

# *The Potential of Multimodal Stimuli for Table Top Role-Playing Games with Participatory Design*

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submitted to the  
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# Abstract

In this study, we explored how multimodal stimuli affect creative collaborative settings in tabletop role-playing games, prioritizing external validity. We furthermore aimed to derive guidelines for building multimodal systems for these settings. We conducted an online survey and design workshop to inform a participatory design study with 32 participants and follow-up sessions. In the study sessions, groups of three to six participants played tabletop role-playing games for up to four hours, while experiencing a multimodal set of stimuli.

We prioritized external validity by reflecting real-world conditions by conducting follow-up study sessions and inviting friends, groups, and preestablished groups rather than using lab-setting conditions.

We derived design guidelines based on three factors: the group's focus, the social setting, and the Gamemaster's experience. Our findings provide groundwork for future studies on multimodal systems in creative collaborative settings by guiding which components to prioritize based on the group and context.



# Überblick

In dieser Studie haben wir untersucht, auf welche Art kreative, kollaborative Situationen von multimodalen Systemen beeinflusst werden. Dies haben wir explizit in der Brettspiel-Rollenspiel-Domäne untersucht, mit Schwerpunkt auf der externen Validität. Insbesondere wollten wir ein erstes Design-Regelwerk für multimodale Systeme in solchen Situationen erstellen.

Zunächst haben wir eine Online-Umfrage und einen Designworkshop gehalten, deren Ergebnisse uns darüber informiert haben, wie wir die Participatory-Design-Studie durchführten. Die letzte Studie hatte 32 Teilnehmer:innen, die über mehrere Sitzungen hinweg kamen und für bis zu vier Stunden ein Rollenspiel im multimodalen System in Gruppen mit drei bis sechs Teilnehmer:innen gespielt haben.

Wir haben die externe Validität priorisiert, indem wir Freundesgruppen und bereits bestehende Gruppen eingeladen haben, die zu mehreren Sitzungen gekommen sind.

Wir konnten ein Regelwerk auf Basis von drei Faktoren etablieren. Die Faktoren beziehen sich auf den Fokus der Gruppe, die sozialen Beziehungen innerhalb der Gruppe sowie die Erfahrung der Spielleitung.

Somit konnten wir eine Basis schaffen, auf der zukünftige Studien multimodale Systeme testen können, da Prioritäten je nach Gruppe auf verschiedene Komponenten gelegt werden können.



# Acknowledgements

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Thanks also go to all participants in this study, as they poured time and effort into the study sessions, questionnaires, and the workshop.

I also want to acknowledge other students working at the i10 chair, who provided help and advice and truly supported me in this endeavor.



# Conventions

Throughout this thesis we use the following conventions.

## *Gamemaster*

Gamemaster(GM) is a term for the person leading, or narrating the Table Top Role-playing session Paizo Inc. [2019]. They are typically responsible for the rough story-outline, outcomes in individual moments, and oversee the technical part of the game-system.

## *Table top roleplaying games*

Table Top Role-playing(TTRPGs) usually have both players and a GM. Players play a character in an imagined world that the Gamemaster narrates. These settings and rules vary from system to system and also from group to group. In our study these groups always had one GM and two to five players. Typically sessions last for a few hours and story may continue for months or even years Henrich and Worthington [2023].

## *Participant citations*

Study sessions and workshops were conducted in German, and all quotes have been translated into English. Furthermore, specific participants will be referred to by their ID, and participants will be abbreviated as P. A participant reference is therefore P1, for example.



# Chapter 1

## Introduction

Many everyday moments are shaped by creativity, as creativity itself is a process influenced by participants exchanging and forming ideas collaboratively Anna et al. [2020]. These creative collaborative settings occur in many domains and differing environments. These environments offer different modal stimuli that further shape the creative collaborative process Anna et al. [2020]. Modal stimuli can come from visual and audio-based stimuli like music or pictures; however, not only these but also haptic stimuli affect collaborative creativity im et al. [2023]. Different modes come together forming multimodal stimuli, all impacting participants differently in their creative collaborative process.

Although humans have more senses, this work focused on the multimodality of audio, visual, and haptic stimuli.

This was because audio and visual stimuli both provide spatial information through environmental ambiance and offer direct information across different channels. Especially in the domain of Tabletop Role-Playing Games (TTRPGs), those stimuli were already frequently in use, as reported in an online survey at the start of our research.

Haptic stimuli had been chosen for a multitude of reasons. im et al. [2023] already presented the positive impact it has on creativity and collaboration. Furthermore, vibrational feedback specifically had already been explored in a playing domain by Yun et al. [2026] and Sohn et al. [2026]. Participants generally regarded vibrational feedback as

Creative collaborative settings happen in many situations and are influenced by a multitude of modes.

Visual and auditory stimuli were chosen because of their diverse feedback options.

Vibrational feedback as a haptic mode has previously been explored in video game and creative collaborative settings.

positive and helpful, even when not playing themselves. This motivated us to explore further and include haptic stimuli in a creative collaborative setting.

TTRPGs are a creative collaborative domain that typically tells a story continuously over multiple sessions.

One of these creative collaborative domains is TTRPGs, which are games where a group of friends comes together to create a story of their own in one big collaborative effort. Due to this, the domain of TTRPGs lends itself well to research concerning collaborative creative settings, such as research on multimodal systems in the specified settings. The world of tabletop role-playing games is diverse, with many different game systems. These game systems can range from rule-heavy sci-fi settings such as Lancer Lopez and Parkinson Morgan [2019] to classic fantasy adventures such as Dungeons and Dragons Gyga and Cook [1989]. In these settings, one person often takes on the role of a narrator, and the rest create and play their own character in the shared imaginary world. This often happens in real-world gatherings for a couple of hours at a time, the roles and created characters staying the same but evolving. Many stories are created and expanded over many weeks, sometimes even years.

Multimodality in TTRPGs has previously been explored with artifacts and augmented reality.

Multimodality in TTRPGs is often explored with physical devices, Shyne and Cooper [2025] creating artifacts fitted to specific games and participants. Players enjoyed haptic components and felt physically connected to their imagined character through these devices Buruk and Özcan [2018]. Additionally, Preuschoff et al. [2026] showed that augmented reality, employing sound and visual modes, enhanced immersion into the created world. This was achieved even with low-fidelity representation and atmosphere by Preuschoff et al. [2026], which became especially interesting for our study.

Compared to previous studies, our studies prioritize external validity by doing follow-up study sessions and observing pre-established groups.

The findings of preexisting studies displayed great potential and opened avenues for further exploration. In real life, TTRPG sessions take place between friends and span stories over long time periods. However, many studies do not observe preexisting groups or friend groups, due to limitations. These limitations complicate relating lab findings to the real world.

This led us to the question of how prioritizing factors

like repeated use and social dynamics would change the impact and use of multimodal systems in TTRPG settings. This would ensure higher external validity by repeatedly having preexisting groups and friends experience the multimodal prototype, compared to previous studies, which were limited in study session repetition and social dynamics by choosing already established groups.

Based on these factors, we conducted a participatory design study with nine groups, of which seven participated in multiple sessions. The sessions were two to four hours of the groups' chosen tabletop role-playing game, while utilizing our multimodal prototype set-up. We provided vibrational, auditory, and visual stimuli as well as a control interface and integrated the group's feedback continuously to shape the prototype further.

Our participatory design study consisted of nine groups experiencing a multimodal system over one to three study sessions.

We formulated design guidelines for multimodal set-ups tailored to specific creative collaborative settings, considering group dynamics and individual participants. Our work started with an online survey with over 50 participants; then we built a prototype and refined it in a design workshop. We then tested and further refined the prototype in a participatory design study with follow-up sessions. We found differences in use depending on the group's focus, the Gamemaster's(GM) experience, and the social setting.

Our design guidelines regard usage of multimodal stimuli depending on each group's social dynamic, focus, and the Gamemaster's experience.



## Chapter 2

### Related work

Often, a first step in multimodal TTRPG research is immersion and players feeling connected to the character. Because TTRPG players have a fixed character they play and connect with in an imagined world, researchers have tried to make them feel physically connected through a variety of physical devices Shyne and Cooper [2025]. Another approach explored gauntlets and augmented dice in an exploratory design study Buruk and Özcan [2018]. Players enjoyed the physical connection and felt connected, especially because it did not replace existing physical components like dice with digital versions. One approach that differed from the physical-device trend showed that players in a fitting augmented reality setting felt greater immersion and connection to their character Preuschoff et al. [2026]. In particular, only atmospheric ambiance still significantly helped participants' immersion. Both studies applied rather complex set-ups, whereas this aimed to adapt simpler technology to the purposes of multimodal systems. As our study has a smaller scope in terms of complexity and cost of used technology, this is promising for further exploration.

Both devices and augmented reality enhance participants' experience while playing TTRPGs.

While exploring multimodal TTRPG systems, two doors naturally opened: one leading to typical board games expanded with technology, and the other to video games with haptic stimuli. For these hybrid board games, participants found devices that needed time to configure and

Studies regarding multimodal stimuli in board games and video games explored vibrational haptic feedback.

took up table space less desirable. This led to devices needing to earn their place on the table or to be forgone Soraine and Rogerson [2025] Soraine and Rogerson [2026].

On the other hand, haptic stimuli in video games had a unique effect, especially for spectators of first-person shooter games. Haptic stimuli, such as a vibration to the controller held by the spectator, heightened their attention and gave a feeling of usefulness; the participant actually playing felt less strongly Sohn et al. [2026]. This led us to theorize that vibrational stimuli can keep players invested and interested, even over three- or four-hour TTRPG sessions.

Our study invited pre-existing and friend groups for multiple study sessions and provided haptic, auditory, and vibrational stimuli.

These directions suggest several ways to further explore the impact of multimodal stimuli in creative collaborative settings, such as TTRPG sessions. While focusing on TTRPG research, many noted a lack of certain external validity factors Shyne and Cooper [2025]. Long-term observations, in particular, seemed rare, even though TTRPG sessions typically last weeks to years. Furthermore, most of these groups are friends, but this was not the case in most studies. This differed from our study, in which we purposely recruited preexisting groups and friends to participate in multiple sessions. Similarly to the Preuschoff et al. [2026] distinction between Room Space, Table Space, and Player Space, we wanted to iterate on components within these three dimensions.

## Chapter 3

# Own work

### 3.1 Research Approach

Because our research addressed not only initial feature use cases but also the evolution and aspirations for a multi-modal system, we chose a participatory design approach. This approach has also been used in the TTRPG realm by Buruk and Özcan [2018]. We realized this by basing the prototype for the main study on an online survey and a follow-up design workshop. We integrated the feedback and used it to refine the system before starting user studies. Between user study sessions, we also iterated the prototype to accommodate each group's wishes.

We chose a participatory design study and adapted Space dissection by Preuschoff et al. [2026].

As groundwork for our choices of modes, features, and placements, we followed Preuschoff et al. [2026]. In their research, dissecting spaces into Room Space, Table Space, and Player Space was very promising. Originally, we planned to fill each space with one of each mode, but haptic and auditory features were hard to realize appropriately in all spaces.

To decide which haptic stimuli to choose, we drew mainly on a study of video game spectators receiving vibrational feedback Sohn et al. [2026]. For participants spectating a

Vibrational stimuli were chosen because they have been previously studied in video game and creative collaboration settings.

video game and receiving vibrational stimuli, perceived usefulness was higher for spectators than for the players themselves. Yun et al. [2026] similarly investigated vibrational feedback while playing a video game. Because video games share an aspect of play with TTRPGs, we were motivated to explore how vibration translated into this domain and implement it as the haptic component. The desire for a physical stimulus component was mainly derived from Buruk and Özcan [2018], as a physical connection to the game was important to many participants.

For a low mental load, we chose a simple interface.

For the final interface, we prioritized a simple, non-overwhelming approach to avoid overloading the GMs' mental load. Shyne and Cooper [2025] and Katifori et al. [2022] highlight the importance of this.

We prioritized external validity by inviting friend groups to multiple study sessions.

**External Validity** Instead of focusing on internal validity, we prioritized external validity. This shift in focus means prioritizing groups being comfortable with one another, ideally by knowing one another beforehand, and groups coming back for multiple sessions to overcome any novelty effects that may occur in the first session. To ensure a higher external validity, groups were asked to come in for multiple sessions. Additionally, we specifically recruited friend groups and preexisting groups. Of the nine groups, seven participated for two to three sessions each, and six were friends or pre-established groups.

## 3.2 Research Questions

We aimed to construct design guidelines for and derive the impact of multimodal systems for TTRPGs

Our Research aspired to answer two questions:  
 How do multimodal stimuli affect creative, collaborative TTRPG sessions when external validity is prioritized?  
 How should multimodal systems be designed for different TTRPG groups?  
 Deriving guidelines for future work to expand on was the optimal result we aimed to achieve.

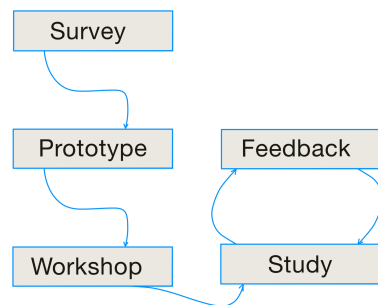


**Figure 3.1:** A diagram showing the study design progression as a flowchart. The chart starts with a box, symbolizing the online survey leading into a box for the design workshop, then leading into a box for the study, which is in a cycle with the box for the feedback given by the groups.

### 3.3 Study Structure

Figure 3.1 presents the methods used to prepare and conduct the study. A Survey helped form the baseline of information to build a prototype. We refined this prototype in a design workshop before using it and expanding it further during the study sessions and through participant feedback.

Our study started with an online survey; we then built a prototype, conducted a design workshop, and finally held a participatory design study with follow-up sessions.

### 3.4 Study Design

#### 3.4.1 An Informative Online Survey

The first step after the literature review was an online survey distributed across multiple tabletop role-playing forums to gauge interest, first impressions, and potential use cases for the envisioned prototype features.

The online Survey provided a first overview of participants' impressions and ideas on the three stimuli.

**The Online Survey Participants** The survey yielded 58 valid responses: half were exclusively players, 13,8% were exclusively GMs, and 36,2% claimed both roles. Genders were split between male 44,64% and female 42,86% and

Participants were diverse in gender, age, and education.

12,5% non-binary participants.

The median age was 27, with a range of 15 to 54 years. Most participants had a bachelor's degree or higher, with 19% having a PhD. The rest were 22.41% with Abitur or lower and 1.73% without an answer.

Across the three stimuli, sounds ranked best, while many were unsure about haptics.

**Online Survey Findings** The Survey provided a good overview of existing setups in various tabletop groups, many of which used dice, maps, and figurines. Some groups already used background music or ambiance; a few even implemented colorful lights for ambiance.

Afterward, participants shared their initial thoughts and potential use cases for vibrational haptic chairs, sound systems, and light systems while playing their TTRPGs. Vibrational feedback was received hesitantly by 53,33% most often, because participants thought it would not fit the casual atmosphere and would potentially be uncomfortable. The other participants showed interest in utilizing the haptic chairs for bigger impact in combat or story moments.

A light system was overwhelmingly positively regarded, with 61,9% wanting to employ it for atmosphere. Some raised concerns about ease of setup and integration with existing smart home systems.

Similarly, a sound system was mostly positively received, though 9,5% were hesitant, typically due to worries about distractions. The most common use-case ideas regarded background soundscapes and prepared sound effects in combat situations.

Lastly, when asked about concerns, participants frequently mentioned not wanting to burden the GM and even building systems that could reduce the mental load for GMs.

### 3.4.2 The Workshop Prototype

The initial prototype, intended for the design workshop, was built with intentionally low fidelity. This prototype included only a haptic vibrational chair, one dimmable RGB lightbulb <sup>1</sup>, one speaker, and a TouchOSC interface to control the three components.

The chair had a ten-watt body shaker <sup>2</sup> attached underneath the seat. This shaker was connected to an amplifier <sup>3</sup>, which received the audio signals via an aux cable connected to a Laptop. The sounds could be played by pressing corresponding buttons on the interface, which sent an OSC signal to Node-RED. Node-RED converted the signal and notified Home Assistant, which then played the audio file on the outgoing aux. The same path was taken for the speaker and the light as well, only differing in the last signal not being a sound file, but a Zigbee command from Home Assistant <sup>4</sup>.

For the workshop, the prototype had one haptic chair, a dimmable RGB lightbulb, and a speaker, which were controlled via Home Assistant

### 3.4.3 The Design Workshop

The workshop included eight participants, five of whom later participated in the main study. In the design workshop, eight participants explored and defined the previously built prototype, each trying one feature per mode on its own. The workshop took place in German with four female, two nonbinary and two male participants.

Eight participants reflected and brainstormed on their ideas for each feature in the design workshop

The workshop structure consisted of going through each of the three features, first showing them to the participants and letting everyone interact with the feature by pressing buttons on the interface. For the chair, this also included

<sup>1</sup>ZigBee Lamp [https://www.reichelt.de/de/de/shop/produkt/smart\\_light\\_lampe\\_tint\\_e27\\_10\\_w\\_kit-225907](https://www.reichelt.de/de/de/shop/produkt/smart_light_lampe_tint_e27_10_w_kit-225907)

<sup>2</sup>BodyshakerEX45S [https://www.reichelt.de/de/de/shop/produkt/koerperschallwandler\\_ex\\_45s\\_10\\_w\\_8\\_ohm-93644](https://www.reichelt.de/de/de/shop/produkt/koerperschallwandler_ex_45s_10_w_8_ohm-93644)

<sup>3</sup>amplifier class D PAM8403 [https://www.reichelt.de/de/de/shop/produkt/entwicklerboards\\_-\\_audioverstaerker\\_klasse\\_d\\_pam8403-323066](https://www.reichelt.de/de/de/shop/produkt/entwicklerboards_-_audioverstaerker_klasse_d_pam8403-323066)

<sup>4</sup>Home Assistant Website <https://www.home-assistant.io/>

sitting on the chair in addition to using the interface. After a short test of the provided feature, each participant brainstormed potential use cases by writing them down on a provided piece of paper. Immediately after that, participants formed pairs to further ideate on their use cases. Afterward, each pair presented their ideas in a discussion round, which concluded that section of the workshop.

After exploring all features individually, participants were free to try combinations while taking a break. This was followed by an additional brainstorming session on further features participants might enjoy in the prototype. Finally, participants were asked to determine their priorities for such systems and then to create their own ideal system and interface on paper.

In the workshop, light and sound received positive feedback, and improvements on haptic chairs emerged

**Design Workshop Findings** While light and sound systems were mostly deemed very important, haptic feedback was criticized because the implementation was less than ideal, and concerns about it being annoying were also raised. Requests to fix the issues included strengthening the body shaker, moving it from under the seat to the backrest, armrest, or table, and trying a localized wearable vibration instead. Furthermore, mentioned use cases and requests for lights concerned player-specific lights to display health in combat, status, or actions of the player's characters.

### 3.4.4 Refining the Prototype

Based on feedback from the design workshop, we refined the prototype before starting the main study.

We implemented the feedback by strengthening the vibrations and moving the bodyshaker location

**Improvements to the Haptic Stimuli** To address criticism of the haptic chair, we upgraded the body shaker to a 100-watt unit with an appropriate amplifier. As three

such body shakers were already available and attached to wooden platforms due to another project, they were used in addition to three body shakers which were attached to the backrest of the chairs instead of directly under the seat. This significantly improved the location and strength of vibrational haptic feedback on the chairs. To address requests for localized wearable vibration, we added six small, coin-shaped vibrational motors <sup>5</sup> to the prototype. Each vibrational motor had a esp32 chip <sup>6</sup> connected to it, allowing wireless control over Wi-Fi to Homeassistant. This allowed one vibrational motor per player, or more in groups with three or fewer players.

**Improvements to the Sound System** A main finding from the workshop was the high importance of sound, especially the ability to use background music, ambiance, and effects. This is why we set up two Wi-Fi and up to two Bluetooth speaker boxes, which groups could freely place within the set-up area. The GMs then discussed a variety of sound needs and requests and prepared everything requested before the next study session.

As requested, the sound system gained three speakers for music, ambiance, and soundeffects

**Improvements to the Light System** In the workshop, participants shared many ideas of how to use the light system. All players wanted to explore ambiance lights that could be very bright or colorful and dim, so they needed strong, multiple light sources. Some participants also suggested using them as personal indicators for health, spells, and the order of turn-based play. This was realized by providing up to eight ambiance lights and up to four table lamps.

The light system expanded by gaining more lights, both as ambiance lights and as lamps clamped onto the Table

<sup>5</sup>DC-Vibrationsmotor, 3V, 80mA, 10000rpm [https://www.reichelt.de/de/de/shop/produkt/dc-vibrationsmotor\\_3v\\_80ma\\_10000rpm-330549](https://www.reichelt.de/de/de/shop/produkt/dc-vibrationsmotor_3v_80ma_10000rpm-330549)

<sup>6</sup>Xiao ESP32C6, WiFi 6 / BT5.0, Zigbee, Thread [https://www.reichelt.de/de/de/shop/produkt/xiao\\_esp32c6\\_wifi\\_6\\_bt5\\_0\\_zigbee\\_thread\\_mit\\_header-406831](https://www.reichelt.de/de/de/shop/produkt/xiao_esp32c6_wifi_6_bt5_0_zigbee_thread_mit_header-406831)

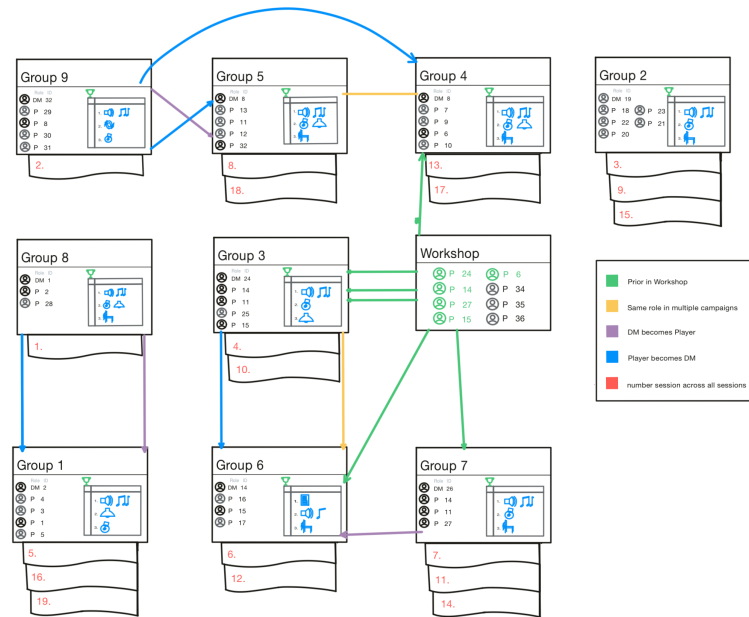


**Figure 3.2:** A Diagram presenting each group, its number of sessions, and shared participants between groups. A rectangle represents each group, showing participants, their overall top three ranked features, and each session as a smaller shape added below the main rectangle. An arrow represents each participant that was in more than one group. Arrows are color-coded depending on whether the participant stayed in the same role or switched roles between groups.

### 3.4.5 The Study

#### The Study Participants

Nine groups and a total of 32 participants took part in 19 study sessions.

The main part consisted of 19 sessions in which 32 participants, distributed across nine groups, played a TTRPG system of their choice for up to four hours. Groups 1, 2, and 9 were already preexisting groups, one of which continued to play their current game. Additionally, groups 3, 6, and 7 were previously friends and decided to start a game for the study; however, none of the three GMs were typical GMs in their friend groups. The last three groups, groups 4, 5, and 8, originated from two GMs who regularly

lead games in the local roleplaying forum as well as for friends, and proceeded to do the same as in the study sessions. The connection between groups and the number of sessions is further shown in 3.2. All participants were German-speaking; the study also took place in German.

Just over half of participants identified as male, a quarter as female, and the rest as non-binary. The median age was around 27,5 years, though the age range spanned from 21 to 54 years. Around 65,5% held a bachelor's degree or higher. Across all studies, the average number of sessions each individual participant participated in was 2.72, with the most common amount being 2 sessions per participant.

Participants were high in age, gender and education diversity.

### The Multimodal Study Set-up

The final set-up had up to eight ambiance lamps hanging from an aluminum frame and up to four additional lamps clamped on the table. Additionally, up to three speakers could be placed inside the study area. Haptic components were limited to one per player, as each had a haptic chair and a vibrational motor. Figure 3.4 shows an example setup requested by group 6 in their second and final study session. The technical set-up with Home Assistant is displayed in 3.3.

We gathered first impressions and opinions on the provided concepts through an online survey. Because many participants wrote about using physical components such as dice, minis, and maps, we kept the Table Space as free as possible. Many GMs also worried about a high mental load while managing the group, which is why we searched for an intuitive, easily adjustable interface. Additionally, phones, tablets, or laptops were often mentioned as resources and management tools while playing, so we could host the interface on these devices without introducing additional hardware. For the interface, we used Home Assistant and its extensions, Sendspin Bluetooth Bridge and Music Assistant, for more seamless control over the audio components.

The study set-up contained eight ambiance lamps, four table lamps, up to six haptic chairs, and up to four speakers, all controlled via Home Assistant.

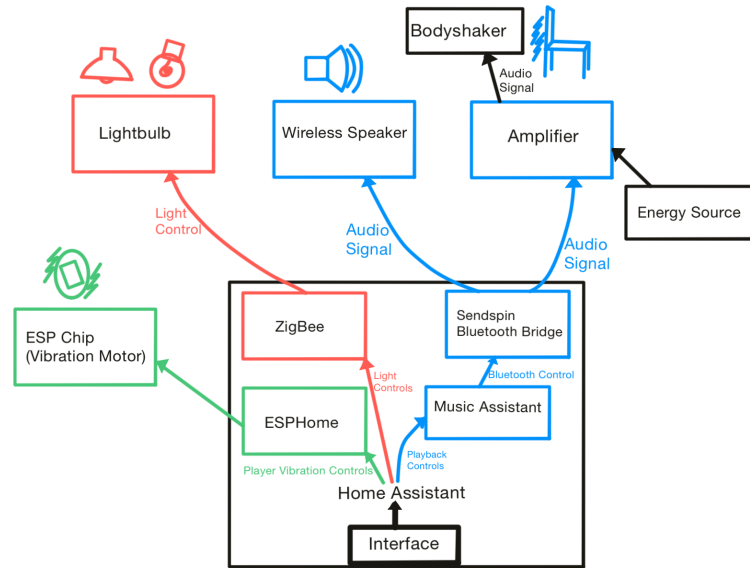


**Figure 3.3:** The technical set-up of the multimodal system. Home Assistant has a ZigBee connection, and ESPHome, Music Assistant and Sendspin Bluetooth bridge as extensions. The diagram displays the different channels of controls to each system feature.

The Room Space had lamps for visual stimuli and speakers for auditory stimuli.

**Room Space** For Room Space, we omitted haptic stimuli because there was no feasible or meaningful way to incorporate them. We provided auditory stimuli via wireless Bluetooth and WiFi speakers. We provided visual stimuli with up to eight dimmable RGB lightbulbs hung from the ceiling. We purposely left them without lampshades to keep it as open to interpretation as possible.

Body shakes on chairs, speakers, and table lamps filled the Table Space.

**Table Space** For the Table Space, haptic stimuli were actualized through chairs that had bass shakers attached to them either at the back of the chair or on a platform the chair was placed upon. Sounds could be played over an aux cable to all chairs at the same time, vibrating in the patterns of each sound's bass. The same type of lightbulbs

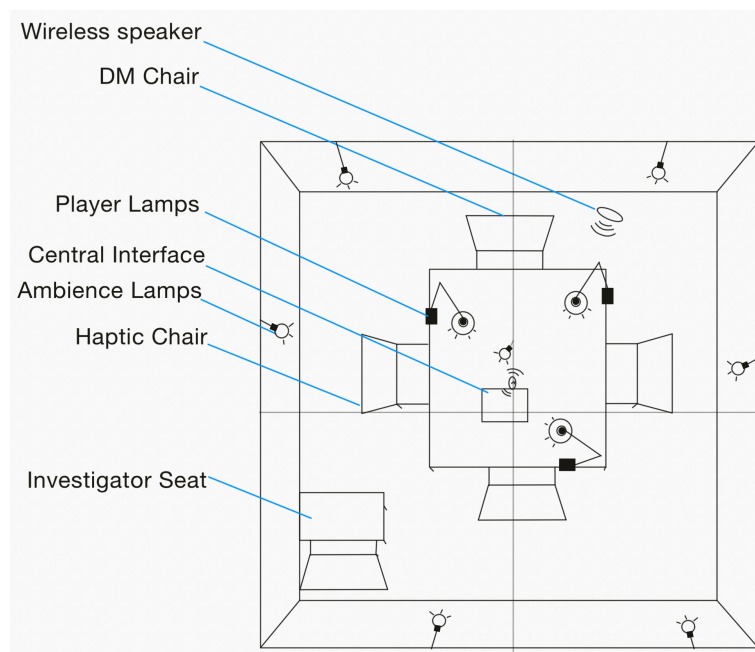


**Figure 3.4:** A diagram showing group 6's setup in the second session. Three player chairs and one GM chair are placed around a table in the middle of a room. An additional chair and table are placed in the lower left corner as the investigator seat. The diagram portrays ambient lamps hung from the aluminum frame on all sides of the table, table lamps on each side of the table, and music boxes placed in the room.

provided the visual stimuli, either hung directly above the table or clamped directly to the table. The speakers used in Room Space overlapped with the Table Space and were moved on the table or in the room depending on each group's needs.

**Player Space** In the Player Space, an ESP32 chip actuated small vibrational motors and controlled them via the Interface over a wireless connection to Home Assistant with ESPHome. For the first three sessions, all vibration motors were controlled by an ESP chip placed underneath the table where each participant sat. For those sessions, two flexible cables ran from the vibration motor to the centered ESP

In the Player Space, each player was assigned a wearable vibration motor and a table lamp

chip. For the visual stimuli, we used the same type of light-bulbs; however, they were in lamps clamped to the table, with one lamp assigned per player. We considered sound stimuli but did not use them, since we did not want to inhibit the social aspect by giving participants headphones, and other sound options were either not feasible or not limited to the individual players.

We customized a dashboard to trigger effects and scene changes for each GM each Session in Home Assistant.

**The Interface** The control over all components was handled through Home Assistant, a smart-home application that allowed for dynamic and individualized dashboards, which later served as the individual interfaces each GM got access to. Over the course of the study, we also gave players slimmed-down versions of the interfaces, allowing effects and, at times, certain lights to be controlled by players as well as the GM. An exemplary interface from the first session is displayed in 3.5, as this group focused mainly on an arena fight; crowd noises and monster effects played the central role.

### The Study Procedure

The groups filled out Likert scale and open-ended questionnaires each session.

The main study involved 32 participants across 19 sessions in nine different groups. Seven groups came back for up to three sessions. Each group received Likert scale questionnaires in the middle and at the end of each session. They were encouraged to change features or uses of the set-up to their liking between sessions. From the second session onward, an additional questionnaire was handed out before starting the game.

The sessions took up to four hours of play time for each group in addition to preparation meetings with the GMs.

Because of time limitations, individual study sessions were limited to a maximum of four hours each, and the GMs were asked to use every feature. Further, before having the first study sessions, the GMs explored the set-up in person and planned possible uses and wishes with the principal investigator. This included drawing the technical components onto a sketched map of the setup to place speakers and lamps. We also raised questions about each component

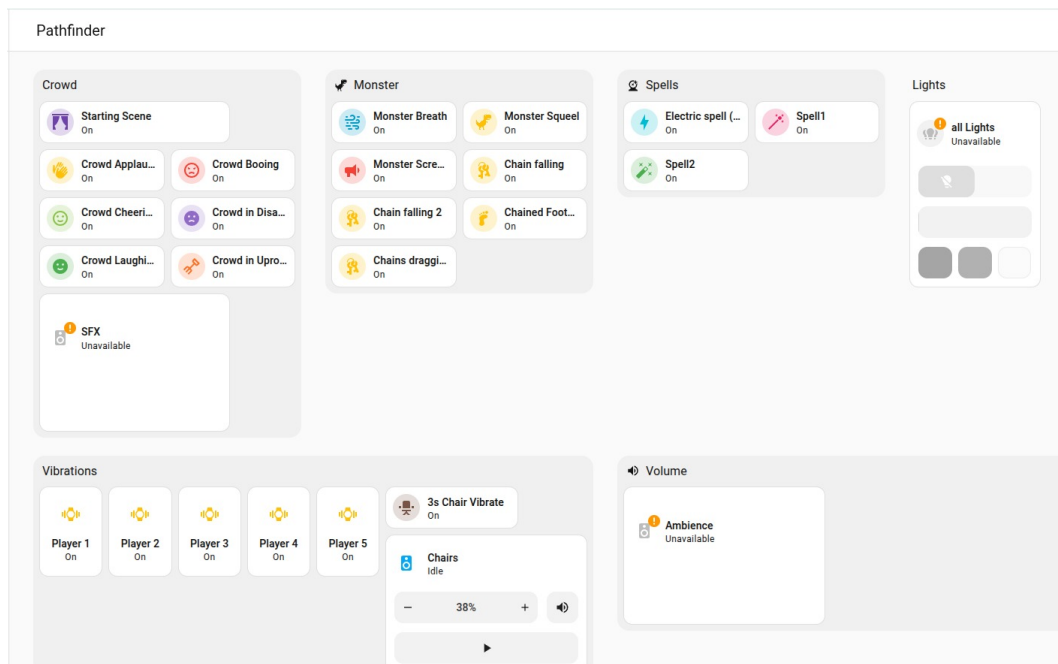


**Figure 3.5:** This is the interface used by group two in their first session. Different effects are categorized by use case; crowd noises share one category, as do the monster sounds. All effects had been previously requested and discussed with the participant, the GM of group two 19.

and how to use them in combination, and brainstormed with the GMs.

### 3.5 Data Collection

We recorded everything on an iPhone 14 provided by the institute, with a private Samsung ZFlip6 as a backup. Because the main recording device had technical difficulties and the backup device had data corruption issues, some sessions were recorded only partially as audio files.

We handed out questionnaires with Likert scales and open-ended questions in the middle and at the end of each session. During breaks and at the end of each session, participants gave open feedback, and we held informal discussions to gather additional feedback. All questionnaires are available in the appendix.

Filming was done with two phones as well as supplementary audio recording on a tablet.

The questionnaires covered the impact participants felt from the prototype, as well as a ranking of the features. We also asked for additional ideas and criticism.

### 3.6 Data Analysis

Qualitative analysis was conducted on the questionnaires and videos, as well as statistical analysis of the Likert scale answers

We conducted qualitative analysis of all questionnaires, followed by statistical analysis of Likert scale responses. These informed the Reflexive Thematic Analysis conducted on the video material for most groups. We limited analysis to groups with at least one follow-up study session, as the focus shifted to observing participant behavior over time. After coding and identifying themes across all analyzed videos, we additionally interviewed three study participants. P 14, 8, and 2 had been players in the study and then chose to host another group as the GM. They were asked about how the player experience shaped their usage of features, specifically the haptic components. Specifically, P 14 chose to use the vibration monitors as in-game objects rather than as a way to provide indications through vibration.

#### 3.6.1 Qualitative Analysis on the Questionnaires

Participants enjoyed personalized interfaces for players and expressed further creative use cases for future projects.

As a first step, we read all questionnaires group by group, mapped answers, and noted initial trends across participants and use cases. As we read everything, we recorded Likert-scale data in a table and highlighted particularly interesting reasoning in the open-ended questions. This step prepared the Likert scale data for analysis and helped identify initial patterns between participants' behaviors and opinions on the multimodal stimuli. Mainly, these questionnaires extracted participants' wishes and criticisms. While most players enjoyed the interfaces, ideas for shared screens and interfaces were mentioned multiple times. P 19 and 15 wished for a digital map, and after experiencing a central interface for puzzles, P 12 wished for both a constant central screen and personalized interfaces.

Participants requested further changes to combine the interface with, or fully replace, analog buttons, as scrolling or looking at the screen was bothersome, as noted by P 8. This was strengthened by players often forgetting their interface, such as P 20. Participants also felt distracted by their phone, which displayed the interface and therefore chose not to use it; this was the case for P 13.

Participants wanted the interface on separate devices or as analog buttons.

Other wishes often concerned the sound system, wishing for surround sound, like P 22 and 27.

For haptic components, especially the wearables, several participants complained that the attachments were uncomfortable. Commonly, participants felt they did not use the wearables enough to justify the discomfort from uneven edges and tape; P 13 and 14 explained this. P 14 felt the wearables needed to be used enough to warrant the discomfort or be disregarded.

Players often requested more local vibration and different attachments.

Overall, participants tended to want higher-quality sound systems and more comfortable haptic-stimuli wearables.

Generally, participants wanted higher-quality sound and more comfortable wearables

### 3.6.2 Statistical Analysis of the Questionnaires

Although the qualitative Reflexive Thematic Analysis formed the larger part of the results, statistical analysis of the Likert scale and feature ranking provided additional insight.

Statistical analysis of the questionnaires provided a ranking of all features, with sound being the highest-ranking one.

In the statistical analysis, we saw a generally positive reception of the personalized interfaces, shown in figure 4.4 as well as a positive reception of the overall prototype, shown in figure 3.6. Additionally, we mapped GMs' Likert-scale responses to whether the prototype distracted them and whether it had a positive or negative impact across consecutive sessions in figure 4.7.

We then calculated each feature's ranking using the median

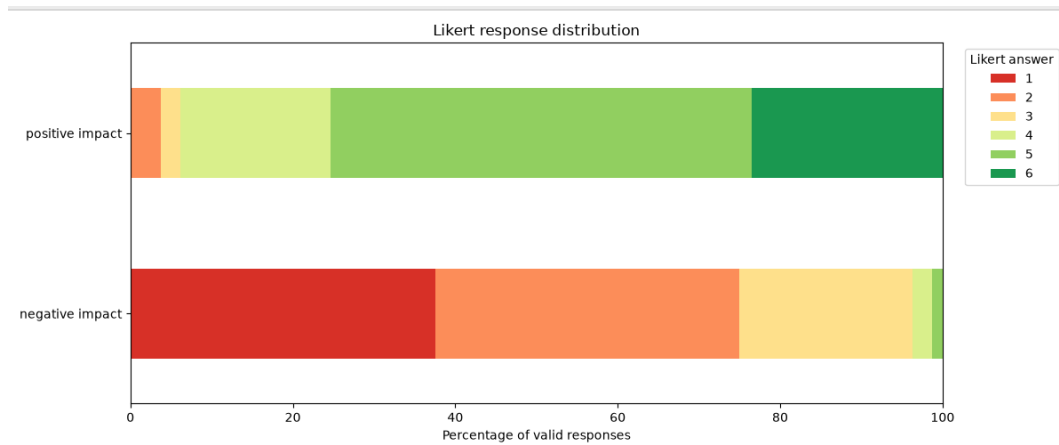


**Figure 3.6:** A diagram showing the distribution of Likert scale responses to whether the prototype had a positive or negative impact on the playing experience. Answering one meant strongly disagree, three somewhat disagree, four somewhat agree, and six strongly agree. Most participants felt a positive impact and no negative impact.

answer across all responses, and compared them. The results are shown in 4.6, with sound and light among the top features and haptic stimuli ranking lower. We processed Likert-scale answers in Python to turn selected columns into diagrams and compare answers over time, groups, or participants.

Additionally, 3.2 displays each group's overall top three ranked features.

### 3.6.3 Reflexive Thematic Analysis over the Videos

Seven groups had two or three sessions; their videos were analyzed in MaxQDA.

We analyzed the videos using Reflexive Thematic Analysis, as established by Braun and Clarke [2006]. Reflexive Thematic Analysis formed the main part of the data analysis. This consisted of coding the recorded videos in MAXQDA<sup>7</sup> with playing phases, uses of the prototype, and reactions and impact of our prototype on the participants and their game, and vice versa. Two groups were excluded because they had only a single session, compared with the remaining seven groups with two or three sessions.

<sup>7</sup>MAXQDA Website <https://www.maxqda.com/><sup>8</sup>

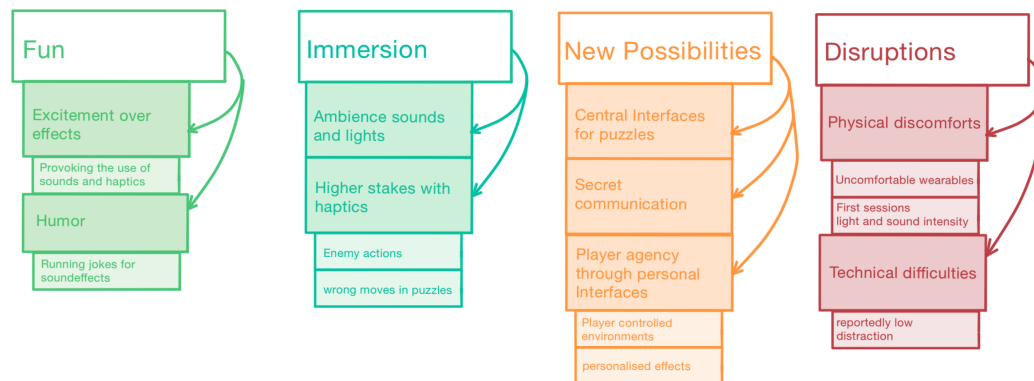


**Figure 3.7:** A visualization of the four identified themes. Each theme is displayed in a unique color, with a large box at the top holding the main theme and gradually defining subthemes.

The coding phase was followed by grouping the codes into subsets and labeling them. All codes and their frequency as well as their definition is listed in the codebook in the appendix A.2. The first subsets consisted of the following: "Effects", "Reactions", and "Haptics"; these then gradually became more complex, gained purpose, and formed the subsets regarding the themes "Laughter," "Scene changes", "Disruptions", and "The set-up influencing the world".

After multiple rounds of this analysis step, types of GM behavior, changes over time, and typical reactions to sound effects, scene changes, disruptions, and haptic stimuli became more apparent.

### 3.6.4 Themes

Finally, we identified four main themes from these subsets. These themes were named "Fun", "Immersion", "New Possibilities" and "Disruptions". Figure 3.7 shows an overview of these themes.

"Fun", "Immersion", "New Possibilities" and "Disruptions" are the four major themes.

## Fun

"Fun" as a theme is characterized by excitement over effects and humor through running jokes about sounds.

Central to "Fun" as a theme is the excitement many participants felt over various effects. One prominent example was P 17, who exclaimed excitement over explosion effects that played sounds and haptic feedback at the same time. At certain moments, this participant would ask for or announce and trigger this effect, with the group excited alongside. Similarly, P 5 loudly expressed excitement as the GM used the haptic chairs to indicate the player's characters were being healed. Many such examples occurred in most analyzed groups; notably, most used sound and haptic stimuli or sound-only, and light effects appeared to be rare in eliciting excitement.

Beyond excitement, humor also shaped this theme, as many groups quickly formed running jokes about specific effects or ambiance sounds. One example was group 3, which shared an ongoing joke about one of the sound effects being connected to a non-playable character. A non-playable character is a character played by the GM and is a temporary part of the story rather than a constant character, like those played by players. Comments such as "oh look there he floats by again," by P 5, as the effect played, led the other participants to laugh before continuing the game. This group also had a variety of ambiance noises while going through a mine and hearing people mine gems in the distance; P 1 made light of the situation, referencing their rhythmic behavior. Most of the time, these comments created a light atmosphere and chuckling without ever truly stopping the game.

Some GMs prepared a funny track to create humorous scenes.

In some cases, sound was purposely employed by the GM as a means to create humor. Groups 3 and 6 both used silly background tracks for specific situations; P 24, the GM of group 3, prepared both a serious and a funny option as background music for a specific scene. The prepared scene involved sneaking into a tower accompanied by serious music; if the players failed and got discovered, the GM would switch to the funny music from the serious op-

tion.

In group 6, the funny music was chosen as intro and outro music to the session to lighten the overall mood. Both groups were friends, which helped the atmosphere feel less stiff overall.

### Immersion

Due to heightened immersion being a clear outcome of studies such as Preuschoff et al. [2026], as well as participants already mentioning ambiance for immersion in the survey and workshop, this theme was not surprising. As expected, participants reported that constant background sounds and colorful lighting were major factors in increasing immersion, as P 16 felt the mine ambiance was greatly enhanced by light, sound, and even vibration. Participants felt more "into it," as P 19 phrased it.

Not only did ambiance help the immersion, but heightened stakes could be created through the prototype. In situations like group two fighting a big monster in their first sessions, participants felt a higher threat, as the steps were underlined with sound and haptic chair effects. Not only in combat, but also in puzzles, such as in group 6, the vibration and sound effects increased tension. As P 16 pressed buttons, they expressed stress about taking the right path on the digital map.

Ambiance, light and sound, and for some, vibration, increased participants' immersion

Haptic chairs increased the stakes in stressful situations for players, such as puzzles and combat.

### New Possibilities

The prototype opened several new possibilities that we observed in the data. Two avenues that opened for participants came from the dynamic nature of the interfaces created in Home Assistant.

First, players gained agency in controlling the environment and triggering effects themselves. Multiple groups requested this, and many players used it frequently. Group 2 used the interfaces frequently. Of this group, P 23 explicitly shaped actions around using the interface, since they were very keen on using the effects as much as possible. P 20 gained access to the function to briefly

We enabled more player agency and collaborative puzzles through the prototype. Player agency concerned control over lights, effects and even targeted vibration of other players via a personalized interface.

vibrate the wearable vibration module of specific players to signify their healing. Similarly, in group one, players enjoyed their interface. In this group, P 1, 4, and 5 used i their own interface to show whose turn it is by switching on and off their personal lamps. This group also grew accustomed to each other's effects quickly, which led to multiple situations where players asked one another for specific effects instead of the GM. One of these moments included P 4 asking P 3 to trigger an effect of a sword slicing a body, as one of the characters killed an enemy in battle.

Similar to asking other players for effects, participants had the opportunity to trigger effects for other players or GMs, as P 11 did in group 5. Especially in moments in which effects would have been forgotten, due to the involved participants being busy with roleplay or looking at rules, P 11 provided background effects for the in-game situation.

Players particularly enjoyed the central interface for multimodal puzzles.

The interface also added personalized player interfaces and a central interface for group 6. Twice in their second sessions, participants collectively used the interface displayed on a tablet placed on the table. Both times, they used the added features to solve puzzles created with the prototype in mind. One puzzle showed four unlabeled buttons, which each toggled a different subset of table lamps, to switch on all four lamps. The other puzzle featured a map of large tiles to cross from one side to the other. The map was composed of a grid of buttons in the interface. Pressing a button either moved the character to that grid space or triggered an error sound and vibration over the haptic chairs.

Through local vibration, the GM could send secret messages to players.

Lastly, the individually controllable wearable vibration motors enabled secret communication. By buzzing one participant, the GM would not need to say anything to notify the targeted participant. P 16 experienced this, as they were secretly told to turn on the other players via the buzzing of their local vibration motor. The GM achieved this by previously explaining that there was a small chance someone would turn evil and feel a vibration. Group 9 did something similar: each player was buzzed when their character

got infested by an alien parasite, or, in Group One's case, a demonic spell.

### Disruptions

Lastly, disruptions emerged as a theme, as both technical issues and physical comfort affected the prototype experience.

Technical issues included lagging audio and delays due to poor Wi-Fi connections and Bluetooth issues. Although they had a low impact on the overall experience, they sometimes delayed the game and partially caused breaks.

Physical discomfort stemmed from the wearable vibration modules and the intensity of the light and sound systems. Because the wearables were mostly attached with tape and lacked a casing, they could poke, or the tape could restrict movement depending on placement. P 15 noted a difference between placement on the ankle and the arm, with the ankle being more comfortable.

Too dim or colorful lights caused eye strain and discomfort for P 9 and 6. They then opened the blackout curtain further to let in additional natural light. Similarly, loud music was exhausting for some participants, such as P 27, who requested quieter music between sessions. Participants best accommodated these discomforts by discussing them with the GMg between sessions.

Disruptions were caused by poor Wi-Fi connection and uncomfortable wearable applications.



## Chapter 4

# Evaluation

### 4.1 Findings

#### 4.1.1 About the Room Space

The Room Space features up to eight dimmable RGB light-bulbs hung from an aluminum frame, along with speakers. Figure ref fig: ambiance shows how this may have looked for groups tending towards a heavier atmosphere. A heavier ambiance refers to strong, colorful light, no natural light sources, and constant music or ambiance sounds. In particular, lighting differs between heavy and light ambiance, as dim coloured lights were the first to go when aiming for a less intense atmosphere.

How groups and individual participants used the prototype features in the room space did not vary too much over time for most of them, as sound and light were consistently enjoyed and used.

**Initial Usage** The initial usage of Room Space features focused on continuous background sounds and colorful, dimmed lights for ambiance. A lot of groups switched ambiance not just for a change in location, but rather as a change of scene. An escalating situation resulting in combat would often be followed by a change of music. This

The Room Space served as ambient sound and light feedback for most groups.

Colorful light and constant background sounds or music were consistently used by most groups.

was observed for group 3 and 5; ambiance lights and music changed simultaneously when entering combat. Some groups prioritized bright, warm light with only occasional short changes for light effects. Group 2, for example, turned all lamps, including Room Space lamps, red for short periods of time in combination with sound effects to simulate magical fireballs being cast.

Overall, Room Space features were consistently used for immersion and atmosphere.

Participants liked  
ambiance light and  
sound, some disliked  
dim lights or loud  
music.

**Typical Immediate Feedback** Generally, most feedback towards the lights was positive, especially P 13, who highlighted the GM being able to quickly change the mood by switching the colors. Opposite to this, players of group 2 requested more light usage from their GM between sessions. This was due to regular warm, bright light being the main light and light effects occurring very rarely in their first session.

A few participants required their sensory needs to be considered. This was either regarding the dimmed light being straining to the eyes or background music being too loud. This was already a previously mentioned worry in the survey. Specifically, in the second session of group 7, quite strong colors and intense music were chosen as ambiance lighting, to which P 27 requested more comfortable lighting and quieter music for the next session.

Feedback frequently concerned the usage of Room Space features instead of the prototype itself.

Adjusting light  
brightness and  
controls for sound  
volume helped with  
the participants'  
complaints.

**How these Qualms were addressed** As solutions to complaints concerning light intensity and brightness, most GMs adjusted their light settings. P 14, having experienced the lights as a player first, chose to color every second light and leave the others a bright white, when playing as the GM for group 6. Participants in group 4 simply opened up the curtain further to let in more natural light. To accommodate finer control over sound volume, buttons to lower

and heighten the volume were added underneath the previously provided slider; this especially had an impact on group 3, as P 24 then adjusted the volume with more ease. Demands of players in group 2 regarding more lighting effects from the GM were addressed in the second session. Combinatory effects including light changes, sounds and haptics were added to the GM interface as labeled buttons. The light turned a bright color and then slowly turned back to the neutral light the group preferred. All issues could be addressed over time, mainly with communication between participants.

**Main findings** The Room Space features were typically applied to create a fitting atmosphere with regard to the in-game environment and gameplay mechanics. This positively impacted the immersion and game experience. Especially when considering sensory needs of participants, providing easy volume control and options for additional neutral light sources can not be dismissed easily. Additionally, groups that focus on game mechanics and play with battlemaps like group 2 and partially group 3 may prefer more neutral light, which allows them to easily oversee the physical map on the table. Therefore, whilst highly regarded, Room Space audio and visual stimuli may have a big positive effect, but also pose risks of discomfort if not adjusted to each participant properly.

Depending on the group's and participants' needs, the intensity of ambiance features should be adjusted.

#### 4.1.2 About the Table Space

The Table Space prototype featured lamps clamped to the table with dimmable RGB lightbulbs, speakers, and haptic chairs that could vibrate in the pattern of a bass sound played through them. The Table Space was used quite often; for example, in the first two sessions of group 2, combination effects were used for actions in combat taken by characters and enemies.

Table Space features often were used for effects, especially in combat settings.

**Initial usage** Initially most groups used Table Space fea-

While often used for effects, semantics for Table Space features differed between groups.



**Figure 4.1:** The photograph shows a table and chairs drenched in blue and orange light emitted by lamps hanging around the table and lamps clamped onto it.

tures for effects. Most commonly, sound effects or combination effects triggered a sound and simultaneously haptic feedback through the chair or light effects. Atypical was group 2, as they applied the vibration of the chair without any sounds as a healing indicator. Whenever characters got healing, players asked for the chairs to vibrate, especially towards the end of the first session. Other groups had first used the chair in combination with sound effects for environmental or enemy-based dangers. Participant four, the GM of group 1, simulated an earthquake with sound effects, vibrational feedback, and light effects. Similarly, participants in group 4 cheered for vibrational feedback whenever an enemy exploded in combat. Players commonly enjoyed effects with components from the Table Space.

A majority of the feedback regarded player agency, as specific effects were often demanded.

**Typical immediate feedback** While playing, players commonly requested certain effects or changes to the individual features. P 28 requested, in the informal discussion at the end of their first session, a way to alleviate some of the GM's workload by controlling parts of the set-up. Furthermore, participant five petitioned for a soundboard players could access. P 22 enquired about "pitching sound effects" both at the end of session one, as well as in the questionnaire of session one.

Especially in the first sessions with the interface, some groups put effects in the background and didn't use them in a timely manner during more thinking-intensive sections, such as rule-heavy combat or roleplay. For example, in group 3 during combat, short breaks occurred to readjust the lights a couple of times, since adjusting them in the moment when a change occurred was seemingly not a priority. This was overcome with time, as seen in P 24, the GM of group 3. P 24 forgot significantly more effects in the first session compared to the second session, when the participant was GM. While evaluating videos in which the interface was visible, as well as hearing GMs talk out loud while using the interface, mistakes were seen while using the interface. In Session one, four effects were forgotten, and an additional four miclicks occurred, both reduced to only one in the group's second session.

**How these Qualms were addressed** The main solution to increase the number of effects and reduce delay was to spend more time with the system and give players a personalized interface. This interface was a slimmed-down version of the GM's interface. In groups 1, 2, 4, 5, and 7, each player had a unique set of effects, fitted to their character. The other groups did not choose a personalized interface or did not have the opportunity to participate in that feature. For the groups that did not want to participate in personalized interfaces, the GMs of group 3 and group 6 did not want their players to participate in that sense or had other ideas, such as a central interface in group 6. Groups 8 and 9 did not have the chance to participate as they only had one session.

Notably, P 32 and 22 added their own sound effects, while the others had effects picked for them based on rough descriptions of the effects they wanted included.

P 14 used the personalized interface differently as a GM. In group 6, P 14 laid the tablet displaying the interface on the table. This allowed them to collaborate on puzzles and use the interface differently than giving each player their own. In group 2, players not only gained a personalized interface, but the GM P 19 also included more combination effects with light effects, as requested by players.

Over time, and with personalized player interfaces, players gained agency, and creative use cases emerged.



**Figure 4.2:** P 23’s drawing of a tree coming over a seated person with the caption “protector tree!”. This was in reference to an effect that played sound and haptics, as well as later on light effects, whenever the tree spell was cast.

Effects through Table Space features were positively received, often used, and individual for each group.

**Main findings** While observing and analyzing the usage and impact of Table Space features, we noticed that players generally enjoyed playing effects. Although all groups viewed effects positively, the number of effects used differed significantly between groups. Group 2 played very structured, combat-focused in the first two sessions and used 110 sound and combination effects. Compared to group 3, which focused on a mix of roleplay and combat and had P 24, who was less experienced, they used only eight. The groups applying effects less often preserved them for specific moments. Group 3 prepared a wolf howl that was played as a distant warning instead of giving every action a fitting effect.

Table Space effects, especially in sound and haptic combinations, strongly affected many players. As an example, one in particular, P 23, depicted in figure 4.2, the feeling of an effect while casting a specific spell.

### 4.1.3 About the Player Space

Player Space features consisted of wearable vibration stimuli and visual stimuli via one lamp per person.

For the Player Space, haptic feedback was provided via one vibrating wearable per player. Additionally, each player sat next to a lamp clamped to the table. The player space did not provide auditory feedback.

**Initial usage** While features in the Table Space often were used in combination, this occurred rarely for Player Space features initially. In particular, wearables were often disregarded in first sessions; group 7, for example, did not use wearables in their first session, and group 3 did so only once at the beginning. Groups that used them from the start tended to give them a specific purpose. P 32 from group 9 buzzed the corresponding player whenever they got first infested with an alien. A little later on, some of the other groups adapted wearables into combination effects, such as group 7 activating them with a spell effect of the final boss. Player-assigned lamps saw much more use; they provided a quiet structural aid. For groups 3 and six, lamps depicted the individual players' health during combat. Figure A.1 shows an example of this use. Group 4 played a mechanic-heavy, turn-based game; therefore, player lamps served as a visual reminder of whose turn it was. The player's lamp whose turn it was turned green by the GM P 8, while the others remained red. This helped players quickly gain an overview of the initiative. P 7 derived, "Oh, it is my turn, if I see correctly," from the green light in front of them.

One slightly different approach to the player lamps was observed in group one, as each light resembled that player having a light source. As the characters wandered a collapsed mine, only one and later two had torches lighting the way. The torch wandering from one character to another got mapped to the corresponding player lamps by turning them on or off.

**Typical immediate feedback** Most of the feedback on the wearables concerned the discomfort of wearing them. Especially in the first study sessions, the wearables were connected by long wires to a chip in the center underneath the table, restricting movement. Much less feedback focused on the actual haptic stimuli. P 14, like others, complained that the wearables had not been used enough and not with enough purpose to warrant the discomfort.

P 14 and 25 both enjoyed the health tracking lights; P 25 felt the combat felt "more real," and P 14 noted their usefulness during combat. Highlighting the player's turn helped the participants in group 4, as participant six chose it as the most vital part of the prototype. However, at multiple

Though the wearable vibration was initially used infrequently, the player lamps served structural or roleplay reasons for many groups.

Wearable vibrational stimuli received criticism for being uncomfortable. Player lamps helped participants navigate complex situations and role-play as their character.



**Figure 4.3:** An example of table lights being used as health trackers. The front left lamp is green, resembling high health; the lamps in the back are orange and red, displaying lower health.

points, players noted a mismatch between the lighting and in-game reality. For example, P 15 let P 14 know their health and requested that the light color be adjusted at the beginning of the group's second session. Similarly, in group 1, a participant needed to remind their GM to turn off the corresponding torch, as the character had lost it in their first session. This increased delays and added friction.

To reduce discomfort, wires from the wearables were removed.

**How these Qualms were addressed** One of the earliest adjustments was concerning the wearables and the wire connection. Groups 2, 8, and 9 had one session with the wearables wired to one central chip; every session and group afterward experienced the wireless version. This was received with much hope by P 18, who stated their hope for the wireless version at the beginning of the second session of group 2.

Wearable usage increased over time and with combination effects.

Regarding complaints about too little wearable use, GMs offered more effects that combined local vibration with more commonly used features. In particular, group 7 saw the biggest change, since P 26 went from not using the wearables to four combination effects, including the wearables, in the last session. However, other GMs, such

as participant eight, reported higher distraction at the beginning, which then subsided with more sessions.

With the aim to alleviate the GMs' mental load and hand players agency, we created interfaces participants could open on any device with a browser. Through the interfaces, each player got unique effects, and in the case of groups 1, 2, 4, and 5, also control over their personal light. As group 2 did not use the lamps on the table, but still wanted personal light for the last session, the lights were hung directly above the players instead of placed directly next to them.

The personal interface included light controls to lessen the GM's burden.

**Main findings** Particularly interesting is participants' opinion of local vibration. Although local vibration ranked lowest overall, it seemed to relate more to the device's other qualities than to haptic feedback. P 29 highlighted a surprisingly high impact of local vibration in the discussion after the group's first session. They felt it had a stronger impact on stress and tension when battling enemies in combat. Similarly, participants from group 9 and partially from groups 4 and 6, who all had specific purposes for wearable vibration, rated the wearables first or second place compared to all other features. For most participants, however, wearables ranked last, on average, because they were uncomfortable and not used enough.

Both opinions on and semantics for wearable vibration devices differed between groups and participants.

Furthermore, P 14's view that the device's discomfort had to be worth it resembles findings on digital components in board games by Soraine and Rogerson [2025], which found that additional devices in board games had to earn their place at the table. P 14 disliked the low usage and lack of integration into the imagined world as a player. Therefore, P 14 gave the wearables a purpose in their own sessions as a GM for group 6.

Groups 1, 3, 4, 5, 6, 7, 8, and 9 used personal lamps on the table. Across these groups, players generally received the lamps positively, and participants in groups 3, 4, and 6 supported the lamps with structural signifiers.

Player lamps served various use cases and were heavily enjoyed when used.

Customizing lamps to the group's purpose would likely enhance their use. In group 1, P 5 held the lamp in their hand for parts of the last session to simulate holding a torch as their character. Since the lamps were the characters' torches, it made sense; however, getting the lamp out of its stand and holding it seemed cumbersome. It was not long before the participant placed the lamp back into its socket; in this case, a lighter, less bulky option could be beneficial. Group 3 also played with light brightness and intensity, as indicators should not dictate the room's atmosphere. P 14 proposed this use case in the workshop with small glowing cubes. Because this was one of many ideas in the workshop, and other ideas suggested different forms of table lamps, we chose adjustable table lamps.

#### 4.1.4 About the Interface

By the second session, most players tested a personalized interface.

The interface to control the prototype features was accessible on any participant's device via the browser. Originally, it was given only to the GM of each group and included buttons, volume, and light controls. Each GM decided what buttons and controls their interface should have; this was then implemented until their next session.

Initial usage was mostly smooth, with occasional misclicks.

**Initial usage** From the start, most GMs used the interface without significant issues. Some less experienced GMs initially pressed the wrong buttons; for example, they pressed effect buttons or light options by mistake, quickly explained the mistake, and then chose the right effect. GMs not only decided on effects and when to press certain buttons, but players also requested adjustments and effects from the GM. Asking the GM to adjust a player's lamp to symbolize a light source happened in various situations. This was the case for groups 3 and 1 in combat and roleplay situations.

Players asked for specific effects, directing the GM's interface use.

A memorable example was initiated by participant one in the group's first session by simply saying "now let's have the light there", as their character finally handed over the

torch to a companion. Similar situations regarding sound effects and music occurred; one prominent example was group 4. Participant nine's character owned a sound system, prompting the player of group 4 to ask the GM to change the music as if the character had done it, instead of being able to act out that part themselves.

**Typical immediate feedback** The interface was received positively, with P 16 deeming it "easy to use and helpful for immersion". Most feedback was gained through players like P 20 wanting to add in their own effects and P 29 suggesting shared control of the prototype in a discussion afterward. Other players also wished for a "soundboard," as participant five phrased it. Overall, feedback on the interface focused on usage and sharing, rather than direct issues with it.

GMs liked the interface, players wanted control of the environment as well.

**How these Qualms were addressed** After hearing some initial feedback, we decided to provide personal interfaces for personal light control and effects to all participants who wanted to engage. Most groups tried the personal interfaces for every player once given the option, except groups 3 and 6. Not all groups that used personalized interfaces used them the same way or to the same extent. In particular, group 2 started with the interface controlling the corresponding player's lamp and nothing else. The following session, everyone gained personal effects, as players wished for a soundboard in the questionnaires.

Most groups opted for player interfaces, most often for character specific effects.

In group 6, the interface was still used collaboratively in the second session, not by giving players a personalized interface on their own devices, but by sharing one device for sections of the session.

**Main findings** Adding a personalized interface for most players offered more advantages than disadvantages, as shown in Figure 4.4. Players and GMs perceived the interfaces positively, both in terms of receiving and triggering effects. In particular, the evolution from a GM-only interface to personalized player interfaces was perceived as advantageous for fun, humor, and immersion.

Although overall enjoyed, social awkwardness and worries prevented some players from using the interface.

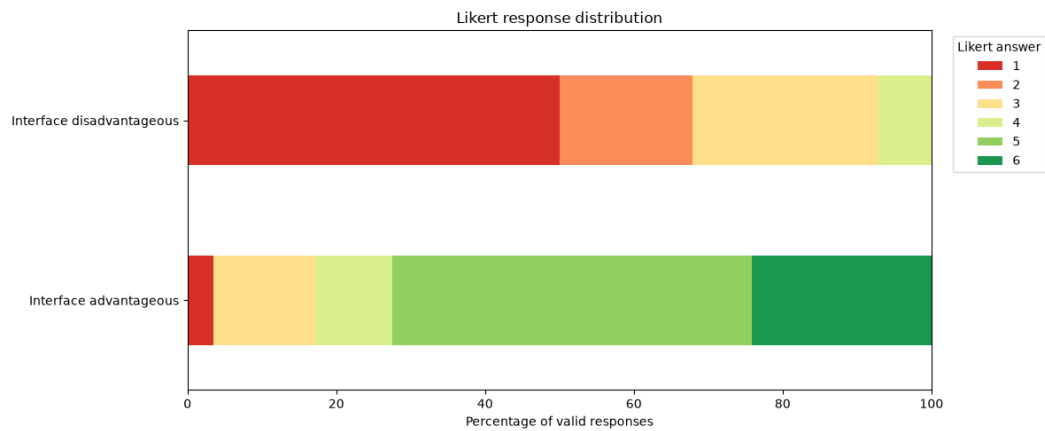


**Figure 4.4:** This graph shows results from Likert-scale questions about whether the personalized interface felt advantageous or disadvantageous. Answering one meant strongly disagree, three somewhat disagree, four somewhat agree, and six strongly agree. Most participants reported high advantages and low negative aspects of the interface.

Players enjoyed playing with effects, such as P 23 wanting to use it as much as possible, and P 20 and 32 adding their own effects as players.

Groups also formed running jokes around specific players' effects and their usages, for example group 4 in which participants frequently asked one another for, or announced effects.

Though a lot of participants enjoyed having a way to control the prototype, depending on group and player, some issues still came up. Social factors played quite a big role, as P 18 was annoyed at P 21's usage of sound effects for comedic moments. On the flip side, P 27 got discouraged from applying the previously requested effects because the other players didn't react as much as hoped. Situations such as these, as well as worries of annoying others like participant seven did when playing with the personal lamp color, or P 13 feeling generally a bit awkward, lead to the interface not always meeting its fullest potential.

Further, interface use varied widely between groups. Groups 1, 2, and 4 frequently applied effects, while in group 5 only a few participants actively used it. P 32, a player in group 5, selected effects themselves and played them at corresponding times, while P 13 in the same group

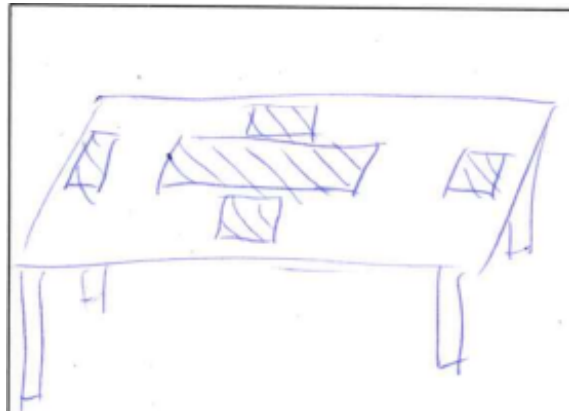


**Figure 4.5:** A sketch by P 17 at the end of group 6's second session. The drawing presents a table with a screen in the middle and four smaller screens placed on each edge of the table, being assigned to the person sitting on that edge. This participant wished for a collaborative interface that could be a map with placable figurines and personal interfaces as well.

refrained from using it after giving it a try. Even less application of the personalized interface occurred in group 7, as the one participant excited about the interface, P 27, quickly got demotivated.

P 14, both as a player and a GM, opted against personalized interfaces, as they wanted a more collaborative, less effect focused option. Group 6's players strongly enjoyed the central interface, ranking it above all other features for three out of four participants in the final session.

P 14 decided against the personalized interface as a player, later creatively using it as a central interface as a GM.

The experience of a central interface and the lack of a personalized one led P 17 to suggest a shared interface constantly on the table combined with a personal interface for every participant. This participant even wished for the shared screen to be a map at times, where players could place their characters and gauge distances. The idea was sketched out and can be observed in figure 4.5. This also overlapped with other participants wishing for digital maps, such as P 19 and five.

Overall, participants received personalized interfaces positively, which opened up possibilities for further exploration and additional game mechanics.

## 4.2 Generalizing

|                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participants heavily enjoyed the prototype, on average strongly favoring sound components                                       | The prototype affected participants and the game far more positively than negatively. Some features were received more divisively, especially the haptic components. Sounds ranked highest on average, as shown in figure 4.6. Sound and light often came together in ambiance applications, reportedly creating atmosphere and establishing new scenes quickly. This seemed to have a big immediate effect whenever the scene changed and then faded into the background, as participant eleven described after the first session in group 3. |
| Usually participants enjoyed haptic components more when used with purpose.                                                     | The popularity of haptics depended on its purpose and comfort, as group 6, which established semantics connected to the wearables, placed the wearables in second place in the feature ranking by the second session. Similarly, group 4 quickly established haptic stimuli over chairs as a common feedback for damage and consistently ranked it on average in their top three.                                                                                                                                                              |
| The reception and usage of each feature depends on the group's focus, the GM's experience and the social setting of each group. | Generally, reception of each feature depends on the group and each participant's preferences. Whilst some participants enjoyed playing with effects and their own interface, often in pre-existing groups, others preferred a less engaged approach, often in friend groups with less experienced GMs. To try and distinguish which factors matter when designing the right multimodal system for each TTRPG group, three main variables became clear when observing the data: the group's focus, the GM's experience, and the social setting. |

### 4.2.1 Group Focus

|                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Groups focused on structure and mechanics, immersion, or a mix of both. Immersion groups applied strong ambiance and frequently used personalized player interfaces. | The observed groups mostly focused on one of three core TTRPG features: immersion and roleplay, combat and mechanics, and, for some groups, a balanced mix of both. Groups 1, 5, 8, and 9 heavily prioritized roleplay and telling an immersive story. All of these groups shared a strong ambiance through dimmed, colorful lighting and ambient sounds, as well as background music. These groups also utilized their personal interfaces from the second session |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

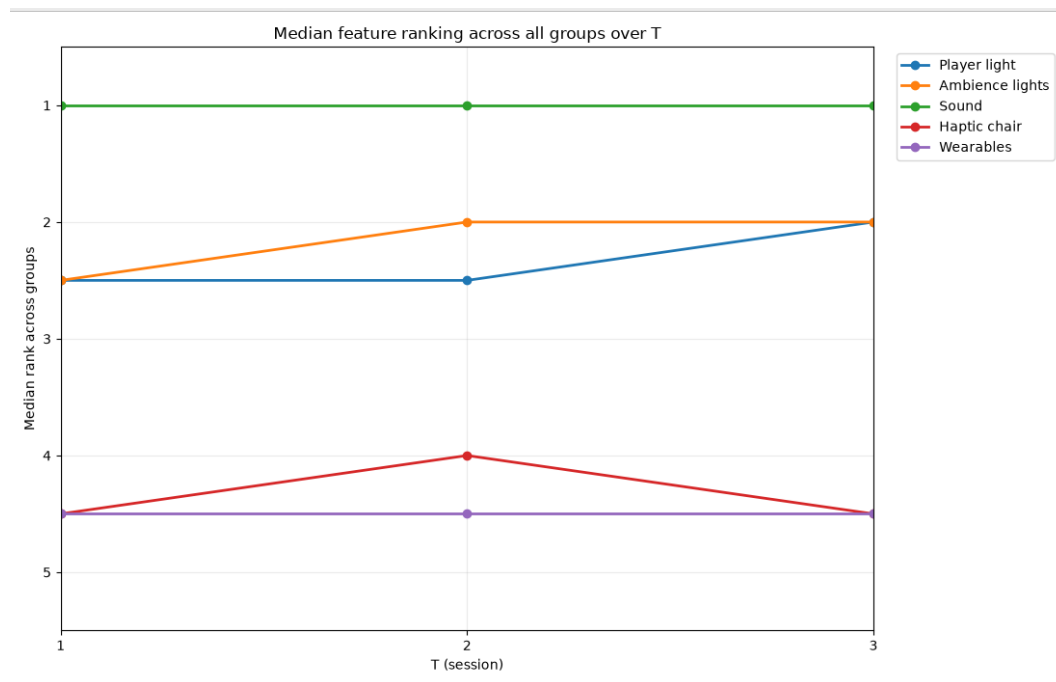


**Figure 4.6:** A median of each feature measured across sessions of each group. Every feature is represented by a coloured line; on the y-axis, the rank is portrayed. The x-axis shows the progression of time in T as the session per group. In this ranking, sound has the overall best score, while haptic wearables have the lowest score.

onwards. Players in group 1 frequently used the interface to indicate their character's presence or absence in a scene through their personal lights, as the party got split in the second session.

The structured groups reported heavy use of personalized interfaces and effects throughout their combat sessions. Groups 2 and 4 mostly prioritized combat and mechanics, as their systems, Pathfinder 2e Paizo Inc. [2019] and Lancer Lopez and Parkinson Morgan [2019], are rule-heavy. Both groups heavily used their personal interfaces from their second sessions onward. Especially in group 2, players each had individual effects that they used in combat for most of the turns they played. The very structured sequence of actions helped players know when to use their effects, as noted by P 10 in an open discussion later on. Although the structured groups differed in ambient light in-

Structured groups had clear times when players could use their interfaces, which increased usage, and players favored a less intense ambience for combat.

|                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                           | <p>tensity, group 2 played almost exclusively in natural light in the first two sessions; players in group 4 requested more natural light. Both groups used more intense lights during roleplaying scenes: group 4 drenched the room in blue light during the roleplay scene, and group 2 switched between multiple colored scenes in the third session, which was more roleplay-focused than before.</p> <p>These groups used the haptic chairs a lot, often tied to enemies and damage, but not exclusively.</p>                                                                                                                                                                                                                                                                        |
| Mixed groups had light ambiance usage and no individual player interfaces | <p>Groups 3, 6, and 7 had an overall relaxed atmosphere and mixed roleplay and combat in each session. All of these groups had constant background music and mostly less saturated light as ambiance. In groups 3 and 7, the light leaned a bit too dark for some; participant eleven complained about eye strain, and the GM of group 3 switched to neutral lights for most of both sessions.</p> <p>Generally, these groups chose one color to lightly influence the room's mood. Two of the groups, 3 and 6, employed the player lamps as health trackers during combat; group 7 used them simultaneously with the other lamps and even removed them for the second session. Furthermore, personalized interfaces played almost no role in these groups; neither did many effects.</p> |
| The group's focus especially influenced ambiance intensity.               | <p>Group 6 and seven increased the number of effects and added new creative ideas over time, as adjusting to the prototype and group seemed necessary for this to occur.</p> <p>Each group's focus influenced the ambiance intensity and partially influenced how appropriate a personalized interface was.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

#### 4.2.2 The GM's Experience

|                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| More experienced GMs adapted faster to the interface; less experienced GMs had a steeper learning curve. | <p>Groups with experienced GMs, such as groups 1, 2, 4, 5, 8, and 9, used the prototype for different effects and ambiance. Rather, the most similarity lies in a smoother usage of the interface, as well as players tending to utilize the interface more often compared to the other groups. Though GMs in these groups occasionally forgot effects, delays, and prototype play were often limited to times when players were busy with themselves. For example, participant two often prepared upcoming scenes while the players were</p> |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

talking, or narrated the scene change when switching between two groups in separate locations. These switches in the second session were introduced with participant two saying “Now meanwhile with you...” and would change the scene simultaneously. This contrasted with group 3, in which, especially in the first session, P 24 missed cues for effects and changed scenes rarely, mostly minutes later than expected. In a similar vein, though with fewer disruptions, groups 6 and 7 also did not prepare many different scenes in their first sessions; both ventured out more in the following sessions. P 14 introduced the central interfaces, and P 26 provided more scene changes and wearable effects for group 7 in the last session.

This leads to the assumption that less experienced GMs may have a lower threshold for handling both the prototype and the game, but also showed a steeper learning curve and partially explored newer directions than groups with experienced GMs.

Less experienced GMs showed greater amounts of novel ideas towards later sessions.

### 4.2.3 Social Setting

The social setting concerns how well participants know each other, especially in the context of TTRPGs. All groups fell into either pre-existing groups, friend groups, or acquaintances and strangers.

Pre-existing groups, such as group 1, 2, and 8, utilized the prototype smoothly and often, and players quickly adapted to the user interfaces and even requested certain effects. P 20 even recorded sound effects and added them to the prototype, as a funny surprise for other players in the last session. In a similar vein, group 2 got many moments of humor from the prototype, as running jokes got attached to sound effects.

Friends formed groups 3, 6, and 7. These groups also shared the category of less experienced GMs. While trying the personal and central interface, participants did not worry about upsetting others; however, for P 27, disappointment that the reaction was not bigger deterred them from applying many effects. In group 6, participants did not display or report worries about displeasing others.

Acquaintances and strangers formed groups 4, 5, and 9.

Player 27 grew displeased with the lack of reaction to their effects and stopped using the interface. Otherwise, personal interfaces were disregarded in the friend groups. Participants in less familiar groups refrained partially or completely from interface usage because of worries and social anxiety.

These had P 8 and 32 as GMs and players. Some participants, such as P 8 and 32 as well as others, knew some of each other, though no participant was familiar with everyone else in the group. Within groups 4 and 5, different participants reported worrying about annoying others. In an informal interview after the second session, P 13 also described social anxiety as being high in this sort of setting and potentially being more exploratory in different social settings. This highlights the importance of participants being familiar with one another to be open to more participatory features.

#### 4.2.4 Changes over Time

Generally, GMs felt less distracted by the prototype over time.

In particular, GMs behaviour towards the interface and effects changed over time, experiencing fewer distractions and a lower negative impact on leading capabilities with the prototype than in the first session. This is visible in figure 4.7; however, except for P 26, the GM of group 7, everyone significantly reduced their distraction and negative feedback over time. In the case of P 26, the heightened distraction and negative impact were caused by especially loud and intense music during the final combat, which concluded the storyline developed over three sessions. This higher distraction also coincided with more scene changes and effects than in prior sessions, especially the first session.

Over time, GMs typically explored more usage, especially combination effects and scene changes. Inspiration over time and from other groups influenced the higher combination effect usage.

Overall, spending more time with the setup, and especially having multiple perspectives on it, helped with a more complex use of the features. However, the outside factors such as experience and group had a bigger impact. After leading two sessions, P 19 began exploring further and included more combined effects using wearables, haptic chairs, sound, and lights simultaneously, and also mulled over ideas for puzzles, as described before the final session. P 19 saw the interface and effects of group 6 while preparing for the last session of group 2. The ideas of P 14's "Heartbeat effect", which pulsed both haptic components and played heartbeat sounds, inspired P 19, who further changed the effect to include light effects and elon-

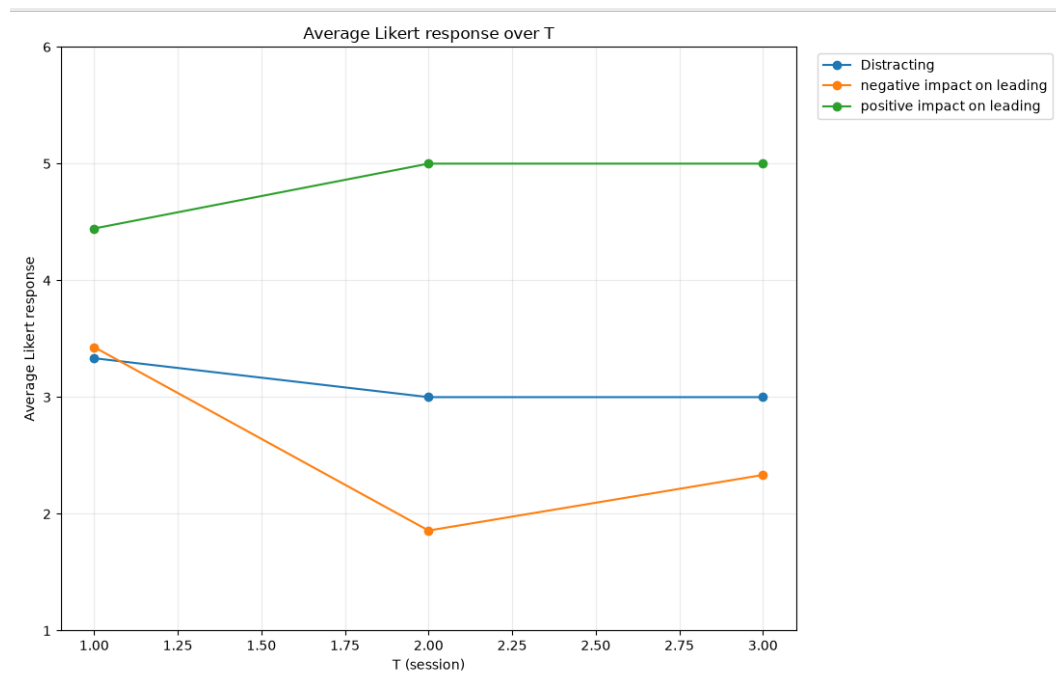


**Figure 4.7:** A graph depicting the GMs' mean Likert scale answer progression over T sessions for each group. The questions asked whether the prototype negatively or positively impacted their leading capabilities. They were additionally asked whether the prototype distracted them. Answering one meant strongly disagree, three somewhat disagree, four somewhat agree, and six strongly agree. Both distraction and negative impact decreased compared to the first session; overall negative impact decreased, though it spiked in the third session due to group 7's high answer.

gate the pulsing sounds. However, they did not have time to prepare puzzles. Similarly, P 23 wrote of applying secret messages to lights and creating puzzles in the first questionnaire, but did not follow through with the ideas. Allowing them more time led to further exploration and more creative use of the different features.

Extrapolate the findings to suggest that a more personalized, less time-sensitive approach would create a deeper connection between features and gameplay, as well as a smoother, disruption-free experience. Additionally, encouraging between-group discussions could promote new ideas, as in P 19's case with the "Heartbeat effect".

Overall, spending more time with the prototype led to a more diverse and smoother experience across the different features.

### 4.3 Discussion

In this section, we mainly reflect on how the multimodal prototype actually impacted the participants' gameplay and overall experience, as well as general design guidelines for groups and limitations of the study.

#### 4.3.1 The Impact Multimodal Stimuli on Table Top Role-Playing Groups

Especially ambiance reportedly increased immersion for participants

Preuschoff et al. [2026] already showed that fitted environments improve immersion for TTRPGs. Notably, less direct, ambiance-heavy environments delivered better results than medium-fitting environments. Our prototype's Room Space features showed that high-impact, low-fidelity, fitting environments improved immersion. Participants very frequently reported how ambiance contributed to their immersion.

Though Space dissection is a helpful starting point, separation of Table Space and Player Space is not always clean.

Furthermore, dissecting physical space into three distinct spaces helped us construct the prototype and may continue to do so for further multimodal systems. This dissection allows focus on the right features for every space depending on the group's needs and participants.

However, distinctions between Table Space and Player Space may become harder to navigate, and we considered them more fluid for features affecting both the Player Space and the Table Space. The player-specific lamps provide a fitting example, as they served as both player-specific indicators and light sources for the table.

Players felt connected to their characters by using the prototype features as if the character had them.

In some cases, the prototype also connected players physically to the imagined world and their characters. This happened with P 9, who used the interface as the character would, as the character had an in-game sound system. P 5 also acted as their character within the interface when taking the lamp outside the socket, holding it as the character

would hold the torch. This increase in connections players feel towards their characters through features like these was already explored for wearables by Buruk and Özcan [2018]. In our study, this connection seemed heightened through immersion, though discomfort-related distractions weakened that effect.

Although players reported little or no help in playing their characters, most denied any negative impact. This came from Likert-scale questions asked at the end of each session. However, participants mentioned heightened attention throughout the sessions multiple times. For example, P 20 stated they had never been this attentive during a game. The physical discomfort caused by the wearable vibration modules mirrored findings from Soraine and Rogerson [2025] and Soraine and Rogerson [2026]; in our study, participants often did not deem the wearables worth the added hassle and frequently disliked or disregarded them. In contrast, groups 6 and 9, which used these devices, showed higher overall acceptance, underscoring the importance of purposeful, meaningful use.

Participants rarely felt any negative impact from the prototype on playing their character, for some even heightening attention. Physical discomfort caused by the wearables was more accepted if they served a purpose

### 4.3.2 How to Design for Different Groups

While building, preparing, and reviewing the different setups and interfaces for each group and session, requirements that varied by group became a clear throughline. These differences fall into three factors: group focus, social setting, and GMs' experience. We therefore recommend using these guidelines when designing multimodal systems for individual groups.

However, these guidelines are based on a maximum of three sessions per group, but as we saw, groups evolved the setups over time by adding use cases and ideas. It could be that the guidelines are to be refined over longer periods of time, discovering further additions such as personalized interfaces and unique purposes given to less common features, such as wearables.

To summarize our findings, different groups need different features; we derived this from studying a variety of groups over up to three sessions each.

Based on the three factors, initial multimodal systems can be fitted to a group, but the requirements will evolve.

## 4.4 Limitations

Technical issues with filming devices, Wi-Fi problems, and physical discomfort from the wearables limited the study.

Because this study had to fit the scope of a bachelor's thesis, it was time-limited. A lack of time for further prototype and questionnaire refinements, and for more sessions, was especially noticeable. This limited timeframe furthermore allowed for a less detailed analysis, as only 17 of the 19 sessions could be analyzed with reflexive thematic analysis.

Limitations also regarded recording devices, as the main filming device, a provided phone, did not record all sessions. This was because the main recording device had errors and stopped recording during some sessions. For those videos, we had to analyze less optimally placed secondary video or audio files instead. This particularly impacted the observations on the GMs' behavior, as only the main filming device was placed to see their interface interactions as well.

Regarding the prototype, uncomfortable wearable vibration motors, partially buggy audio, and other general technical errors disrupted the game sessions. The uncomfortable wearables largely affected how well the impact of local vibration could be observed, as the hurdle to feel it was higher than with the other, less noticeable features.

Additionally, the first sessions especially suffered from a poor WiFi connection, which caused partial delays and frustration. However, this was solved after a few sessions.

## Chapter 5

# Summary and future work

### 5.1 Conclusion

In this work, we explored the impact of multimodal systems for creative collaborative settings. We examined the TTRPG domain, prioritizing external validity. TTRPGs are played with friends who come together to tell a story collaboratively. Because these domains share aspects with video games and board games, we considered them, along with TTRPG-related studies. In contrast to single sessions or lab settings, we focused on friend groups and consecutive follow-up studies to strengthen external validity.

We placed TTRPG groups in a multimodal system with haptic, visual, and auditory stimuli that participants controlled. We derived the findings from Likert-scale questionnaires and reflexive thematic analysis of the sessions' video recordings.

Based on our study, we identified three questions that guide the creation of a multimodal system for TTRPG groups. These questions are: For what game system and purpose will the system be used? Who will be interacting with and experiencing the interface, and how do they

As guidelines for a multimodal system, ask: for which game system, for whom to interact with it, and for whom to control it?

interact with one another? Finally, who will control the system and interact with the primary interface?

### 5.1.1 The Right System for Which Group Focus?

Rule focused groups benefit from natural light sources and structural aids, immersion focused groups prefer strong a ambiance.

When asking for the purpose the system will fulfill, it is important to investigate the group's priority. Some groups play rule-heavy game systems, may use maps and cards, and therefore prefer bright light that does not interfere with vision. Not providing these light sources might cause eye strain and discomfort.

Furthermore, these groups that include rule-heavy sections, or focus fully on them, might also benefit from lights as a quiet structural aid.

Other groups might focus more on roleplaying and feeling immersed in the story. For these purposes, ambiance lights are often allowed to be dimmed and colorful. Similar to findings from Preuschoff et al. [2026], even less direct, more atmospheric representations of the world around the characters help players feel closer to their characters.

### 5.1.2 The Right System in What Social Setting?

High usage of player interfaces especially occurred in pre-existing groups.

The tabletop sessions were influenced not only by the game system, but also greatly by the people who played it. Usage and comfort with the prototype's features also depended on how well participants knew each other. Hence, placing groups in one of three categories- pre-existing groups, friend groups, and acquaintances or strangers- may help decide core functionalities of the system.

Players in pre-existing groups tended towards less social friction, such as worries and awkwardness around self-applied effects. These groups furthermore gradually explored the prototype and communicated with one another about the potential use cases. In friend groups, players still did not show much worry about using the interface. Overall, these groups nevertheless used the prototype much

In friend groups, players were less worried about annoying one another and showed a steeper learning curve with the prototype.

less. Instead, many early sessions were marked by delays and forgotten effects. This was due to a lack of smoothness in the play itself, as the group had not played in this constellation before. Groups like these benefited from multiple sessions and showed a learning curve, even integrating especially interesting approaches, such as the central interface of group 6 and the wearable-sound-effect combination in group 7. These groups also became more generally smooth over time, especially in group three.

Discomfort around exploring features and worries occurred more frequently in groups that were not familiar with one another. For these groups, more player-involved approaches may take a backseat in the beginning, though it should not be disregarded, as players overall still enjoyed them. It is reasonable to infer an overtime balance as people became more accustomed to one another and the prototype, especially when feedback and discussion were encouraged between participants. This was observed in group four, as discussions about favorite effects heightened the excitement around them. This, however, fell more into the category of acquaintances, as three of four players knew each other from sharing the same workplace. A group with less acquainted participants, such as group 5, showed far fewer personal effects, even after trying them out and meeting a second time.

Participants not comfortable in a group are more likely to refrain from personal interfaces.

### 5.1.3 The Right System for Whom?

The system should benefit not only players' immersion, but also support the GM and be easy to manage. Concerns about manageability and mental load came up as early as our first survey and continued in the workshop.

With consideration for each GM's needs and preferences and the dynamic adjustability of Home Assistant dashboards, interfaces overall were reported to be "easy to operate" as of P 26.

Experience and time spent with the system affected the smoothness of use and visible distress, as well as reported distraction and negative impact caused by the prototype.

GMs with more experience leading TTRPGs showed a gradual decline in distraction and negative impact, starting

An easy-to-use interface should primarily support the GM.

The GMs' experience especially impacted the initial distraction caused by the interface.

More experienced  
GMs displayed a  
higher threshold of  
complexity and  
multitasking.

with relatively low levels overall. These groups had fewer disruptions by GMs misclicking or adjusting.

Less experienced GMs showed a steeper decline in distraction and negative impact; however, they could be more easily swayed by loud music.

This implies that the more experience GMs have, the higher their threshold for feeling distracted or overwhelmed by the mental load may be. Granting less experienced GMs simpler interfaces with fewer buttons and easier controls, while still allowing exploration, may be more beneficial than giving every GM the same level of interface complexity.

## 5.2 Future work

Future work could  
focus on longer-term  
observations, a  
higher-quality  
prototype, and more  
personalized Player  
Space devices.

This work focused on external validity by prioritizing established groups and friend groups and observing groups over multiple sessions. However, exploring a long-term study in which groups continuously play in and shape the multimodal system through feedback is promising.

As groups playing tabletop roleplaying sessions often play over months and decades, as stated by Henrich and Worthington [2023], observing them for a maximum of one month for groups 1 and 2 helped infer trends but left open questions about their potential. As GMs gain time and experience with the features, they can use them more creatively, such as for puzzles. A longer observation time, along with encouraging open feedback, would also help overcome social friction as participants get to know each other and the in-game world.

Furthermore, refining the prototype and fixing technical issues that occurred during the study would help reduce negative impacts from factors outside the modes themselves. Especially adapting the wearable haptic stimuli to each participant and fine-tuning ambient features to participants' sensory needs may help the overall experience. Often-wished-for features that could not be included due to funding or time constraints included surround sound systems and large interactive screens for interfaces and maps. These features would make sense to explore in a longer, more refined study process, allowing participants

to adapt to every feature.

This would allow for more personalization within the Player Space. Buruk and Özcan [2018] already showed a sense of connectedness among players through physical ties to their characters. Participants utilizing the prototype as their characters or picturing effects as belonging to their characters, as P 23's "protector tree", underlined a desire for these options. A closer match to participants' needs for specific use cases could further strengthen this feeling and improve usefulness in cases like lights as structural aids rather than in-game objects.



## Appendix A

# Additional tables and figures

| Name                            | Amount coded | Definition                                                                                                                                                       |
|---------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abstracter SFX                  | 28           | A soundeffect that is not how it directly sound like in the in-amgined world. Example an error sound for wrong button press or effect for player failing a roll. |
| ambiente Licht                  | 34           | Ambient lights got changed, not just the table lamps.                                                                                                            |
| ambiente sounds an/gewechselt   | 13           | Ambient sound started or changed                                                                                                                                 |
| announced anpassung des volumen | 1            | The GM announces adjusting the sound volume                                                                                                                      |
| announced wearable              | 5            | The GM announces the use of wearables                                                                                                                            |
| announcement FX                 | 15           | An effect is announced by a participant                                                                                                                          |
| central Interface               | 2            | A period of time in which a central interface is present/used                                                                                                    |
| Character reak-tion auf fx      | 7            | A roleplay, character reaction to an effect                                                                                                                      |

|                                               |     |                                                                                            |
|-----------------------------------------------|-----|--------------------------------------------------------------------------------------------|
| character<br>schlussfolgerung<br>durch set-up | 10  | A roleplay, character conclusion occurs due to stimuli from the set-up                     |
| DM announced SFX                              | 8   | The GM announces using a sound effect                                                      |
| DM bereitet scene vor                         | 19  | The GM is visibly preparing a scene on the interface                                       |
| DM bereut fehlende Benutzung                  | 1   | The GM explains being sad about not using the set-up a certain way                         |
| DM erklärt Nutzung im Nachhinein              | 16  | The GM gives reason to the set-up use after triggering an effect or scene change           |
| Dm erklärt play-ern Interface                 | 4   | The GM explains the interface(s) to their players.                                         |
| dm fragt spieler nach set-up einstellung      | 3   | The GM asks players to confirm set-up settings and adjustments                             |
| Dm löst für player effekt aus                 | 5   | The GM triggers an effect in place of the player, who had previously triggered that effect |
| DM sucht effekt                               | 38  | The GM is looking for an effect on the interface                                           |
| erklärung SFX                                 | 16  | The GM explains a used sound effect                                                        |
| exciter stuhl                                 | 189 | The haptic chair is triggered                                                              |
| fehlender effekt                              | 40  | An effect usually played in this moment is not triggered                                   |
| fehler dm mit set-up                          | 12  | The GM misclicks or has other interface issues                                             |
| haptic beeinflusst welt                       | 3   | The haptic stimuli influences how players see/interact with the world                      |
| inworld grund/vorbereitung auf sfx            | 6   | The GM is giving in world reasoning before playing a sound effect                          |
| lachen                                        | 1   | Participants laugh                                                                         |
| lachen über ambience geräusche                | 1   | Participants laugh about ambience noise                                                    |
| lachen über haptic effect                     | 1   | Participants laugh about haptic effect                                                     |

|                                                     |         |                                                                                                                                                    |
|-----------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| lachen über SFX                                     | 52      | Participants laugh about a soundeffect                                                                                                             |
| Licht effekt                                        | 66      | A light effect is triggered. This includes table lamps or short light changes that go back to normal afterwards                                    |
| licht hilft bei struktur                            | 3       | Participants make exclamation about light helping as a structural aid. For example initiative light in combat                                      |
| licht initiative                                    | 58      | Table lamps are changed as part of initiative symbol                                                                                               |
| Musik manuell an/ gewechselt                        | 54      | Music is switched on or changed manually, not in combination with other effects                                                                    |
| musikwechsel nachholen effekt                       | 5<br>19 | Music is changed<br>A previously missed effect is now triggered                                                                                    |
| player (frage) bewegt DM zum Set-up verwenden       | 7       | A player's behaviour is leading the GM to use the interface. This is for anything that is not a direct demand or question to use specific effects. |
| Player adjusted physisches set-up                   | 9       | A player is adjusting the physical prototype around them. For example change where the table lamp is pointing                                      |
| Player choice impacted durch Set-up                 | 5       | The set-up impacted a choice the player made. For example a noise sounds dangerous so combat is started.                                           |
| Player durch Benutzung des Playerinterface impacted | 1       | A player shows direct impact felt through the personalized interface                                                                               |
| Player fordert effekt von anderem Player            | 4       | One player is asking for a specific effect from another player.                                                                                    |

|                                                        |    |                                                                                                                 |
|--------------------------------------------------------|----|-----------------------------------------------------------------------------------------------------------------|
| player fordert Einsatz von spezifischem set-up feature | 22 | A player demands a certain effect of feature                                                                    |
| player fragt nach haptic                               | 3  | A player asks for haptic stimuli                                                                                |
| Player Frust                                           | 5  | A player is visibly annoyed                                                                                     |
| Player FX                                              | 90 | A player triggers an effect over the interface provided                                                         |
| player lampen animation an                             | 2  | A consistently changing light effect is triggered on the table lamps                                            |
| player löst ausversehen aus                            | 1  | A player triggers an effect on accident                                                                         |
| player macht effekt für player                         | 4  | A player triggers an effect the other player would have usually triggered. This is for supportive effect usage. |
| player musik                                           | 8  | A player triggers the music over the personalized interface.                                                    |
| Player nutzt physisches set-up als character           | 6  | A player uses a physical set-up component as a prop for their character.                                        |
| Player stellt action/status mit set-up dar             | 5  | A player symbolizes their action or status with the controls of the interface                                   |
| player vergisst interface                              | 1  | A player forgets about the interface                                                                            |
| Player wehrt sich                                      | 3  | A player talks back to the GM based on the set-up. For example correcting the health indicator lamps.           |
| Reaktion auf exciter Stühle                            | 15 | Participants react to the haptic chairs                                                                         |
| reaktion auf licht                                     | 15 | Participants clearly react to a lightchange                                                                     |
| reaktion auf Musik                                     | 9  | Participants clearly react to music playing                                                                     |
| reaktion auf sfx                                       | 21 | Participants clearly react to a sound effect, in a way that is not laughing or a joke                           |

|                                              |     |                                                                                                                                                          |
|----------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reaktion auf Wearables                       | 17  | Participants clearly react to the wearable vibrating.                                                                                                    |
| scenenwechsel                                | 19  | A scene change is triggered. This is for more than one feature changing to indicate a different scene. Most common are ambient lights and music changing |
| Scenenwechsel mit Announcement               | 15  | A scene is announced and then changed                                                                                                                    |
| Scenenwechsel mit in world erklärung         | 22  | A scene is changed and explained with an in-game explanation                                                                                             |
| Scenenwechsel mit Reaktion                   | 12  | Participants react to a scene change                                                                                                                     |
| Set-up basierter witz                        | 42  | A joke based on effects or features of the set-up is made                                                                                                |
| SFX                                          | 292 | A soundeffect is triggered                                                                                                                               |
| sorge zu nerven                              | 3   | A participant is worried to annoy other participants                                                                                                     |
| status Licht                                 | 33  | A table lamp is changed to indicate status of that player. For example for health indicators in combat.                                                  |
| Unsicherheit und Kritik mit Set-up Benutzung | 4   | Participant is not confident in the set-up and criticises components of it                                                                               |
| verwirrung über haptic                       | 7   | Participant is confused over haptic feedback.                                                                                                            |
| wearables                                    | 41  | The wearables are triggered to vibrate                                                                                                                   |
| Welt durch Licht beeinflusst                 | 2   | The ingame world is influenced by the light used in the set-up                                                                                           |
| Welt durch sound beeinflusst                 | 12  | The ingame world is influenced by the sound used in the set-up                                                                                           |

**Table A.2:** The codes used in MAXQDA, the codes definitions and the amount each code was used is shown in this table.

| Number of study sessions | Gender | Age | Highest education |
|--------------------------|--------|-----|-------------------|
| 3                        | nb     | 34  | Phd               |
| 4                        | m      | 31  | Master            |
| 2                        | w      | 28  | Master            |
| 3                        | m      | 33  | Bachelor          |
| 3                        | m      | 31  | Master            |
| 2                        | w      | 22  | Bachelor          |
| 2                        | w      | 27  | Bachelor          |
| 5                        | m      | 24  | Abitur or lower   |
| 2                        | m      | 27  | Abitur or lower   |
| 2                        | m      | 22  | Abitur or lower   |
| 7                        | w      | 28  | Bachelor          |
| 2                        | m      | 22  | Abitur or lower   |
| 2                        | w      | 37  | Bachelor          |
| 7                        | nb     | 24  | Bachelor          |
| 4                        | m      | 26  | Abitur or lower   |
| 2                        | m      | 25  | Bachelor          |
| 2                        | w      | 22  | Abitur or lower   |
| 3                        | m      | 36  | Phd               |
| 3                        | m      | 33  | Master            |
| 3                        | m      | 30  | Master            |
| 3                        | w      | 31  | Master            |
| 3                        | m      | 31  | Master            |
| 3                        | m      | 32  | Master            |
| 2                        | w      | 23  | Bachelor          |
| 2                        | m      | 26  | Abitur or lower   |
| 3                        | nb     | 21  | Abitur or lower   |
| 2                        | nb     | 22  | Abitur or lower   |
| 1                        | m      | 35  | Master            |
| 1                        | m      | 24  | Abitur or lower   |
| 1                        | nb     | 47  | Phd               |
| 1                        | m      | 22  | Abitur or lower   |
| 3                        | m      | 54  | Staatsexamen      |

**Table A.1:** Participants Demographic and number of sessions that they participated in.

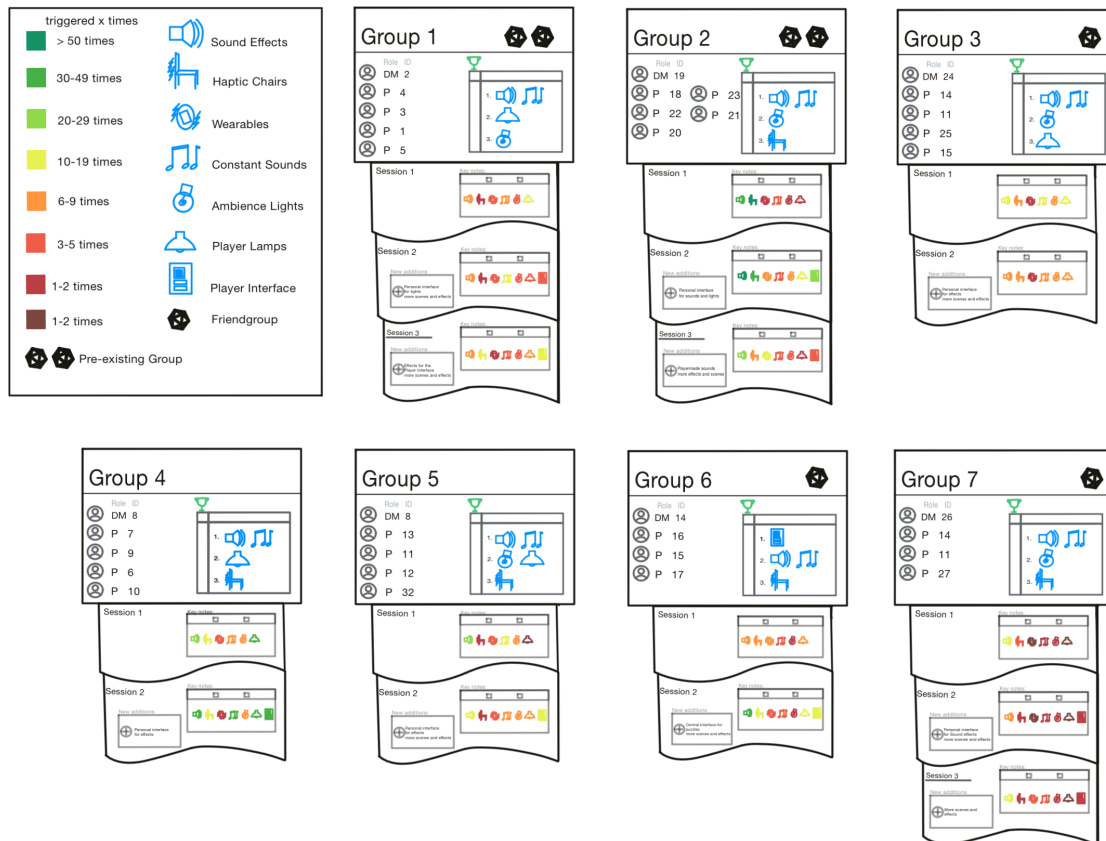


**Figure A.1:** A diagram depicting each group analyzed in the video reflexive analysis. Each group has the number of sessions represented by boxes added to the main bracket. The main bracket displays the average top three features by ranking in the questionnaires pooled over all sessions for this group. Each session-box contains colour-coded symbols, referring to the amount the features of the prototype were used. If new additions were made to the prototype, they are noted on the left side in the session-box.



## **Appendix B**

# **Questionnaires**



TableTopTools → base

30.09.2026, 10:09

A002

# About this survey and the study

In this survey we aim to get a feeling for what tools are used at the roleplaying table by game masters or players to add to their gaming experiences.

We will use these findings to move forward with a study at RWTH University Aachen about specific tools with a low barrier to entry and explore how they are used and how they may impact the overall session experience.

If you are interested in the follow-up, there will be more information at the end of the study.

## 1. Please enter your age in years.

A006

Age:

## 2. Please enter your gender.

A005

## 3. What is your highest level of education?

A007

- ☐ Realschulabschluss (Middle School)
- ☐ Fachabitur
- ☐ Abitur
- ☐ Bachelor
- ☐ Master
- ☐ PhD
- ☐ Other

A001

#### 4. What game systems do you usually play?

Systems:

#### 5. Which role do you usually play ?

**A003**

- ☐ Game Master
- ☐ Player
- ☐ Both

#### 6. How would you describe your playing style?

**A004**

Briefly describe your playing style in relation to the system, fellow players and personal priorities when playing. For example, do you focus on mechanics or roleplaying aspects?

Playing style:

A101

## Existing tools

We will start by getting an overview of your experience with tools, gadgets, apps and the like.

These include anything besides the core game mechanics and can range from lights, a music box or apps to screens, gadgets and more.

A102

**7. Please detail your typical tabletop game setup including the tools you tend to use in your table top sessions. Also describe how you use them and what you like and dislike about the tools**

Tools include anything from dice, battlemaps, apps, to ambient light/music and tech gadgets

Frequently used  
tools

Sometimes used  
tools

A103

## Our Toolkit

In the follow up study we will provide a Toolkit with different functionalities that may be used during TTRPG sessions. Our aim is to explore what functions are being used in which ways and to continually shape these tools to adapt to their use cases.

These features will be controlled through a simple interface the Game Master has access to.

In the following section some potential functionalities will be described. Since we are in the early stages of development, the features described below are hypothetical.

Please read through them and evaluate how, if at all, you might use them. In case specific scenarios or concerns arise, detail them as well.

A104

**8. These are some potential features in the Toolkit. They can be controlled separately and in combination with each other.**

Read through the features and describe whether they would be used at your table, and how.

Vibrating chairs or tables: vibrating exciters are placed underneath, for example, chairs and can be controlled separately or conjoined. The vibration intensity, frequency and pattern can also be adjusted

Lights: Color changing light sources that can also be turned on and off.

Sound: a soundbox and access to various soundeffects, music and ambient noises.

Others that you would like to see:

**9. What are features or problems you wish to see addressed in such a Toolkit?**

A105

**This may included pitfalls you see often, concerns, but also features you desire to be easily accessible while playing a TTRPG session.**

## Follow up study

If this topic interests you, we would be grateful for further participation in our study at RWTH Aachen. There are multiple options to further participate depending on the amount of time you may have.

Please reach out to us via [Zoe.stradal@rwth-aachen.de](mailto:Zoe.stradal@rwth-aachen.de) if you have any questions or need further information.

Since we cannot collect emails or other personal information via this survey, we kindly ask you to reach out directly in case you want to participate in the follow-up study. A very short message with your name and whether you have an established group or are a single player/game master will suffice.

Participation options include a Workshop in which we discuss and test the Toolkit, and additionally, we will host playtest sessions in which you can play a TTRPG session of your choice and test the Toolkit with your group.

---

Last Page

## Thank you for completing this questionnaire!

We would like to thank you very much for helping us.

For any questions or further participation please reach out via [zoe.stradal@rwth-aachen.de](mailto:zoe.stradal@rwth-aachen.de)

Your answers were submitted, you may close the browser window or tab now.

Zoe Stradal, RWTH Aachen – 2026

G

T

P

Datum \_\_\_\_\_

Alter \_\_\_\_\_

Höchster Abschluss \_\_\_\_\_

Ich habe diese Session als : Spieler:in [ ] DM [ ] gespielt.

Geschlecht \_\_\_\_\_

Spielsystem \_\_\_\_\_

**1. Zwischendurch hat das technische Set-up das Spiel positiv beeinflusst**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Begründung:

**2. Zwischendurch hat das technische Set-up das Spiel negativ beeinflusst**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Begründung:

- 3. Diese Dinge am technischen Set-up haben unerwartet gut/ schlecht geklappt**

- 4. Beim Spielen sind mir folgende Ideen für zukünftige Nutzung des technischen Set-ups gekommen:**

**1. Das technische Setup hat einen positiven Einfluss auf das Spiel**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

**2. Das technische Setup hat einen negativen Einfluss auf das Spiel**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

**3. Das technische Setup hat negativ beeinflusst wie ich leite und meinen Spaß daran**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

**4. Das technische Setup hat positiv beeinflusst wie ich leite und meinen Spaß daran**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

**5. Ich würde Komponenten von diesem Set-up nocheinmal verwenden wollen**

Stimme gar  
nicht zu

Stimme nicht  
zu

Eher nein

Eher ja

Stimme zu

Stimme  
sehr zu



Und zwar:

**6. Ich würde Folgendes an dem Set-up ändern/ ausprobieren wollen:**

Und zwar:

## 7. Komponenten von diesem Set-up haben mich abgelenkt

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Und zwar folgendermaßen:

## 8. Komponenten von dem Set-up ermöglichen Neues im Spiel/ der Spielleitung

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Und zwar:

**9. Wenn zutreffend, in welchen Situationen hat das technische Set-up deine Spielleitung besonders beeinflusst?**

**10. Folgendes an dem technischen Set-up fand ich besonder gut:**

**11. Folgendes an dem technischen Set-up fand ich nicht gut:****12. Ich konnte alle Teile des technischen Set-ups sinnvoll verwenden**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

13.

Bitte geb eine Rangliste der gegebenen Komponenten an.  
Begründe diese (1= am Besten)

- \_\_\_ Licht Tisch
- \_\_\_ Licht Umgebung
- \_\_\_ Sound
- \_\_\_ Vibration Stühle
- \_\_\_ Vibration Wearables
- \_\_\_ Sonstiges 1:
- \_\_\_ Sonstiges 2:

14.

**Weitere Bemerkungen, Skizzen, Ideen oder Verbesserungsvorschläge:**

**1. An was von dem technischen Set-up letzter Session Erinnerst du dich?**

**2. Welche Hoffnungen oder Erwartungen hast du auf Grund der letzten Session an das technische Set-up heute?**

3.

**Es gab Momente da mochte ich das technische Set-up**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

4.

**Es gab Momente da mochte ich das technische Set-up nicht**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu**In folgenden Momenten:**

**5. Durch Vertrautheit mit dem technischen Set-up habe ich meine Session anders geplant**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu**6. Die Rückmeldung meiner Spieler:innen zwischen Terminen hat meine Verwendung des technischen Set-up beeinflusst**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Folgendes mache ich dieses Mal anders oder ähnlich:

**7. Aspekte des technischen Set-ups habe ich seit dem ersten Termin in Sessions außerhalb der Studie integriert**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



**8. Ich möchte Aspekte dieses technischen Set-ups in meinen Sessions außerhalb der Studie integrieren**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Begründe für 7 und 8 welche Aspekte und mit welchem Ziel

**1. Zwischendurch hat das technische Set-up das Spiel positiv beeinflusst**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu**2. Zwischendurch hat das technische Set-up das Spiel negativ beeinflusst**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

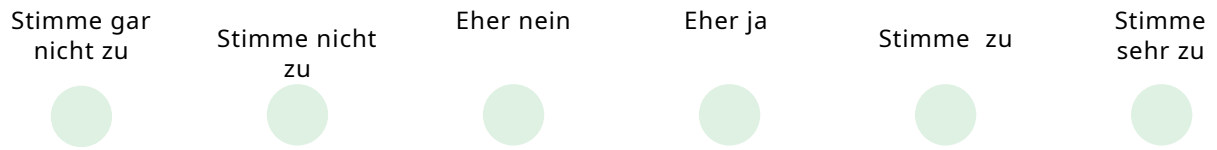
Stimme  
sehr zu

Begründung zu 1 und 2:

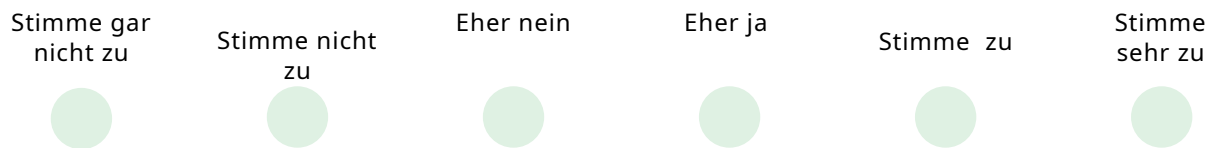
**3. Diese Dinge am technischen Set-up haben unerwartet gut/ schlecht geklappt**

**4. Beim Spielen sind mir folgende Ideen für zukünftige Nutzung des technischen Set-ups gekommen:**

1. Es gab Momente da mochte ich das technische Set-up

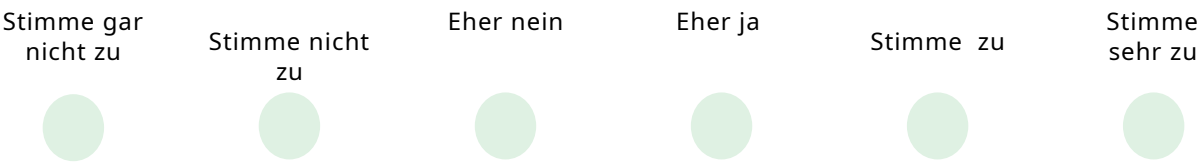


2. Es gab Momente da mochte ich das technische Set-up nicht

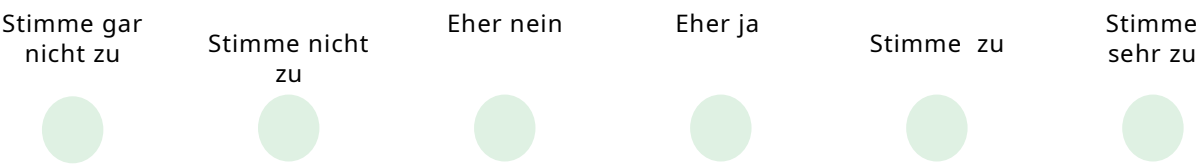


In folgenden Momenten:

3. Das technische Setup hat negativ beeinflusst wie ich leite und meinen Spaß daran



4. Das technische Setup hat positiv beeinflusst wie ich leite und meinen Spaß daran



Begründung für 3 und 4:

**5. Ich konnte alle Teile des technischen Set-ups sinnvoll verwenden**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

**6. Folgende Komponenten habe ich im Vergleich zur letzten Session mehr/ weniger verwendet**

Und zwar Folgende aus diesen Gründen:

**7. Ich bin zufrieden mit den Änderungen die ich an dem Set-up seit letztem Termin vorgenommen habe.**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Insbesondere bei diesen Komponenten:

**8. Wenn es eine weitere Session mit diesem Set-up gibt, möchte ich mehr am technischen Set-up ändern**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Insbesondere bei diesen Komponenten:

**9. Wenn zutreffend, in welchen Situationen hat das technische Set-up deine Spielleitung besonders beeinflusst?**

**10. Komponenten von dem technischen Set-up ermöglichen Neues im Spiel/ der Spielleitung**

Stimme gar  
nicht zu

Stimme nicht  
zu

Eher nein

Eher ja

Stimme zu

Stimme  
sehr zu



Und zwar:

**11. Komponenten von dem technischen Set-up haben mich abgelenkt**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Und zwar folgendermaßen:

**12. Ich konnte alle Teile des technischen Set-ups sinnvoll verwenden**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

13.

Bitte geb eine Rangliste der gegebenen Komponenten an.  
Begründe diese (1= am Besten)

- \_\_\_ Licht Person
- \_\_\_ Licht Umgebung
- \_\_\_ Sound
- \_\_\_ Vibration Stühle
- \_\_\_ Vibration Wearables
- \_\_\_ Sonstiges 1:
- \_\_\_ Sonstiges 2:

14.

**Weitere Bemerkungen, Skizzen, Ideen oder Verbesserungsvorschläge:**

G

T

P

Datum \_\_\_\_\_

Alter \_\_\_\_\_

Höchster Abschluss \_\_\_\_\_

Ich habe diese Session als : Spieler:in [ ] DM [ ] gespielt.

Geschlecht \_\_\_\_\_

Spielsystem \_\_\_\_\_

1.

Das sind meine ersten Eindrücke zu dem technischen Set-up:

2.

Das technische Set-up hat das Spiel negativ beeinflusst

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Begründung:

3.

**Das technische Set-up hat das Spiel positiv beeinflusst**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

4.

**So beeinflusst das technische Set-up mein Spielerlebnis**

1.

**Das technische Setup hat einen positiven Einfluss auf das Spiel**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

2.

**Das technische Setup hat einen negativen Einfluss auf das Spiel**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

3.

**Ich würde dieses technische Set-up noch einmal verwenden wollen**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein

Eher ja

Stimme zu

Stimme  
sehr zu

Begründung:

4.

**Ich würde folgendes an dem technischen Set-up ändern/ ausprobieren wollen:****5. Die Nutzung des technischen Set-up und das Spiel haben sich gegenseitig beeinflusst**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein

Eher ja

Stimme zu

Stimme  
sehr zu

Und zwar:

**6. Das technische Setup hat mir geholfen meinen Charakter zu spielen**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

**7. Das technische Setup hat es schwerer gemacht meinen Charakter zu spielen**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

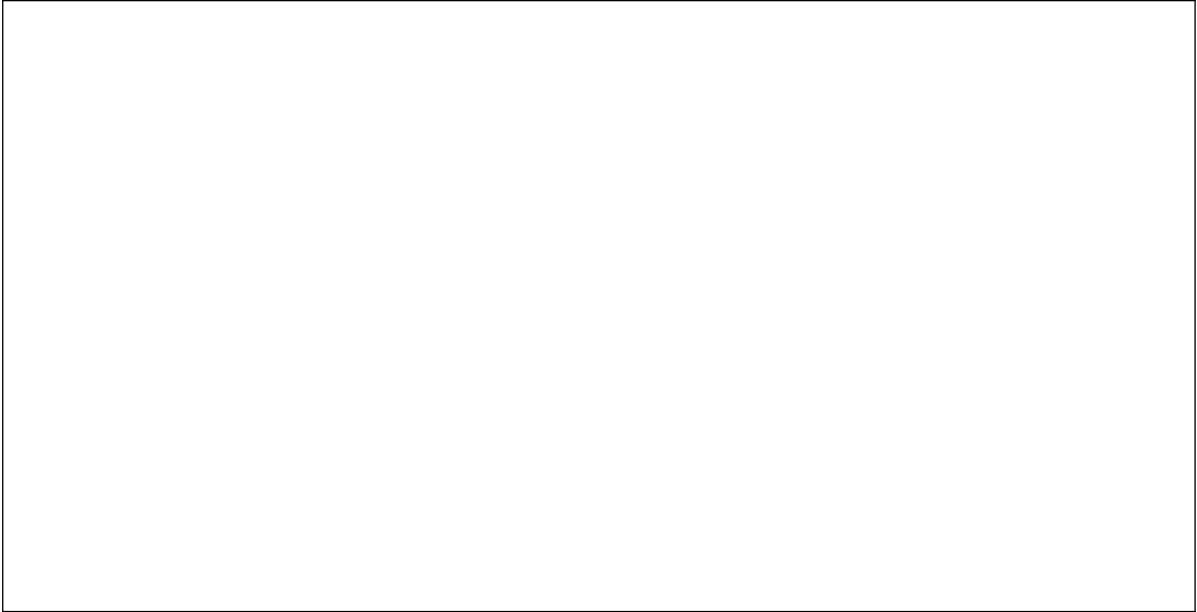
Stimme  
sehr zu

Begründung:

**8. Wenn zutreffend, in welchen Situationen hat das technische Setup dein Spielerlebnis besonders beeinflusst?**

**9. Folgende Teile des technischen Set-ups fand ich besonders gut:**

10.

**Folgende Teile des technisschen Set-ups fand ich nicht gut:**

11.

**Das technische Setup hat mich abgelenkt**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu**Begründung:**

12.

Bitte geb eine Rangliste der gegebenen Komponenten an.  
Begründe diese ( 1= am Besten)

- \_\_\_ Licht Tisch
- \_\_\_ Licht Umgebung
- \_\_\_ Sound
- \_\_\_ Vibration Stühle
- \_\_\_ Vibration Wearables
- \_\_\_ Sonstiges 1:
- \_\_\_ Sonstiges 2:

13.

**Weitere Bemerkungen, Skizzen, Ideen oder Verbesserungsvorschläge:**

**1. An welche Komponenten von dem technischen Set-up letzter Session erinnerst du dich?**

**2. Welche Hoffnungen oder Erwartungen hast du auf Grund der letzten Session an das technische Set-up heute?**

3. Hast du seit dem ersten Studientermin außerhalb von diesem technischen Set-up Table Top Roleplaying Games gespielt? Wenn ja, hast du etwas vermisst?

#### 4. Die Erfahrung mit dem Set-up hat meine Vorbereitung und Charakterpläne für diese Session beeinflusst

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu

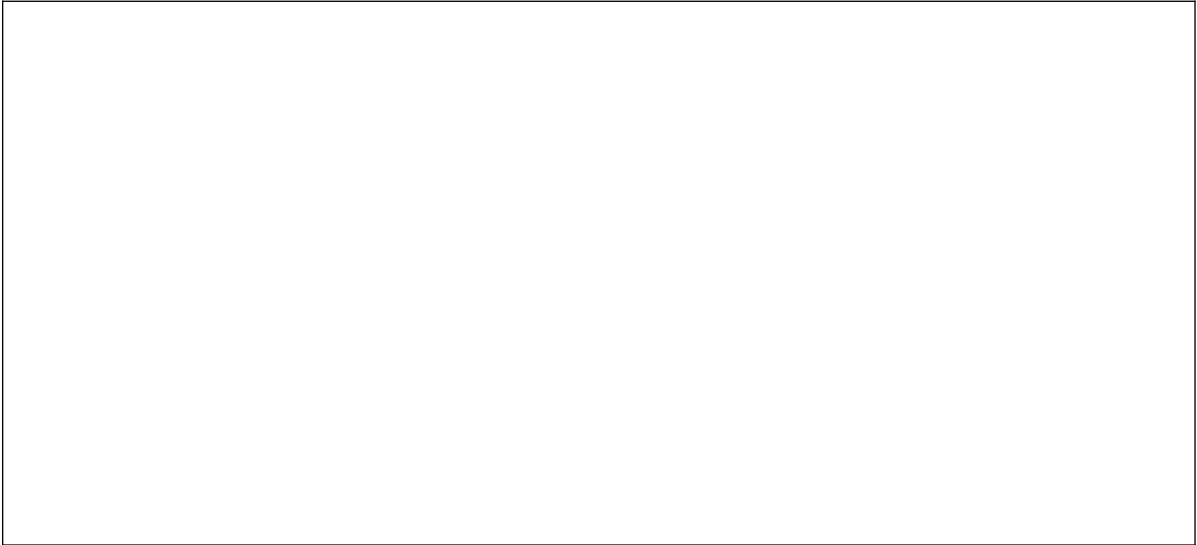


Stimme  
sehr zu

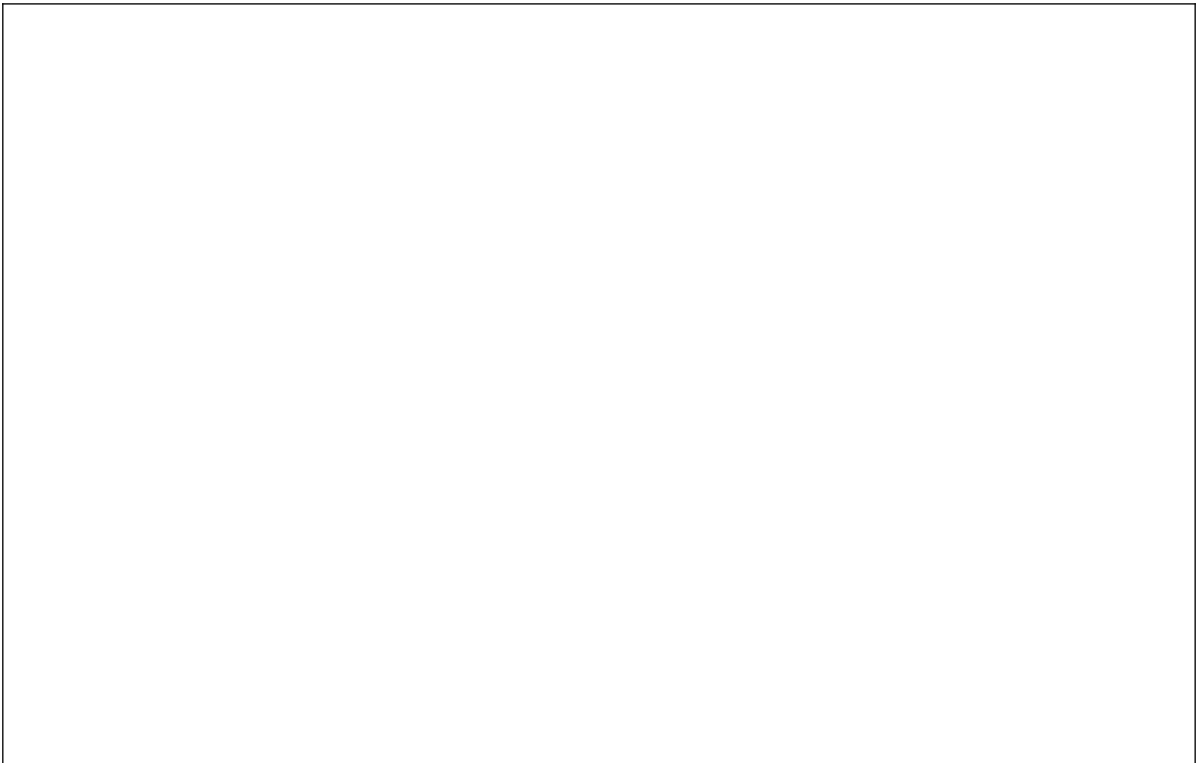


Und zwar folgendermaßen:

1.

**Das sind meine ersten Eindrücke zu dem technischen Set-up:**A large, empty rectangular box with a thin black border, intended for the user to write their first impressions of the technical setup.

2.

**So beeinflusst das technische Set-up mein Spielerlebnis**A large, empty rectangular box with a thin black border, intended for the user to describe how the technical setup influences their gaming experience.

## Das technische Set-up hat das Spiel positiv beeinflusst

### Das technische Set-up hat das Spiel negativ beeinflusst

**1. Das Spielerlebnis mit dem technischen Set-up war besser als in der letzten Session**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



**2. Das Spielerlebnis mit dem technischen Set-up war schlechter als in der letzten Session**

Stimme gar  
nicht zu



Stimme nicht  
zu



Eher nein



Eher ja



Stimme zu



Stimme  
sehr zu



Begründung zu 1 und 2:

3.

**Ich würde dieses Set-up noch einmal verwenden wollen**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

4.

**Ich würde folgendes an dem Set-up ändern/ ausprobieren wollen:****5. Die Nutzung des technischen Set-up und das Spiel haben sich gegenseitig beeinflusst**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Und zwar:

**6. Das technische Set-up hat mir geholfen meinen Charakter zu spielen**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu**7. Das technische Set-up hat es schwerer gemacht meinen Charakter zu spielen**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

Begründung:

|             |
|-------------|
| <div></div> |
|-------------|

8.

**Falls zutreffend: Das eigene Interface war vorteilhaft**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu

9.

**Falls zutreffend: Das eigene interface war nachteilhaft**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu**Erläutere die Angaben von 8 und 9:**

**10. Wenn zutreffend, in welchen Situationen hat das technische Set-up dein Spielerlebnis besonders beeinflusst?**

**11. Folgende Komponenten des technischen Set-ups fand ich besser als letztes Mal**

**12. Folgende Komponenten des technischen Set-ups fand ich schlechter als letztes Mal:****13. Das technische Set-up hat mich abgelenkt**Stimme gar  
nicht zuStimme nicht  
zu

Eher nein



Eher ja



Stimme zu

Stimme  
sehr zu**Begründung:**

14.

Bitte geb eine Rangliste der gegebenen Komponenten an.  
Begründe diese ( 1= am Besten)

- \_\_\_ Licht Person
- \_\_\_ Licht Umgebung
- \_\_\_ Sound
- \_\_\_ Vibration Stühle
- \_\_\_ Vibration Wearables
- \_\_\_ Sonstiges 1:
- \_\_\_ Sonstiges 2:

15.

**Weitere Bemerkungen, Skizzen, Ideen oder Verbesserungsvorschläge:**



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