

# WEARPG: Game Design Implications for Movement-Based Play in Table-Top Role-Playing Games with Arm-Worn Devices

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## 1. ABSTRACT

Combining the physical and the digital is one of the most trending topics in game research in HCI. Augmenting the table-top role-playing games (TTRPG) by adding electronic devices is a growing research area, yet the introduction of new play styles is still open for exploration. We believe that integration of wearable devices and movement-based play, which are also prominent research areas for gaming, hold potential for increasing the TTRPG experience since these are observed to increase the connectedness of players to imaginary world of games by previous studies. However, such augmentation will also bring changes in game design and these changes were not investigated thoroughly in previous studies. To understand how game design of such games may change due to the usage of wearables and movement-based play, we conducted a participatory design workshop with (1) 25 participants, (2) designed a new game system according to our findings and (3) evaluated it with iterative tests with 15 participants in TTRPG sessions. Our study resulted in 8 player-centered game design implications for the use of arm-worn devices and movement-based play in narrative based long-term games like TTRPG. The implications present clues about *forming the narrative, regulating the rules and the functional use of the device in game mechanics*.

## CSS CONCEPTS

• Human-centered computing~User studies • Human-centered computing~Gestural input • Human-centered computing~Ubiquitous and mobile computing • Software and its engineering~Interactive games

## Author Keywords

Wearable Computing, Role Playing Games, Participatory Design, PnPRPG, Guidelines, Player Experience, Play Test, Table-Top, Augmented Games, Exertion Games, Game Design.

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## 2. INTRODUCTION

TTRPG is played in a table top setting (Figure 1) that relies on the social communication of the players. A TTRPG player group usually consists of a game master and players (usually at least two). Game master is the moderator of the game and apart from that he is in the role of a story teller who creates the fictional world. Players assume the role of the fictional characters and guide them in this fictional world and perform some actions. Results of these character actions are usually determined via randomizers such as dice or cards. Therefore, TTRPG environment is filled up with non-digital props like dice, figures or a game board. Still, recent studies investigate the integration of computer assisted devices to such table top games [2,18,20]. These works contribute to the table-top gaming by enhancing different aspects of the games.

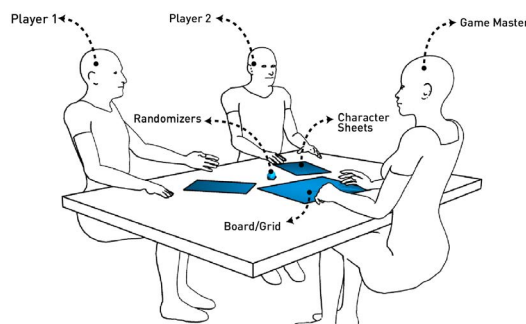


Figure 1: Setting of conventional TTRPG

One part of the former studies in this area focus on shortening the out of game process by transferring processes like dice calculations to the electronic devices [3,19,20]. Several other research made use of audio-visual content which will increase the sensory experience of the players as in computer games [18]. These studies also put forth new rules and mechanics which were raised due to the use of computational power [19]. Previous studies also indicate that, utilization of movement-based play and wearable devices has a potential for increasing one's connectedness to imaginary worlds and ease them to identify with the fictional characters [1,26], which are essential parts of TTRPG. However, we did not encounter the utilization of wearables and movement-based play in TTRPGs.

We believe that movement-based play via arm-worn devices (as the table-top setting renders visible only upper part of the body, we preferred to use arm-worn devices which is attached to the arm, most accessible part of the body [28]) may be a promising new gameplay style which may foster the game-play experience in TTRPG. First of all, movement is claimed to be an activity which increases the engagement with the game by previous studies [5,10,15]. Yet, how movement will affect such narrative oriented table-top game atmosphere is still an unknown question. We believe

that our exploration in this area may provide answers for how to use movement based interaction with narrative involved games. Secondly, previous research suggests that embodied play and modification of body with wearables can increase immersiveness by fostering the identification with the fictional character [1,9,26]. Nevertheless, we believe that complex character creation system and rules of role-playing games need to be reshaped in order to get a holistic feeling of embodied play experience. Therefore, we consider the computer augmentation as a source for new game play and interaction styles instead of considering it a mere implementation for only speeding up and automatize the game process. For creating a computer augmented TTRPG in that sense, we need to go under an extensive user centered design process.

In the direction of above statement, we aimed to understand the player needs and design a TTRPG environment which provides embodied play via wearables. We followed a three pillared design method. First, we conducted a participatory design (PD) workshop to understand players' approach to arm-worn device idea and to elicit further ideas. Workshop consisted of 25 participants from 5 audiences which are *TTRPG players, game masters, cosplayers, jewelry designers and interaction designers*. Second, we designed a preliminary game system, based on movement-based play with wearables drawing upon the insights we got from the workshop. Lastly we tested the game system with 15 participants. Our extensive player centered design process resulted in game design implications which propose insights for the design of embodied games especially for narrative oriented table-top games.

## 3. BACKGROUND

### 3.1 Role Playing Game Systems

There are many role playing systems which focus on different aspects of role playing. Dungeons & Dragons [8], the first role playing game system, has quite complex rules and a play system. Nevertheless, the last version, 5<sup>th</sup> ed., is much more simplified, emphasizing the role playing over the game rules. Vampire: The Masquerade [21] is based on a system called Storyteller/Storytelling which utilizes multiple dice rolling at the same time and put less emphasis on mathematical calculations by highlighting character customization in the system.

Since they came out, role playing games got more and more narrative inclined encouraging free form game play [17]. Everway [27] is a great example of narrative based game system which make players draw cards during character creation and progress on this card drawing system. RPG of Star Wars [16] which was published in 2012 also put storytelling and role playing to priority by simplifying the dice numbers by transforming them into symbols which has a simple rock-scissors-paper logic.

Although dice rolling or cards are common ways of randomizing the play, some role-playing games follow different approaches. Mist-Robed Gate (MRG) [24] is one of these examples which facilitates the play with rules without any randomizers. What is interesting about MRG is the use of a "real knife" for symbolizing the attacks and threats. This role-playing game is designed to be cinematic and all the explanations during the play needs to include also camera angles.

The role-playing systems are too many, yet we discussed several different approaches which put emphasis on different aspects like operational rules, storytelling or role-playing (acting). Throughout the years, game systems give more importance to role-play elements than the operational rules [17]. We believe that computer augmentation via arm-worn devices will also a step forward in this manner by also providing chance to act their characters.

### 3.2 Related Work

Extensive research has been conducted on computer augmented table-top games. The use of computer assisted devices such as mobile, head mounted devices and wearable devices aims at different goals such as increasing the physicality of games, shortening the calculation processes in tabletop games and introducing different mechanics which includes physical environment embodiment.

Stars Platform [19] is one of the computer augmented systems which was designed specifically for computer augmented table top games. Stars Platform is available to be adapted to different games, therefore it lets designers investigate the adaptations of conventional table top games to computer augmented environments. Two games – an adaptation of Monopoly and a RPG called KnightMage – were developed for this platform. Although this research mentioned new game mechanics, rules and interaction styles during the adaptation process, it was not solely focused on TTRPG. Moreover, these changes were not investigated in a way that may guide to the design implications. Another research, Undercurrents [3], specifically aims at augmenting the TTRPG setting and introduces an environment comprises of notebook computers for each player and a software which provides private communication, audio-visual support and real-time documentation. Nevertheless, this study too, did not focus on game design issues occurred during the adaptation of games. In another study, Bergström and Björk investigated 6 different computer augmented games and defined a design space of such games [2]. However, this study presents a broader conceptual space in terms of design instead of focusing on game mechanics or rules. Moreover, none of these studies has implications on movement-based play and wearables.

The usage of wearable devices in physical games may be advantageous in the aspects of mobility or accessibility, nevertheless one of our motivations behind using them is their costume properties which is claimed to foster the bond to the imaginary game worlds. Previous studies by Isbister investigate the utilization of wearables as game controllers and examines the effects on connectedness to virtual worlds [1,9,26]. Bertelsmeyer et al. discusses the game design challenges when wearable devices integrated into the games by conducting a research through the design of a real time strategy game in which the players are involved using their bodies [4]. Although these projects give strong insights about how wearable devices may contribute to the game experience, they do not present user feedbacks about these hypotheses.

Other than these, there are many work which examines the role of the movement in games. Previous research indicates that movement can increase the engagement with the game [5,11]. Moreover, Mueller and Isbister put forth design guidelines for movement-based games, yet the games they examined were mostly casual and did not include long-term gameplay times or were not narrative based [22]. Nevertheless, none of these projects focused on a table-top setting. Furthermore, they do not consider integration of wearables and movement-based play in progressive games with a dynamic story telling.

Our research showed that extensive work has been done for augmentation of non-technological games with computers, usage of wearable devices and movement in games. However, wearable devices and the effects of movement-based play through arm-worn devices were not investigated in the domain of TTRPG. Furthermore, although design guidelines for movement-based games were present, the role of movement were not examined in the context of long-term narrative based games like TTRPG and a

discussion about game design implications has not been raised. In this study, we aim at generating knowledge about the game design characteristics of such adaptation.

## 4. PARTICIPATORY DESIGN WORKSHOP

### 4.1 Participants

The workshop included 25 participants which are *TTRPG players, game masters, cosplayers, interaction designers and jewelry designers* (5 participants from each audience). The information regarding to participants' backgrounds can be found in **Table 1**.

TTRPG players and game masters were our main user base. Cosplayers are hobbyists who design and wear costumes for fictional characters. We included them since their knowledge on producing costumes for fictional characters may contribute to the process. Interaction designers and jewelry designers were the professional participants whose duty was aiding users in design decisions for interaction design and wearable design as arm-worn wearables can also be considered as smart jewelry. For choosing participants, we posted a call to social media pages and e-mail groups related to RPG, games and design. We chose participants among 143 applicants according to their backgrounds and experience in related fields. Participants' breakfasts and lunches during the workshop were reimbursed. Yet, we did not offer any other payment and the main motivation behind their participation was being part of such work for their hobbies. Professional participants which were jewelry and interaction designers may have been motivated by the novel character of the study.



**Figure 2: Some of the non-working prototypes from the participatory design workshop**

### 4.2 Procedure

In order to involve users in the design process from the very beginning, we conducted a participatory design (PD) workshop. PD is a widely adopted method for eliciting design ideas from users and understanding their needs [13]. The workshop lasted two consecutive days, in total 16 hours. In the first day, we wanted participants to create use cases and define the features of the device. Other day, we wanted them to build non-working visual prototypes and test them in game scenarios created and moderated by Game Master participants. They played the game with these non-working prototypes by role playing as if the device is working. Forming user scenarios by the use of role playing and making users explore the design space by creating prototypes was also proposed as an effective method by previous research [25]. At the end of the workshop, participants presented their work with video sketches,

**Table 1: Breakdown of Participants (CP: Cosplayer, IxD: Interaction Designer, JD: Jewelry Designer, RP: RPG Player, GM: Game Master ,S: Sex, XP: Experience in years)**

Part.	Age	S.	XP	Background
CP1	28	F	5-10	Masqueraded more than 10 characters
CP2	24	F	2-5	Masqueraded more than 10 characters
CP3	21	F	2-5	Masqueraded more than 10 characters
CP4	31	F	2-5	Masqueraded more than 10 characters
CP5	20	M	0-2	Masqueraded 3 characters
IxD1	24	F	3	Designer in a web-design company.
IxD2	30	M	2	Musician working on wearable devices.
IxD3	22	M	2-5	IxD student worked in prof. projects.
IxD4	25	M	2-5	Industrial designer working on electronic devices and interfaces
IxD4	26	F	5-10	IxD in a game studio
JD1	27	F	0-2	Industrial Designer with the Fashion Accessories Master Degree
JD2	29	F	>10	Jewelry designer and seller
JD3	34	F	5-10	Fashion Design Researcher with a Master degree in fashion in game design
JD4	25	F	2-5	Industrial designer who designs and sells jewelry
JD5	24	F	0-2	Industrial designer with a jewelry design related work background
RP1	23	F	4-6	Knowledgeable D&D and Custom RPG Systems
RP2	24	M	4-6	More than 5 different RPG Systems
RP3	21	F	4-6	More than 5 different RPG Systems
RP4	21	M	>6	4 different RPG Systems
RP5	21	M	0-2	More than 5 different RPG Systems
GM1	27	M	>6	Knowledgeable in moderating 5 different RPG systems
GM2	33	M	>6	3 different RPG systems
GM3	25	M	>6	More than 5 different RPG systems
GM4	26	M	4-6	3 different RPG systems
GM5	25	M	>6	More than 5 different RPG systems and the co-founder of a RPG

since video sketching is an effective and fast method for explaining use cases. Presentations were followed by a semi-structured group interview in order to learn what participants think about the contribution of the devices.

We facilitated workshop only by making a brief presentation about the usage of wearables in HCI and role-playing games. We did not disclose the idea of using embodied interaction since we wanted them to act on their works free from our mindset.

### 4.3 Outcomes

As a result of the workshop five device concepts were designed by the participants ( Figure 2 and Figure 3). Other than that, the user remarks procured from the semi-structured interview and our observations earned us strong insights about their approach to the idea of using wearable device. The players' found wearable devices effective in several aspects. All of the players and GMs agreed that such device has potential to unveil novel interaction methods and increase the fun factor. Only concern was the distraction that can be caused by the devices. Therefore, players preferred non-distracting interaction techniques.

We will not analyze every project in detail because of the limited space yet we will explain the observed mutual points by referring each project briefly. We will discuss the outcomes under six main themes.

### 4.3.1 Peripheral Interaction Modalities

We observed that participants decided to use peripheral interaction modalities such as gestures, tangible buttons, voice commands as an input. Outputs were mainly in the form of haptic feedback, simple visual and sound feedbacks. We believe that this decision was originated from the concern of possible distractions which will be caused by devices. Peripheral interaction modalities do not distract player by remaining at the periphery and not requiring direct attention. Among all, embodied interaction methods like gestures were also one of these peripheral interaction modalities.

One of the projects called *Nameless One – Group2* (Figure 3b) operates with gestures and body conditions. For instance, if players want to attack to an enemy with a sword, they need to swing their arms instead of just rolling dice. The other project *RProp – Group3* (Figure 3c) made use of gestures which replaces the dice rolling action. Other than that, Group5 with their project *Gauntlet of Fate (GoF – Figure 3e)* used augmented dice and voice commands as input and sound feedback as output. *RPGear – Group4* (Figure 3d) introduced an input modality which includes touching other players. Game Master has to touch a specific player to make her/him affected by the outcome of the move.

We observed that gestural interaction and movement-based game play also may meet with player expectations as two groups decided to use this modality. In workshop, while Group 2 proposed a game play which is solely based on movement, Group 3 used gestures for replacing the dice rolls. Other than that, we observed that participants put emphasis on using peripheral interaction modalities in order to prevent distraction during the game.

### 4.3.2 Auxiliary Props as Interactive Elements

We observed that other than the wearable devices, all concepts had another auxiliary prop in the game environment like dice, figure, grid or other interactive devices. *RPGear – Group1* (Figure 3a) used beacons which are interactive tags for defining the game map and builds a communication between character figures and the device. Group 2 included a double-sided public display as an extension while the Group 3 had interactive figures and a grid. Group 4 did not want to remove dice from the game although the device could perform dice rolls automatically. Group5 integrated augmented dice which sends the rolled value to the wearable device.

Depending on these results, we believe that augmented or not, auxiliary props are important for forming the public information ground of the game which informs all players at the same time.

Apart from letting these props be a part of the game, the interaction between these props and the arm-worn device should be designed as in Group1,2,3 and 5's projects. Among all other elements, dice seem as the most valuable for TTRPG players. One of the players explained the motivation behind keeping the dice in game by saying "Dice is like the treasure for role playing gamers and I am attentive not to lose any of them." Dice was also proven to be an important elements of gameplay experience in board games by previous research [7].

### 4.3.3 Speeding Up the Calculation Process

By design, out of game moments like dice calculations occur repeatedly during the gameplay of TTRPG. All of the groups assigned processes like dice-rolling or storing character information to device. Thus, device has to speed up all of the out-of-game processes. Previous research on CAG role playing games also suggest the advantage of electronic devices in this manner [18,23]. Therefore, the device needs to have all information about the environment, the character properties and the calculation processes. As designers of these kinds of devices we need to think the work flow of setting up the device with all this information. This workflow also should enhance the concentration and role-playing performance of the players without distraction.

### 4.3.4 Becoming the Character

Group4 and Group5 considered devices as a visual representations of the characters. Each device for different character archetypes had specific looks and devices can also be upgraded as the fictional character gains achievements and levels up. *RPGear* (Group4) had slots for achievement tokens to be placed while the *GoF* (Group5) is made of a shape changing cloth which will turn into different forms according to the character properties. Other than that, in all projects, devices included character information and they all refer to customizability although not as structured as in Group4 and 5. We can state that besides facilitating the gameplay, as suggested also by previous work [26], players were tend to see wearables as a part of their fictional character. Therefore, for an increased immersion, relation between device and the characters should be scrutinized by designers.

### 4.3.5 Gameplay Characteristics

A note to mention here was about the change of the gameplay characteristics. Although participants did not raise objections for real-time gameplay, another different characteristic which was the physical challenge-based gameplay was not favored by players. We

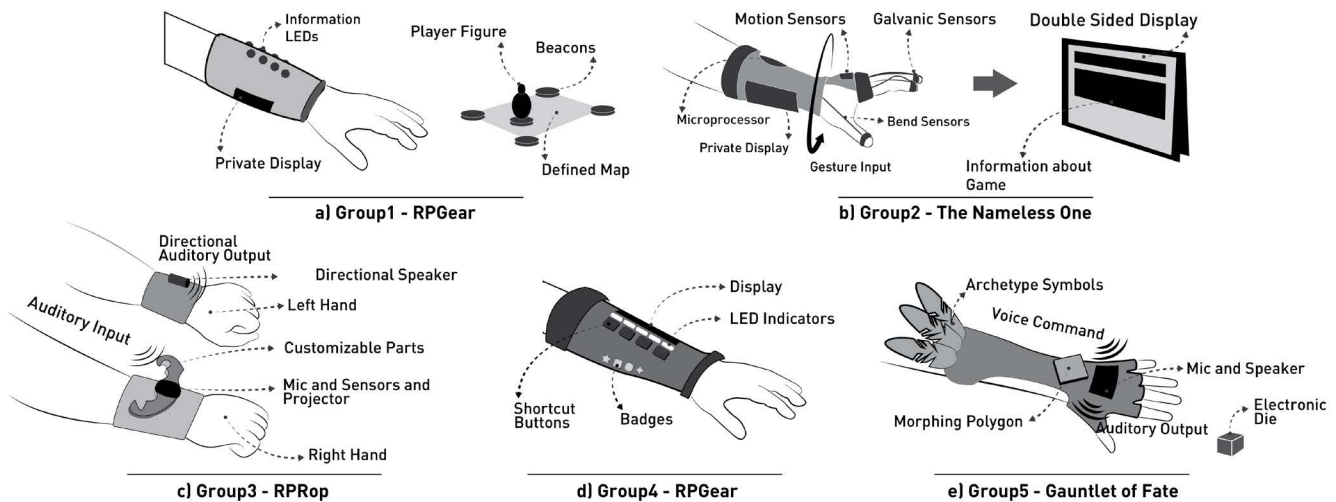


Figure 3: Device instructions for each group

discussed this during the semi-structured interview to understand players' side for this kind of change. One of the players said that "I am a tiny person, however I always role play a barbarian character. How will I overcome the physical challenges which will be faced by my character with my tiny body?" These reactions show that new gameplay or interaction styles may conflict with role-playing elements. Therefore, elements like the fictional character's levels, players' imaginary skills, decisions of GM and role playing abilities of the players should not be overwhelmed by new game mechanics

#### 4.3.6 Scalable Actions

In RPGs, there are vast amount of actions. Therefore, in case of movement-based play, assigning different gestures for every possible action does not seem possible both technically and ergonomically. In conventional RPGs, dice rolls are usually assigned to simple actions which are liable to success check, details of which can be expressed by GM according to the narrative. Participants also followed a similar approach by assigning these kinds of general actions to moves even if they change the gameplay style. Commenting on this approach, we can state that assigning commands to each action is not scalable. Therefore, no action should be precluded because the device does not support them.

This condition drove participants to stick with existing game systems by integrating the technology on top of it. Only Group 1 and Group 2 went with distinct approaches. Players can choose which action (skills, moves etc.) to perform from the *RPGear's* (Group1) private display. Group2 used gestures for different types of attacks like ranged, spell and melee. Moreover, they also considered adding bonus moves like finishing an enemy who is about to die. Although these groups were able to break the routine of RPGs about using dice/randomizers, Group2 kept up with the overall logic of assigning main actions to moves. Group 1 transferred the system from the CRPGs. These two different approaches show that players may be open to new interaction styles with the introduction of the technology yet these new styles should correspond with the limitlessness of role-playing actions.

As a result of the workshop we gained strong insights which will guide us in the game design process. We explained how these insights affected the game design in the following section.

### 5. GAME DESIGN: WEARPG

The workshop resulted in five dimensions we need to satisfy which are (PD1<sup>1</sup>) movement-based play without limiting the role-play elements, (PD2) interaction with auxiliary props, (PD3) speeding up the calculation process, (PD4) ability to reflect fictional characters' properties on devices and (PD5) introducing the new gameplay characteristics without overwhelming the role-play elements. We aimed to satisfy all of the above during the game design process. The game system is still in a preliminary state but it provides a gameplay of 4-5 hours to understand how the embodied gameplay via wearables may affect the player experience. We also exchanged six different role-playing systems which are D&D 3,5<sup>th</sup> and 5<sup>th</sup> ed. [8], Vampire: the Masquerade [21], Shadowrun 5<sup>th</sup> ed [29]., Dragon Age RPG [30], Everway [27] to understand if any of them would fit to our requirements, yet for exploring the effects of new mechanics in a more controlled environment, we decided to continue with a new game system.

WEARPG<sup>2</sup> is a table-top role-playing game with an environment supported by wearable devices (one for each player) and a luck

globe (an augmented dice for the preliminary version). This augmented environment aims to inspire players for new ways of role playing by embodying their fictional characters.

The wearable device can be considered the character sheet which will be carried in the arm. Players can customize the look of the device and creation of the fictional character will be mostly done during this customization. The level of the character, her/his interaction with the environment, skills and moves will all be provided via device. As the character strengthens and levels up it is need to be upgraded accordingly. The other part of this interactive setting is the *luck globe*. Luck Globe is an interactive dice which is also used to perform some of the movement-based tasks.

#### 5.1 Fictional Setting and Character Creation

WEARPG's fictional world is a realm where the five elements – fire, water, air, earth and electric- prevail the nature and all the living creatures. Every breathing has a penchant for one or more elements and has to live their lives with the weakness and the strength bestowed by these elements.

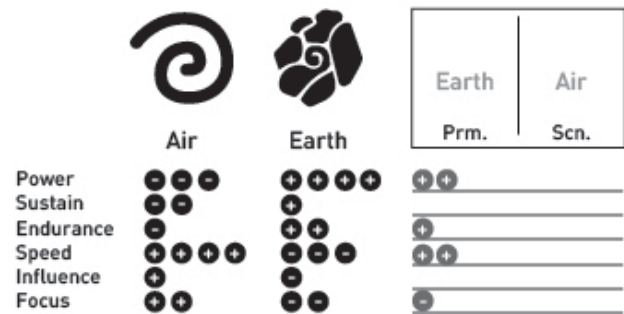


Figure 4: Example character of Earth/Air Combination

The character creation of the game is based on these elements. Each character can choose two elements which is a primary and a secondary. Character attributes are assigned automatically according to their element choices. For example, Earth element is strong in "power", however lacks the "speed" and "focus" which is required for concentration related actions. Air element at the same time is very capable in "speed", good at "focus" however weak in "power". Combination of these two elements creates a character which is not too strong and hasty but balanced in every manner (Figure 4). Players need to attach their *elemental stones* (tangible props) to their devices for choosing their elements.

#### 5.2 How to Play?

WEARPG aims to leave more space to players for role-playing by loading the burden of the calculation to the device. Therefore, most of the character creation is done as players attach their elemental stones to the devices. There are three pillars of the game play session of WEARPG which are (1) activation moves, (2) rolling the luck globe, (3) character skills.

The second and the third pillar are known steps from conventional RPGs. However, WEARPG has another pillar which is the Activation Moves. Activation moves (Figure 5) can be explained as embodied mini games played just before the globe is rolled. These moves can grant the character bonuses or penalties according to the success of the player. After the move is performed, player will roll the luck globe and the outcome will be calculated depending on the

<sup>1</sup> These codes will be referred in the other parts of the paper as the outcomes of the Participatory Design Workshop.

<sup>2</sup> Quick Start Guide can be downloaded from: <http://bit.ly/1TgseVx>

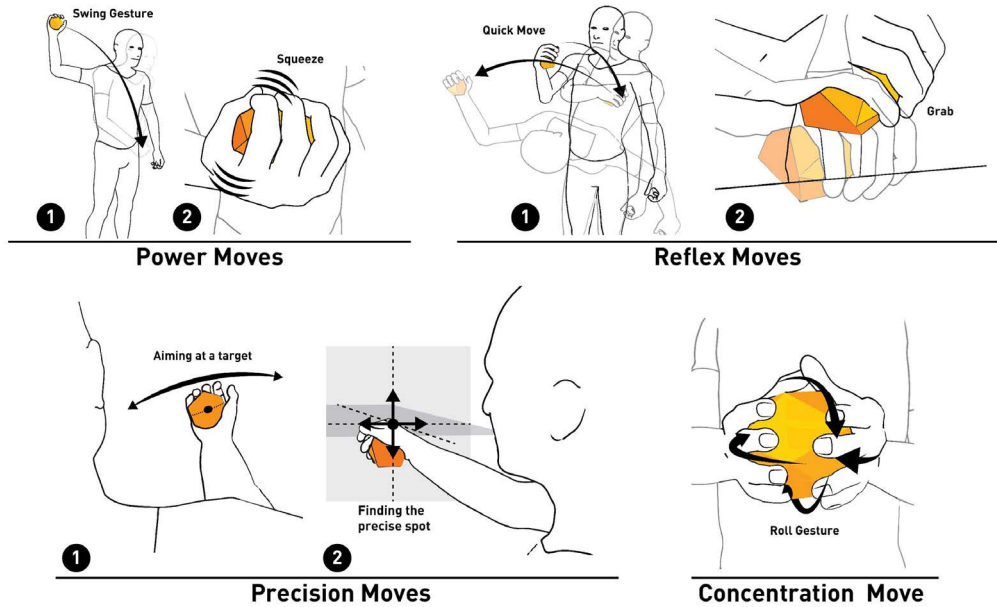


Figure 5: Activation Moves

moves' success, luck globe result and character skills. There are 4 different types of activation moves which are *Power*, *Reflex*, *Concentration* and *Precision*. Power moves requires to squeeze or swing the luck globe as strong as possible before rolling. *Reflex moves* require to move quickly by moving the arm after a haptic feedback or grabbing the luck globe quickly from the table after a visual feedback. *Precision moves* refers to aiming at a target presumably far away by moving the arm according to LED indicators on the wearable device or moving in a precise and delicate way to be able to find an open spot at the target following the haptic feedbacks. *Concentration move* requires to roll the luck globe by finding and maintaining the right rolling speed for a certain period of time or match the right rolling direction according to the haptic feedback from the globe and from the wearable device.

User studies were conducted with experience prototypes and only the luck globe had interactive abilities due to the prototyping issues. Therefore, Figure 5 demonstrates the activation moves as if they are all performed based on the luck globe. In the final implementation of the game wearable device will also take part in activation moves. Activation moves can be combined together. Some of the skills may require more than one activation moves. Therefore, more than one move can be performed at the same time or sequentially.

## 5.3 Motivations behind the Game System Design

### 5.3.1 Luck Globe

Luck globe is the ancillary interactive device in the WEARPG environment. We believe that addition of the Luck Globe to the game system will work towards satisfying players' needs for *keeping the dice/auxiliary props* in the game system. (PD2).

Luck Globe is basically an augmented die which can detect movements of players and give visual and haptic feedback. Form factor of the Luck Globe is not defined yet. Therefore, in the final version it may look different from a dice. Luck Globe, together with the Wearable Device will be responsible for calculations of the moves. The success of the activation moves, outcome of the dice and character skills will all be calculated automatically and *speed up the out of game process* (PD3).

### 5.3.2 Element Based Character Creation

In game system, players need to augment their devices with elemental stones (modules with different looks for each elements) in order to gain their power and define their base character properties. After players are united with their elemental stones, they become *Wearers* according to the game lore. We believe that this kind of direct reference to the fictional characters will be easy to interpret for players and strengthen their bonds by giving them the *capability of reflecting their characters* on the device (PD4). These elemental stones can be upgraded as the character's level raises.

The preliminary version of the game only consists background customization like age, occupation and manner of the character apart from the elements. However, we plan to add more customization availabilities like religious beliefs, alignment, race etc. In this way, while we were able to keep the elemental features as a core property which is easy to relate with characters, side customization opportunities can work as an extra for increasing the belongingness of the devices to the fictional characters.

### 5.3.3 Movement-Based Mini Games

We gathered activation moves under four categories for the sake of scalability. We thought that these four moves can encapsulate all of the actions in the game related with character attributes which are *Power*, *Sustain*, *Endurance*, *Speed*, *Social* and *Focus*. These moves do not rely on discrete gesture recognition but simple data which will be got from sensors. This method is also supported by previous work which proposes guidelines for movement based games [22]. For example, in *Power Move* players can swing their arms in any direction they want. The only important data is their swinging speed. Therefore, we tried to provide players with the opportunity to perform embodied acting without limiting their role-playing space (PD1). Mapping the movements in an imaginative way was also recommended by previous work [22].

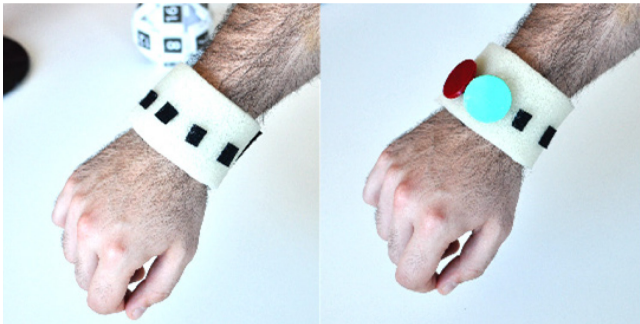
Other than being non-discrete, these moves are also adaptable to each player. There are two conditions for the outcome of the moves. First is the character properties. For instance, if the fictional character's "power" attribute is high, *power move* will be easier to perform meaning that she/he/it will have a better chance of getting high scores. The second parameter is the calibration. The globe and

the device will be calibrated for each player only for once. For instance, a physically strong player needs to apply much more force compared to a physically weak player. Our aim with these two design decisions is to preserve role-playing experience for each player independent from their physical conditions but dependent on their fictional characters' conditions (PD5).

## 6. USER EXPERIENCE TEST

### 6.1 Procedure

We conducted player experience tests to understand how new game system with movement-based play via wearable devices would change the experience of players. We conducted game play sessions with three different TTRPG groups of players and game masters. Each game session lasted around 4 hours and was moderated by the game masters. Quick Start guide was sent to players and game masters prior to test via e-mail. In the player version of the quick start, we censored the parts which may cause biased opinions.

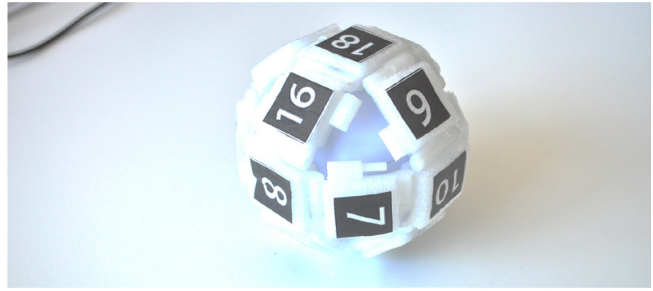


**Figure 6: Experience Prototype of the Arm-Worn Device. (Left) Before Elemental Stone Ritual (Right) After Ritual**

We used the Wizard of Oz (WoZ) method in game sessions. Players wore experience prototypes [6] made out of sponge (Figure 6). These props did not function at all yet the participants conducted the elemental stone integration ritual. Moreover, we explained users the possible interaction methods which will work after implementation. In our plot studies, the Luck Globe was also non-functional. However, the lack of feedback after activation moves hindered the experience of the players. Therefore, we used a Sphero<sup>3</sup> which is a programmable ball and 3D Printed a dice shell for it (Figure 7). Sphero has a simple programming interface and by this we were able to program some of the activation moves. The ones that we could not program like power move which requires squeezing, controlled by us during the gameplay. These moves, as expected from the WoZ, did not function as precise as they should be, yet the applications were enough to facilitate the embodied play.

All of the sessions took place in different locations. One study was in a café, one is in the lab condition and the other one was in a convention area (Figure 8). We especially administered this due to the exploratory nature of the study.

Each game session concluded with a semi-structured interview which aims to get players' opinion for overall game setup, contribution of movement-based play and wearable device, the game system and the adaptation of this setting to other role-playing game systems. The purpose of the interviews was to gain insights about (1) hindering parts of the game environment, (2) benefits and (3) detriments of the new game mechanics, rules and interaction style on the player experience.



**Figure 7: Luck Globe prototype with Sphero**

### 6.2 Participants

15 participants (14 male, 1 female,  $Age_m=26.6$ ,  $Age_{std}=5.46$ ) took part in the study as three groups. Groups consisted of five, four and three players respectively. Each group has one game master. More information about the participants can be seen from **Table 2**.

The game masters were chosen among the participants of the PD workshop. Therefore, they knew the aim of the project however, we wanted them not to tell players about the purpose of the study. We wanted them to choose players from their gaming groups. Therefore, players were chosen by the game masters among the players who they regularly play with. As the game master is an important aspect of the RPG experience we preferred this setting in order to provide ideal experience for each player in terms of game moderation and storytelling in their accustomed environment.



**Figure 8: User Experience Test from the Convention Setting**

## 7. OUTCOMES AND DISCUSSION

Overall the user study encouraged us about the embodied play since the players' reactions towards it was quite positive. Still, there are parts that we need to consider for further improvement and some negative points which should be overcome by revisions.

### 7.1 Movement-Based Play

The participants' reaction to the movement-based play was overtly positive. One of the Game Masters said "Although I did not love how the game system works, I really liked the embodied play part. If this type of play could have been implemented to D&D 3,5<sup>th</sup> ed, I would not play it in the regular way anymore." Another player expressed that he already acted the characters with his body during the game play and a system that rewards the embodied play was quite pleasing for him. Towards the end of the game session one player said "I want to play more with the ball (referring the luck globe)." We observed that the embodied play increased the engagement of the players. One of the players who also moderates other games as a Game Master told that this kind of play can increase the motivation of the players who lost interest to game when the turn is theirs.

<sup>3</sup> <http://sphero.com>

The ambiguity of the activation moves was favored by players. We observed that players were able to perform their moves in different ways according to the story. Moreover, some players expressed that they especially liked the freedom in that sense. The positive feedbacks on this feature corroborates with previous research [22].

**Table 2: Breakdown of Participants (GM: Game Master, XP: Experience in Years)**

Participant	Age	Sex	XP	Session
Player 1	22	M	6	#1
Player 2	32	M	15	#1
Player 3	34	M	20	#1
Player 4	37	M	19	#1
Player 5	24	M	14	#1
GM1	26	M	12	#1
Player 1	21	M	12	#2
Player 2	19	M	1	#2
Player 3	20	F	1	#2
Player 4	21	M	2	#2
GM2	26	M	10	#2
Player 1	27	M	4	#3
Player 2	28	M	3	#3
Player 3	29	M	13	#3
GM3	34	M	20	#3

As we hypothesized before, players also mentioned that embodied play worked towards increasing the connection between them and the character. One of the players said “It helped me to identify myself with my character.”

An interesting remark from one of the players indicated that the game is something between TTRPG and LARP (Live-action Role-Playing Game).LARPs are played in an open field where people act and move around instead of sitting around a table. A previous study named a similar conceptual setting as Trans-Reality Role-Playing Game [14].

### 7.1.1 Considerations

The first negative point for embodied play was about GM’s contribution to the game. In combat position GM had to act all enemies. Therefore, he had to make a lot more activation moves compared to players. When it gets that intense, fatigue can be an issue for GMs. We believe that with exceptional rules about the movement-based play for GM, we can overcome this issue.

One other negative point they expressed was the possible campaign duration. Several players expressed that this play style may not be appropriate for long term engagement and get boring. One player told “I would lose my interest in this type of play soon.” While this may be a disadvantage for experienced players, some players expressed that this may be a good start for casual players too.

We believe that players were concerned with the possibility of repetitive feeling which may be caused by activation moves. Previous research on user experience claims that properties which look fancy and supposed to work towards a better experience may not work as expected in the long term [12]. Yet, in the game context *designing for the self* is a dominant issue since it is a domain where people willingly spare their time and eager to perform tasks outside of their daily routine. Although, activation moves kept players engaged with the game, they took a bit more time than the dice roll and required more effort. We did not observe any fatigue because of the turn-based system, still if players lose their interest on doing the same activation moves it may become dull in long campaigns. Therefore, game design should be shaped in a way that renders the activation moves less repetitive. This can be either done by increasing the variety or providing flexibility on the use of actions.

This negative feedback may be the result of the slow nature of WoZ. In every move, we had to activate the specific code set which created some hassle in the long combat scenes. This effect may be removed when the system is implemented as a working prototype.

## 7.2 Wearable Prop

In our test environment, wearable devices were not interactive and focus was more on the luck globe. We could only explain how the device was expected to work. Moreover, players attached their elemental stones during the character creation process (Figure 6). Although, we could not provide the expected interaction techniques for the devices, we could still get valuable insights about the integration of wearables.

Our observations and participants’ comments showed that wearable props helped players to identify themselves with their fictional character. During the interview one player indicated that the wearable prop helped him to identify himself with the fictional character. One of the players shouted, “I attached my stones, now I got the power” after he stuck the elemental props to the wearable. During the interview, we asked the question “Would it be any difference if the device was not wearable but something on the table?” Players agreed that, it would make a difference. One of the players indicated that wearing the device personalizes the experience. One other players expressed “To identify myself with the character, wearing the device is important.”

### 7.2.1 Considerations

Still some of the players consider the wearable as only a visual prop. One player said “I would wear it only for it is fancy”. This comment was made in the first test session. In this session, although wearable devices should be worn in the middle of the game according to the story, GM got them worn in the beginning. We considered this condition may affect how players perceive the wearable device. In the second and the third test, we asked GM to make players wear the devices when it is told according to the story. In the second and the third tests we took positive feedbacks about wearable device’s effect on player/character relationship.

One other concern about the wearable device was the replay condition. Our design facilitates reflecting the character on the device. However, role-playing gamers can have more than one character for the same game system. When this is the case, will players need to have another device? Or should they rebuild the device from the beginning with different element stones and other possible modules? These questions also should be considered by designers for designing devices which can be customized not digitally but physically.

## 7.3 Game System

Majority of the participants expressed positive opinions on how game system works. One of the participants said “We have played for 4 hours, yet we did not encounter with any serious problems which interrupts the gameplay.” One of the players appreciated how wearing the device is blended into the lore with the “Wearer” concept. In each session, participants agreed that testing the new play style with a game specifically designed for it better since the established games systems have complicated rules which may be hard to adapt and compromise the test purposes.

The game system is still in a preliminary state and even during the tests it is revised according to the feedbacks from players. In the last game session, we took much less feedback which require revision in the game system. Still we observed some fallbacks which should be investigated in further development.



### 7.3.1 Considerations

Although we predicted that our activation moves can encapsulate all the actions, we observed that GMs used other dice for abstract concepts like luck or initiative. We also observed that they rolled the Luck Globe without performing activation moves for a few times. Although this was not a condition that we wanted to prevent, we should scrutinize the rules for further concepts which require success check. We also observed that actions of diplomacy and social interaction with the NPCs in the imaginary world was performed with the *Concentration Move*. We did not consider any activation move for social interaction since it was not kinesthetic but verbal. However, tests showed that we need to regulate the rules for social interaction without extending the current activation moves or define new activation moves for social interactions.

Another consideration is that the game system should be acknowledged by the GMs for a better moderation. In our first test, GM expressed that he would moderate the game in a better way if he had a chance to manage it once more. During our first tests, GMs only watched while players were performing the acts. From time to time we interrupted the story by narrating the activation moves. For instance, while a player was performing the *Reflex Move*, we narrated the process by adding a story like “You evaded the first sword swing, wow it really hit hard in the second, fortunately you saved yourself in the last minute.” The difference of this narrative piece was that it was told *during* the activation move performance rather than *after* the dice roll. Although we could not observe such performance from the GM, when the game is completely designed this recommendation should be in the Game Master Guide.

## 7.4 Other RPG Systems

Although players found that designing a new game system for testing purposes is favorable, they agreed that, after a solid implementation, especially the movement-based play part of the system can be applied to the other game systems. They expressed that rules can be easily programmed if the props are open source.

Still, especially the visual adaptation would be much harder. The first idea coined by the participants was that it may have several different styles according to melee, ranged and magic using characters. However, this may require a major visual redesign or addition to the devices. Moreover, they also expressed some conditions where characters should fake their appearance. Therefore, for the implementation of other kinds of systems more scalable customization properties should be introduced.

As a result of our user study we have seen that movement-based play was enjoyed by players and it works towards a better character identification. Wearable prop also showed that, if it is implemented as working prototype, it has the potential of adding up to the identification feeling with the perception of a character costume. Also the game system was not met with negative critiques, however it should be improved for deeper character customization and activation moves should be regulated or advanced for matching with a broader pack of actions. The most significant concern in the current state is the long term game play conditions which may be hindered by the repetitive structure of the activation moves. These problems can be overcome by regulations in the rules about the activation moves or devising more various ways of using the them.

## 8. GAME DESIGN IMPLICATIONS

Our study which is comprised of a participatory design workshop, design process and a user study gained us valuable game design implications for the design a role-playing game which supports embodied play via wearable devices. We believe that our

implications may help the design of both embodied game play in narrative based games and the interactive devices which aims to enhance the gameplay with new interaction styles.

*1. Device belongs to the fictional world:* In case of augmenting the game with interactive devices, they should be treated as the part of the fictional world. Players expressed that they experienced a better identification with their fictional characters in the session in which the devices were fully integrated with the story.

*2. Providing non-repetitive performances:* Movement should be designed in a way which let players perform actions in different ways. Still, we observed that as long as the nature of the move is the same this may create boredom in players. Therefore, these movements may be flourished either by creating combinations or introducing different versions with different characteristics.

*3. Setting and its relation with the visual customization:* Players expressed that, being able to relate their elemental stones to the fictional world increased their feeling of immersion. However, our discussion with players put forth that the adaptation of such visual connection should separately be considered for other RPG systems. Therefore, if the devices introduced to the game have a place in the lore of the game, players can have a better connection to the fictional world.

*4. Narrating the body moves:* When the activation moves are considered as a part of the game frame instead of the performative frame [17], they may increase the out-of-game moments unintentionally. The nature of the moves should let the GM/Storyteller narrate them during the motion. Therefore, there should be enough time to GM improvise story pieces on them. Other than that, GMs should also be trained for such narrative.

*5. Replay availability of the devices:* RPG players can use different characters in the same game system. The only thing that they need is a different character sheet. In cases where devices represent the fictional character players should be able to switch between characters without much effort. Therefore, visual customization should also be adapted to it.

*6. Increased speed of the game:* When electronic devices are the case, the biggest expectation of the players is to speed up the process. While the devices bring the advantages of the computational power, they also carry requirements like calibration for each player. While designing such games, designers should make sure that new processes does not slow down the process.

*7. Player specific outcomes of movements:* While movements can increase the engagement of the game, they raise the question of how players’ real physical condition would affect the gameplay. In role-playing games outcomes of these moves should change and depend on the abilities of fictional characters. Moreover, actions like squeezing, swinging which depends on power or like evade depending on the reflexes should be calibrated for each player.

*8. Different roles, different play:* Although the GM’s duty is to moderate the game session and to tell the story, we should not forget that they also play the game. However, in embodied RPG, the same rules which applies to players may create fatigue for GM since they had to perform them more frequently. Therefore, exceptions should be defined for the GMs. In movement-based games, designers should consider the movement frequency of different parties.

## 9. CONCLUSION

In this study we tested the embodied play in TTRPG via wearable devices. We applied a design process comprised of a participatory design workshop, game design process and a user experience test.

Participatory design workshop included 25 participants from *TTRPG players, game masters, cosplayers, jewelry and interaction designers*. We designed a new game system according to the outcomes of PD workshop and evaluate the game with explorative user tests with 15 participants.

As a result of our study, most of the players expressed and agreed that their engagement to game and connectedness to fictional character was higher with movement-based game play and wearable props. However, long-term engagement which refers to more than one game session should be treated as a design challenge which should be overcome by regulating the body movements in the game. Moreover, designers should consider ways of integrating the wearable device by forming a connection with the story and scrutinizing the replay conditions with different characters.

Research on movement-based games is growing [22] yet the research is mostly done on casual games which has short gameplay times. Moreover, previous research did not put forth design guidelines about how to integrate wearable devices into games. Our extensive user centered design process gained us valuable insights and let us put forth 8 game design implications *about forming the narrative, regulating the rules and the functional use of the device for game mechanics* which can guide the game designers in the means of movement-based games' and wearable devices' integration to long-term narrative based non-digital games like TTRPG. The implications can also be applied to other kinds of personal gadgets that can be integrated to such games.

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