the examination of the impact of the media of expression (tabletop, console, PC), and what happens when transferring superficially similar game situations (multi-player RPGs) between three different formats.

	PnP	CRPG	LARP	MMORPG
Platform	Imagined	Virtual	Physical	Virtual
GM/player ratio	High	High	High-Low	Low
Communication lines available	All	Texted chat, live speech, limited emotions/body language	All, limited by sight range or communications equipment	Texted chat, live speak, limited emotions/body language
Character action descriptions	Verbal	Verbal and/or visual	Visual	Verbal and/or visual

Table 1: Key differences of RPG formats impacting on player communication. Note that Multi-player CRPGs can either be played with the participants geographically separated or positioned in the same space, using separate monitors or sharing one. The GM/player ratio is a measure for the proportion of players per game master or game manager, which is an important driver in RPG design.

2. MEDIAL DIFFERENCES

Role-Playing Games (RPGs) are a rare example of a game form that has spread across a variety of formats (including technology bases, or medias of expression) [King& Borland, 2003; Lindley and Eladhari 2005; Tychsen et al. 2007], providing an ideal opportunity to investigate the effect of porting games between media formats. It is necessary to understand how these games operate in terms of communication frameworks, in order to explain results of analyses of player communication, and therefore a brief introduction to these games is provided here.

There are numerous useful resources detailing the design and processes of RPGs across formats, [2,10], as well as a steadily increasing number of scholarly publications [e.g. 3,8,17,19,22,25,31]. Additionally, the players of the Live Action RPG (LARP) community and the tabletop RPG community has produced a number of useful publications that provide design- and practical knowledge about how these games operate [e.g. 4,6,11,14,24]. These publications form the bulk of the literature available in studying LARPs and PnPs.

The various forms of RPGs share a number of key features (e.g. rules systems and themes); however, the experience of playing an RPG involving more than one player – be it tabletop-based, digital multi-player or a digital massively-multiple online RPG (i.e. a MMORPG), varies between these formats [26,34]. This difference is linked to the variations in the number of players involved, the situational setup (tabletop, shared screen, individual screens, played on mobile phones/PDAs etc.) and importantly to the way that the fictional game world is represented. Tabletop RPGs (PnPs) rely on a shared, imagined representation, while CRPGs and MMORPGs feature a virtual world. In comparison, LARPs utilize the real world as a backdrop for the gaming activity (Table 1). These medial (format) differences affect the lines of communication open to the players, and therefore presumably the communication structure.

It is important to note that verbal communication would appear to serve different functions in digital, non-digital and physical RPGs: In tabletop RPGs, verbal communication is used to ensure a consistent view of the state of the shared, imagined game world and the actions of the player-controlled characters within it [6,14,37,38]. In order to make their characters perform acts within the fictional world, players have to communicate these to the other participants, and have the act be approved by them

and in particular the Game Master (GM). In terms of speech act theory [1,27], the players of tabletop RPGs are performing a series of illocutionary acts (acts performed through speech) subject to the approval of the GM. To be exact, they are illocutionary acts by proxy since the player character performs them; however this distinction is irrelevant in the current context. The GM is a specific type of participant, who typically but not consistently has the control of the fictional environment and is responsible for providing feedback to the players as to the actions of their characters. The GM is also tasked with maintaining the flow of the game storyline and ensures that everyone is entertained. In contrast to the shared, imagined worlds of PnPs, the computer-created fictional worlds of CRPGs (including MMORPGs) means that software has taken over a part of the communicative tasks of tabletop RPGs: That of maintaining and updating a shared understanding of the world. However, CRPGs also restrict player communication channels, for example in terms of using body language directly in front of each other. When playing CRPGs, players are turned towards a screen, not each other as in a conventional PnP. Even when playing a console game, the attention of players can be assumed to be more directed towards the screen than the other players, as the game action takes place on the screen. The introduction of game software also means that players do not need to be aware of the rules to the same extent as in tabletop RPGs, even if this does not impact on the ability of player to ask questions about the rules, berate them or otherwise communicate about the game rules. In comparison, LARPs form a hybrid between the digital and other non-digital RPGs. Players enjoy the character-based narrative freedom of PnPs, but using the real world as a backdrop severely limits the actions players can perform. On a final note, it is possible in some CRPGs, e.g. *Neverwinter Nights*, for players to move their avatars outside the segment of the virtual world visible to the other players. This is not possible when multiple players are interacting via the same monitor, as is the case with console games such as *Champions of Norrath*. In the former case, the players remain in contact, either verbally or via texting; however they may lose visual sight of each other's avatars. This situation is different from the PnP situation where the players are generally aware of the actions of the other players.

3. APPROACH AND METHOD

3.1 Game criteria: The ideal basis for a comparative analysis of the communicative patterns in CRPGs and tabletop RPGs would be to sample transcripts of the communication taking place in a wide span of games, because RPGs vary substantially between formats (e.g. digital and non-digital) and internally within formats, e.g. in the case of tabletop games improvisational theatre at one end and simulation play at the other. It was therefore chosen to aim for three games that were as alike as possible in terms of rules system, basic story and linearity of plot, and ease of play. This approach ensures a modus of context control, notably with respect to the influences of the game storylines on player communication: It could be expected that players engaged in an investigative storyline would communicate differently than players engaged in an action-oriented storyline. Therefore, games with similar themes, approach to gameplay etc. were selected.

What a Lovely War!: The tabletop RPG (PnP) module selected was *What a Lovely War!* Produced by a group of 15 multiple-convention award winning and highly experienced scenario writers and GMs. The game module utilizes the relatively simple rules set from the *Traveller Light* D20 system, which is focused on the interaction between the player characters and the environment, e.g. rules for combat and skill use. The rules system is comparable to that used in the two CRPGs.

Champions of Norrath & *Neverwinter Nights*: The CRPGs chosen for this study were the opening chapters of the PS2-version of *Champions of Norrath* (Sony Online Entertainment, 2004), and a custom-made module for multi-player *Neverwinter Nights* (Bioware, 2003). Both games (Figure 1) are sword & sorcery type fantasy online-capable CRPGs. *Champions of Norrath* is set in the same universe as the MMORPG *EverQuest*, and utilizes the development company *Snowblind's* engine from *Baldur's Gate: Dark Alliance*. *Neverwinter Nights* is set in the popular Forgotten Realms setting used for numerous tabletop- and digital RPGs and uses Bioware's AURORA engine. The games feature elements common to the CRPG form, e.g. action-driven gameplay, a linear storyline, and a generally collaborative environment. However, *Champions of Norrath* was played on a single monitor, which means that all players share the same set of game visuals, whereas *Neverwinter Nights* provide each player with their own monitor and perspective on in-game events.

Participant Recruitment: The players for both the game sessions were recruited at the IT University of Copenhagen in 2004-2005, the Macquarie University (Sydney) in 2005, as well as among the Danish and Australian gaming communities. There does not appear to be any significant differences between the Danish and Australian datasets. The age of the players varied between 18-54 years (only one was below 20). For the CRPG players most were students of the university, with a substantial amount of games experience. For the PnP players, experience varied. Both sexes were represented, with about 2/3 male and 1/3 female. 25 PnP players plus five Game Masters, and 22 CRPG players participated. Participant experience with the three game formats varied (tested using a short survey), and did not show correlation with e.g. utterance frequency. In a few of the groups players had previously played together, however not with the entire group. There was no apparent correlation between this factor and results.

Figure 1: Screenshots from *Champions of Norrath* (top, © Sony Online Entertainment) and *Neverwinter Nights* (bottom, © Bioware).



3.2 Experiment procedure: PnP sessions: Participants for the game sessions were recruited at the Macquarie University (Sydney) in 2005 and the IT University of Copenhagen in 2004-2005, as well as among the Danish and Australian gaming communities. Player age varied between 18-54; with only one being below 20. Player experience varied. About 2/3 of the participants were male, 1/3 female. 25 tabletop RPG players participated plus 5 Game Masters, 22 players participated in the *Champions of Norrath* sessions, and 29 in the *Neverwinter Nights* sessions. No cultural bias appears to exist in the dataset between the Danish and Australian data: The data from the Danish and Australian sessions did not display any significant difference when correlating with language, e.g. in terms of communication intensity.

Tabletop RPG sessions: Five tabletop RPG sessions were run with the chosen game module, with 4-5 players in each group (Figure 2). The groups featured players with a variety of experience levels; however all had previously played tabletop RPGs at least once. The game sessions were managed by experienced Game Masters (GMs) (one per group), who utilized the module as a blueprint to run the game from, and selected a relatively linear style of narrative development.

GMs had the freedom to alter the game narrative; however, they were tasked with attempting to maintain the general storyline of the scenario to ensure continuity across sessions and some similarity with the strictly linear storylines of *Champions of Norrath* and the *Neverwinter Nights* module.

Although substantial variation was observed in how the players progressed through the scenario, the GMs performed exemplarily in keeping the player groups within the overall pattern of the module storyline, without forcefully limiting player freedom. GMs vary in their style of managing the emergent storyline, and would be expected to promote or prevent specific types of communication – e.g. avid description of the fictional environment vs. letting the players ask questions about it. Data from multiple groups were included to accommodate for this variation. Furthermore, the five groups included here were selected from 10 sessions, based on the similarity of the GM style, adherence to the storyline etc. A researcher was on call during the sessions, placed in a neighboring room in case there were any questions. These were however rare. The game sessions were videotaped using two cameras, with video feeds mixed in real-time. Participants were interviewed before and after each game session in order to detect any problems relating to the game sessions that could bias the player communication and thus results. Sound was recorded using wireless tabletop microphones. The tapes were copied to digital format and transcribed.

CRPG sessions: Five *Champions of Norrath* and six *Neverwinter Nights* sessions were run for the study. The *Champions of Norrath* groups featured 2-4 players in each group (only one case with two players, CRPG₁), the *Neverwinter Nights* sessions 4-5 (Figure 2). There was no apparent pattern of difference caused by the variation in group size, except for CRPG₁ which does feature a lower average count of words/utterances per minute.

Champions of Norrath was played using a *Playstation 2* and a 50" plasma screen, whereas *Neverwinter Nights* was played using individual 19" displays. The groups were introduced to the game and controls in general terms, and played *Champions of Norrath* for 45 minutes each, from the beginning of the game. The *Neverwinter Nights* groups played a custom module designed using the AURORA toolkit, taking app. two hours to complete.

An observer was present at all times, either in the game room or in a neighboring room, but did not interfere with the players beyond answering questions about controls and similar subjects. Questions were rare as almost all players, experienced well as inexperienced, preferred to solve any problems with the game controls themselves or with the help of the other players.

3.3 Transcription: For each of the three game setups, three scenes were selected based on narrative content and temporal distribution in the individual game modules, and the verbal communication and some body language transcribed in full, including body movement and sound effect mimicking. The three scenes were chosen from the beginning, middle and end of each game session, and featured similar narrative content (Table 2). By transcribing and analyzing sections of the communication at three different intervals of the game sessions, changes in the communicative patterns as a feature of playing time could be located. The completion time for each scene or segment varied between the groups and the three game formats, from a few minutes in *Champions of Norrath* and *Neverwinter Nights* to over an hour in the tabletop RPG setup. Selected segments were

transcribed by two people independently to confirm inter-transcriber reliability.

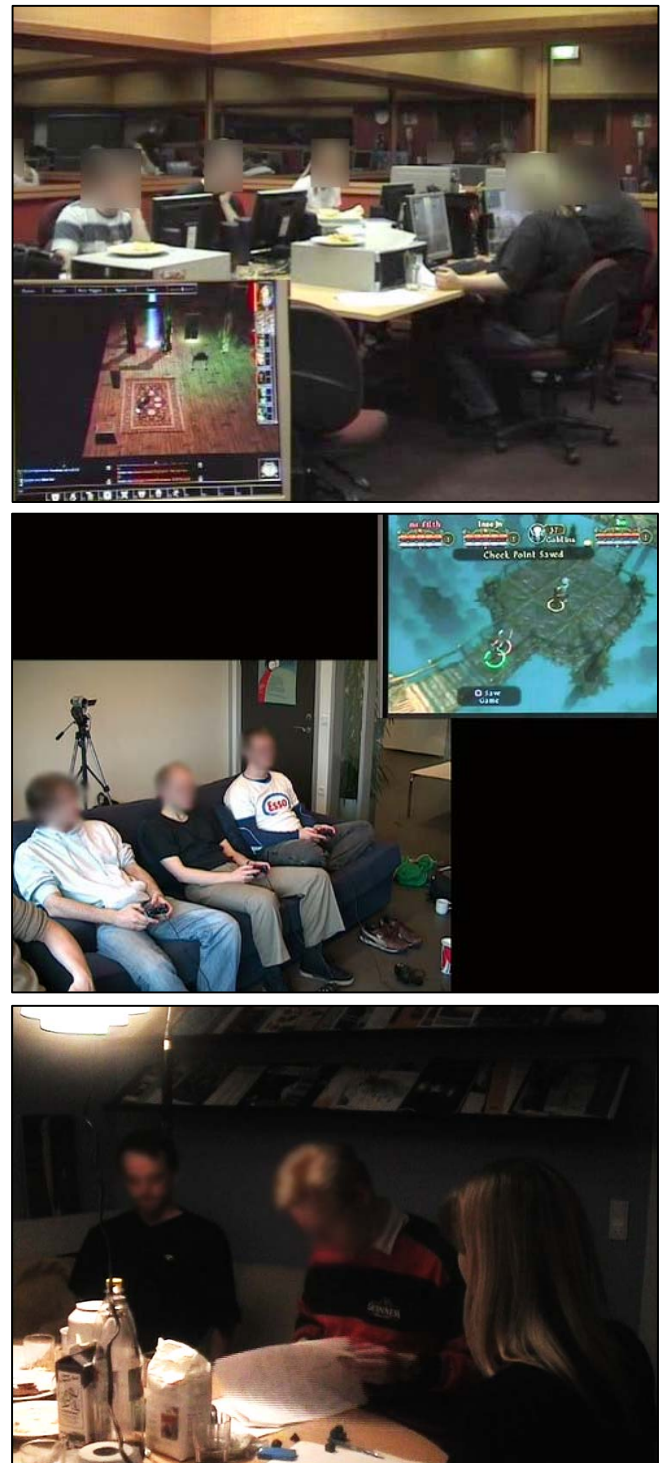


Figure 2: Photos of the three game setups utilized in the study. Top: *Neverwinter Nights* (game visuals inserted lower left); Middle: *Champions of Norrath* (game visuals inserted top right); Bottom: Tabletop RPG (PnP).

	Scene type	<i>What a Lovely War!</i>	<i>Champions of Norrath</i>	<i>Neverwinter Nights</i>
Section 1	Non-stressful planning and prioritizing	Selecting and donning equipment (shopping)	First extended shopping scene	Module start, early NPC encounters
Section 2	Non-threatening combat scene	Initial fight against aliens	Initial confrontation against goblin invaders	Easy fights and NPC interaction
Section 3	Possibly dangerous (lethal) combat scene	Raid on an alien military base, fighting tougher aliens	First boss fight against goblin overlord and his pets	Final boss fight against major demon, story resolution

Table 2: Sections of the tabletop RPG and two CRPGs that were transcribed (modified from [Tychsen & Smith, in press.]).

	In characters				In words			
	Avg. length/chars.	Avg. chars./minute	Min	Max	Avg. length/words	Avg. words/minute	Min	Max
PnP	50.47	894.44	1	940	10.16	175.99	1	174
CoN	82.75	1314.35	9	499	9.80	164.79	2	54
NWN	37.25	546.13	1	877	7.16	105.1	1	112

Table 3: General utterance statistics for the game sessions. PnP = tabletop RPG sessions; CoN = *Champions of Norrath* sessions; NWN = *Neverwinter Nights* sessions.

Approximately 45-60 minutes of verbal conversation was transcribed for each of the tabletop RPG, *Champions of Norrath* and *Neverwinter Nights* sessions. Each transcribed segment was initiated at the start of the relevant scene, running for approximately 20 minutes. For the CRPG sessions, the full length of the specific scenes was transcribed as these were usually shorter than 20 minutes (13 minutes average). Rather than use manual coding of the material, data were extracted from the full volume of the transcribed material using a custom Active Perl-script. This extracted character- and word-length frequencies for each session and each player, as well as listed words used and frequency. The raw output files were further processed in *MS Excel*.

4. ANALYSIS AND RESULTS

The basic unit of analysis was an utterance, defined as consisting of: 1) A subject who performs the communication 2) The content of the communication and 3) An object or objects to whom the communication is addressed [9]. A series of descriptive statistical indicators were calculated for the 16 game sessions in order to gain a structural overview of communication intensity and –rates (Table 3, Figure 1). Despite variations in group size, there was no statistical correlation between this variation and e.g. the length and frequency of utterances. The participants in the *Champions of Norrath* sessions averaged 82.75 characters per utterance, and 1314.35 characters per minute; with the PnP sessions averaging 50.47 characters per utterance and only 894.44 character per minute. At 37.25 characters per utterance and just 546.12 characters per minute, the *Neverwinter Nights* players used the shortest overall utterance lengths and had the lowest average communication density. The pattern for the lengths of utterances in words is slightly different. The *Neverwinter Nights* sessions average 7.16 words per utterance (Figure 1), the *Champions of Norrath* sessions 9.80 and the tabletop RPG (PnP) sessions 10.16. As indicated by these frequencies, the average sentences spoken by the *Champions of Norrath* players, who shared the same visual

display, was 64% longer than for the PnP sessions in terms of characters, but only 3.7% in terms of words. This means that the players of *Champions of Norrath* used longer words than in the other game formats. As would be expected, words such as “you”, “a”, “of”, “on”, “are”, “and” and “is” are the most common words used, with: “give”, “going”, “what” and “we” being examples of other common terms employed. The maximal transcribed sentence lengths were highest for the tabletop RPG game sessions, in terms of numbers of character and words. Standard deviations of the utterance lengths are also highest for this format. The variation in the sum of spoken words per minute (WPM), as a function of the specific scene (segment) of transcription, varies between 81.19 to 339.0 in the *Champions of Norrath* context; between 46-139.7 in the *Neverwinter Nights* context, but only between 151.13 and 225.05 in the tabletop RPG (PnP) games. There is in other words almost twice as much variation in the overall communication intensity in the digital RPG situation as in the tabletop RPG situation. Furthermore, while the pattern for the PnP sessions is one of minor variations between the different player groups, and a constant flow of communication with no apparent relationship to the narrative content of the active scene, the average WPM for both the CRPG situations varies substantially across the three scenes:

Champions of Norrath: 220.39 for Scene 1; 158.67 for Scene 2 and 115.31 for Scene 3.

Neverwinter Nights: 122.6 for Scene 1; 112.54 for Scene 2 and 80.14 for Scene 3.

While the pattern of variance in the WPM counts as a function of the active scene is not identical across all 11 CRPG groups (Figures 2, 3), there is a clear tendency for the players to speak the most during the initial shopping/NPC encounter scene (Scene 1) (Table 3, above), and least during the lethal combat scenes at the end of the gaming sessions (Scene 3).

Figure 1: Average length in words of utterances in the PnP (tabletop) and CRPG sessions. CRPG (1-5): *Champions of Norrath*; CRPG (6-11): *Neverwinter Nights*.

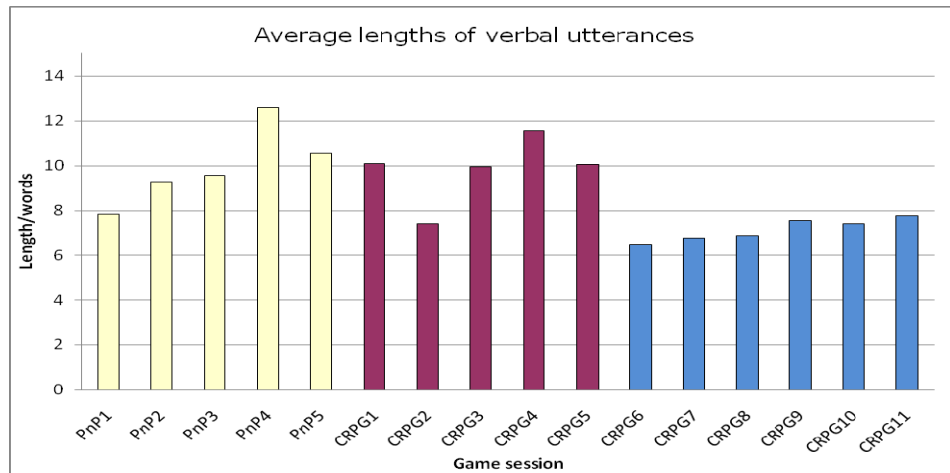


Figure 2: Words per minute in *Champions of Norrath* sessions by game content (scene). Note: CRPG₁ only had two players. [source: Tychsen & Smith, in press].

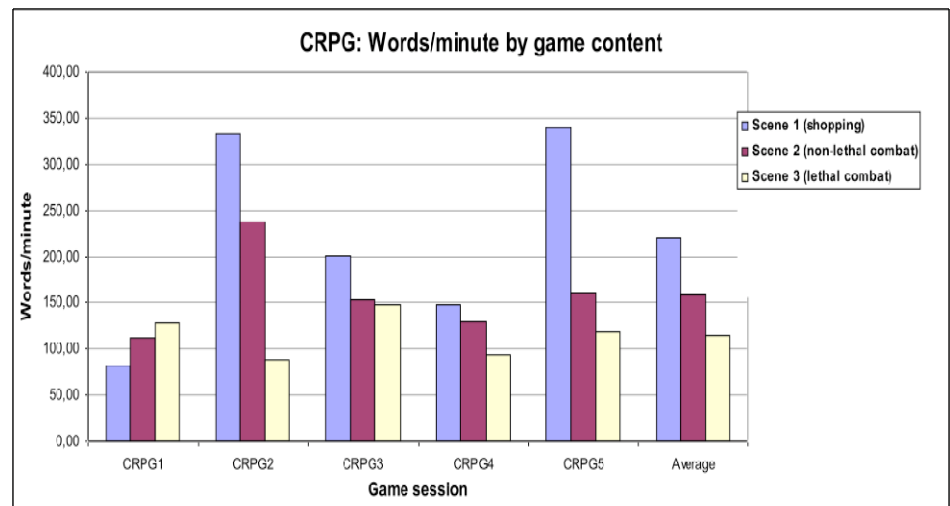
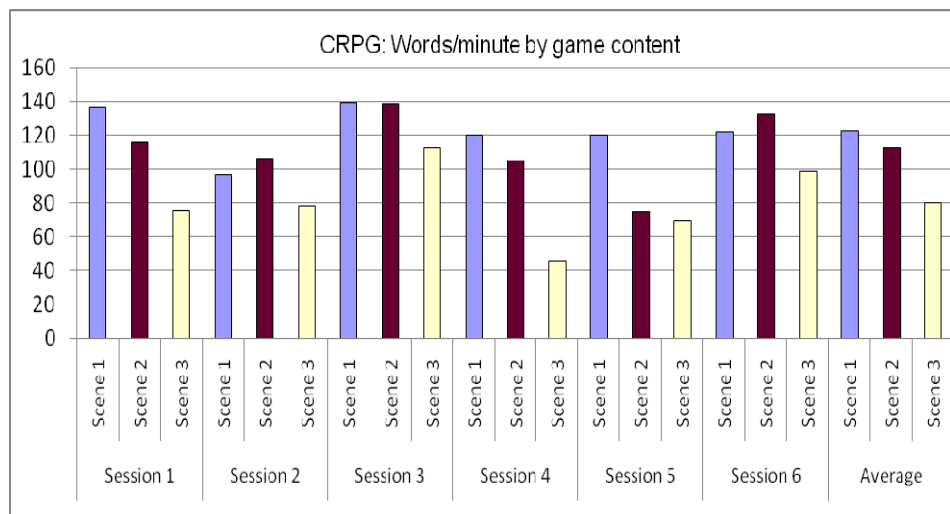


Figure 3: Words per minute in the *Neverwinter Nights* sessions by game content (scene)



This pattern does not emerge in the tabletop RPG data, which is perhaps not surprising: As all events take place through speech in this game, there is no immediately obvious reason for why a specific type of narrative content or dramatic situations should stand out in this regard. Irrespective of the content of a scene or segment of play, players still need to inform each other about the actions of their characters, roll dice to determine results, and so forth. However, in the CRPG context, the players are specifically unburdened cognitively and under no time-pressure during the shopping sequence whereas the lethal combat scenes require intense concentration to merely stay alive (with the possible exception of very skilled groups of players). While there is a tendency for Scene 2 to have lower WPM counts than Scene 1 in the CRPG sessions, this is not a pattern statistically consistent enough to be conclusive.

5. CONCLUSIONS AND DISCUSSION

The analyses presented here provide empirical insights into the under-explored functions of verbal communication during game play, and emphasize the effect of the game format, or media of expression, on the communication intensity of the participating players in multi-player RPGs.

The first conclusion that can be drawn from the results is that for all three game forms, the average communication intensity (words per minute) (Table 3), is somewhat lower than the rates for normal conversation, which operates at 190-230 word per minute [30]. This result can be interpreted in the light that the cognitive challenge of playing a multi-player game lowers the ability of players to “speak freely” as they normally would, or that the demands on relaying game-related information means that social conversation is de-emphasized.

The communication intensity as well as the length of utterances varied substantially between the three game setups, potentially as a direct result of the absence/presence of computer monitors, and the configuration of either a single shared or individual displays. The influence of other variables, e.g. human factors, cannot be entirely ruled out; however, the experiments were in all three cases run in laboratory settings with a variety of players and with three games that featured e.g. similar rules systems.

The *Neverwinter Nights* game sessions consistently emerge as those with the lowest speech intensities, with 75% fewer words per minute than tabletop RPG sessions, and more than 50% less than in the *Champions of Norrath* sessions. Similarly, the utterance lengths were shorter at 37.25 characters per verbal utterance in *Neverwinter Nights*, versus 50.47 in the tabletop RPG and 82.75 in the *Champions of Norrath* sessions. Taken together, these numbers strongly suggest that multi-player gaming where each player has their own monitor promotes low rate of communication between players. During the game sessions, it was commonly remarked upon by the participants that one tended to become focused on the monitor, rather than on the other players, even if they were fully visible over the top of the monitors. In the *Champions of Norrath* sessions, where players shared a single monitor, speech intensity was almost as high as for the PnP sessions, and curiously the length of the utterances spoken by the players participating in these sessions were longer than for the tabletop RPG situation. These results indicate that multi-player

games focusing on tactical and strategic play (e.g. *CounterStrike*, *Battlefield*), which does not require intensive player communication, can be played on individual monitors. In comparison, games that require high degrees of verbal interaction, e.g. PlayStation “party-games”, are better of being designed to fit the shared-monitor format. Conversely, if developing a game requiring high degrees of verbal communication and coordination between players, designers should be watchful of the tendency of players to become focused on their own monitors and the actions portrayed there, and implement strategies to overcome this problem.

It should also be noted that in all three game formats, the players were generally engaged in a conversation with all group members. Utterances were generally directed at the entire group reflecting that the multi-player games in question produced collaborate interaction in which players were able to, within short time spans, work together to achieve their goals [35].

Furthermore, speech intensity has been shown to vary as a function of the contents or events of the specific game scenes for the CRPG players. This pattern is evident in both CRPG formats, which lends credit to the result as the situational setups were different (shared vs. individual monitors). The CRPG players’ verbal communication was most intense during peaceful and low-stress segments of gameplay, and least intense during high-stress, potentially lethal combat situations. This indicates that for these two game formats, low speech intensity does not need to indicate boredom, as players communicated verbally the least when trying to stay alive. The implication of this result is that communicative patterns are related to game content, and therefore that analysis of player communication has the potential to be used as symptoms of boredom or excitement. The results do not indicate, however, that the relationship between communication and player experience is simple. Presumably this relationship is determined by a range of game- and player-related variables.

This pattern of variation was not observed in the tabletop RPGs, where speech intensity was remarkably constant throughout the three analyzed segments of playtime and between the groups, indicating a stable rate of communication for groups of the size of 4-5 players. Future work on player communication could aim at linking communicative patterns to the player experience more directly, and thus assist in bridging the gap between the study of games and the study of player behavior.

6. ACKNOWLEDGEMENTS

The authors would like to thank Dr. Michael Hitchens, Department of Computing, Macquarie University, Sydney; and Dr. Susana Tosca, IT University, Copenhagen, for insightful discussions and feedback. Heartfelt thanks also to the players and GMs who participated in the game sessions, in Denmark and in Australia, and tirelessly answered every question thrown at them by the authors. The Macquarie ICT Innovations Centre, for providing facilities and equipment for the RPG experiments of Anders Tychsen.

7. REFERENCES

- [1] Austin, J. L. 1975. How to do things with words. Clarendon press.
- [2] Bartle R. 2003. Designing Virtual Worlds. New Riders.

- [3] Björk, S. Falk, J. 2001. Pirates! Using the physical world as a game board. Proceedings of INTERACT 2001.
- [4] Bockman, P. and Hutchison, R. (eds.) 2005. Collected papers for Knutepunkt 2005 – the 9th Annual Nordic Conference on Larp. Knutepunkt.
- [5] Chen, L., Harper, M. P., Franklin, A., Rose, R. T., Kimbara, I., Huang, Z., Quek, F. K. H. 2006. A multimodal analysis of floor control in meetings. In Proceedings of Machine Learning for Multimodal Interaction Workshop 2006, 36-49.
- [6] Edwards, R. 2001. GNS and other matters of role-playing theory. The Forge. DOI= <http://www.indie-rpgs.com/articles/1/>.
- [7] Eladhari, M. and Lindley, C. 2004. Story construction and expressive agents in virtual game worlds. In Proceedings of Other Players Conference (Copenhagen, Denmark).
- [8] Fine, G. A. 2002. Shared Fantasy: Role Playing Games as Social Worlds. University of Chicago Press.
- [9] Gabriel, G. C. and Maher, M. L. 2002. Coding and modeling communication in architectural collaborative design. Automation in construction 11, 199-211.
- [10] Hallford, N. and Hallford, J. 2001. Swords & Circuitry: A designer's guide to computer role playing games. Prima Tech.
- [11] Henry, L. 2003. Group narration: Power, information, and play in role playing games. DOI= <http://www.darkshire.net/jhkim/rpg/theory/liz-paper-2003/>.
- [12] Holmes, R. M. and Pellegrini, A. D. 2005. Children's social behavior during video game play. In Raessens, J. and Goldstein, J. (eds.) Handbook of computer game studies. MIT press.
- [13] hutchison, A. 2003. Analyzing the performance of interactive narrative. In Proceedings of DAC 2003 (Melbourne, Australia).
- [14] Kim, J. 2003. Story and narrative paradigms in role-playing games. DOI= <http://www.darkshire.net/jhkim/rpg/theory/narrative/paradigms.html>.
- [15] King, B. and Borland, J. 2003. Dungeons and Dreamers: The rise of computer game culture from geek to chic. Mcgraw-hill.
- [16] Lazzaro, N. 2004. Why we play games: Four keys to more emotion in player experiences. In Proceedings of GDC 2004 (San Jose, California).
- [17] Lindley, C. 2004. trans-reality gaming. In Proceedings of Second Annual International Workshop in Computer Game Design and Technology (Liverpool, United Kingdom).
- [18] Lindley, C. and Eladhari, M. 2005. Narrative structure in trans-reality role-playing games: Integrating story construction from live action, table top and computer-based role-playing games. In Proceedings of DIGRA 2005 (Vancouver, Canada).
- [19] Mackay, D. 2001. The fantasy role-playing game: a new performing art. Mcfarland & co.
- [20] Maher, M. L. and Simoff, S. 2000. Collaboratively designing within the design. In Proceedings of Codesigning 2000 (Coventry, United Kingdom).
- [21] Manninen, T. 2004. Rich interaction model for game and virtual environment design. Internal publication. Department of information processing science. Oulu, University of Oulu.
- [22] Murray, J. 1997. Hamlet on the holodeck - the future of narrative on cyberspace. MIT Press.
- [23] Mäkelä, E., Koistinene, S. 2005. The process model of role playing. In Proceedings of Knutepunkt 2005 (Tampere, Finland).
- [24] Padol, L. 1996. Playing stories, telling games: Collaborative storytelling in role-playing games.
- [25] Peinado, F. and Gervás, P. 2004. Transferring game mastering laws to interactive digital storytelling. In Proceedings of 2nd International Conference on Technologies for Interactive Digital Storytelling and Entertainment (Darmstadt, Germany). Springer Verlag.
- [26] Salen, K. and Zimmerman, E. 2004. Rules of Play - game design fundamentals. MIT Press.
- [27] Searle, J. R. 1969. Speech acts: An essay in the philosophy of language. Cambridge University Press.
- [28] Smith, J. H. 2006. Plans and Purposes: How videogame goals shape player behavior. Center for computer games research. Copenhagen, IT University of Copenhagen.
- [29] Sudweeks, F. and Simoff S. J. 2005. Leading conversations: Communication behaviors of emergent leaders in virtual teams. In Proceedings of 38th Hawaii International Conference on System Sciences (Big Island, Hawaii).
- [30] Tauroza, S., Allison, D. 1990. Speech rates in British English. Applied linguistics 11(1), 90.
- [31] Tosca, S. P. 2003. The quest problem in computer games. In Proceedings of 2nd International Conference on Technologies for Interactive Digital Storytelling and Entertainment (Darmstadt, Germany). Fraunhofer IRB Verlag.
- [32] Tychsen, A. 2006. Role-Playing Games: Comparative analysis across two media platforms. In proceedings of CGIE Conference 2006 (Fremantle, Western Australia).
- [33] Tychsen, A., Newman, K., Brolund, T., Hitchens, M. 2007. Cross-format analysis of the gaming experience in multi-player role playing games. In proceedings of DIGRA 2007 (Tokyo, Japan), 49-58.
- [34] Tychsen, A., Heide Smith, J., Tosca, S. P., Hitchens, M. 2006. Communication in multi-player role playing games – the effect of medium. In Proceedings of 2nd International Conference on Technologies for Interactive Digital Storytelling and Entertainment (Darmstadt, Germany). Springer Verlag.
- [35] Tychsen, A., Heide Smith, J. (in press.) Player Talk - the functions of communication in multi-player role-playing games. In press for ACM Computers in Entertainment (October 2008 issue).
- [36] Wright, T., Boria, E. 2002. Creative player actions in FPS online video games. Game studies 2(2).
- [37] Young, M. J. 2005a. Theory 101: System and the shared imagined space. Places to go, people to be, 26. DOI= <http://ptgptb.org/0026/theory101-01.html>.
- [38] Young, M. J. 2005b. Theory 101: The impossible thing before breakfast. Places to go, people to be, 27 DOI= <http://ptgptb.org/0027/theory101-02.html>.