"What Does Your Robot Do?" A Tabletop Role-Playing Game to Support Robot Design

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Abstract— **Social robot co-design requires aiding users as they imagine these novel devices within their everyday lives and enabling designers to understand and address users' experiences. This paper presents the exploratory development and evaluation of a role-playing game aimed at identifying the desired features and uses of a social robot that can assist people diagnosed with depression. Participants (n = 16) played the game as a character with depression, designed a companion robot for that character, and chose reactions to daily challenges. Though participants initially selected robot capabilities based on their own needs, after the game they identified alternative designs that would better address daily challenges faced by individuals with depression. We discuss aspects of the game that allowed participants to understand how various robot characteristics can address the experience of depression and suggest how role-playing games can support users and designers in identifying beneficial features and uses of emerging robotic technologies.**

I. Introduction

Role-playing games are both a way of removing oneself from reality as well as exploring alternative realities. Role-play has been used before to support design, aiding students in understanding the perspectives of potential users [20], for example. Role-play has also been used within healthcare settings, in order to aid healthcare workers, and find the optimal systems to work with their clients [25]. In this paper, we describe a role-playing game designed to be used as a tool to enable participants to enter the mindset of someone with depression as they go through their day in the company of a social robot. The way participants play the game, in turn, becomes a resource for design insights.

Using a table-top format inspired by well-known games such as Dungeons and Dragons, this game gives players a character that they will role-play as they move through a day in their life. This tabletop roleplay method aims to aid players in understanding the designs and potential uses of socially assistive robots for individuals with depression, by allowing participants to move through an actual day, step by step, and exploring how they might address different issues that come up while using a social robot.

To evaluate this initial version of the game, we recruited participants without asking them to disclose whether they have major depressive disorder (MDD), to get initial insight into how the game was played and feedback from participants. In the future, we plan on evaluating the game further with participants diagnosed with MDD.

People with depression experience various symptoms and challenges in their daily lives. These include familial issues [30] depressed mood [15], co-morbid physical health complications [27], and even death [32]. From the years 2013 – 2016, 8.1 percent of Americans over the age of 20 had depression symptoms in any two-week period [8].

In recent years, researchers have started exploring the potential for using social robots to assist individuals living with depression [10]. This includes designing robots that actively act to engage users in interactions, such as caring for a plant [24], as well as engaging emotionally through facial expressions and reminders [1]. In our own work, we explored how SARs can be used to aid older adults with depression living at home independently [26]. However, despite the growing use of socially assistive robots (SARs), finding the optimal design for each individual may vary based on the needs, perspectives, and activities of the user.

In the creation of this role-playing tabletop game, we particularly focused on incorporating two main types of design insights: the design factors participants would choose for their robots, and how they would use the robot they designed to support those with depression in different scenarios. While SARs have been previously explored for aiding those with depression as companions [26], and as sensor data collectors [5], understanding how the user might integrate the robot into specific everyday situations and activities is still difficult. By way of creating a world where participants could describe step by step how they interacted with not just the robot, but also the environment, our goal was to get a better understanding of how participants might incorporate the robot in their steps to overcome their depression symptoms. Rather than listing out actions that participants could do, they were free to act as they wished, and only prompted by the researcher as to how the robot might be used specifically if they were faced with a depression symptom that they could not overcome alone with the question - "What does your robot do?"

This method aims to provide context for the use of the robot that participants personally design at the beginning of the study, as well as to encourage participants to think of what they would do in any given moment, and how depression might affect those actions, in the context of their everyday activities. Rather than simply asking a participant what a day in their life may look like, they are encouraged to act out what they might do from the moment they get out of bed, and what they are trying to achieve. In this way, this method hopes to give insight into not just how participants might use the robot, but also where and when within the context of their daily experience, through the eyes of someone living with depression.

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II. Background

A. Socially Assistive Robots

Socially Assistive Robots (SARs) are robots which create social support for diverse populations, including older adults [13] and children with autism [16]. They are often designed to be used by vulnerable populations, such as the robotic seal Paro for older adults [14], or the Therabot dog-like robot for children who experienced bullying or abuse or adults with PTSD [12]. Rather than just providing physical support to the user, they also provide companionship and social interactions.

Socially assistive robots have been used within nursing homes and shown to encourage good behaviors through support at mealtimes [23]. They have also been used in the homes of older adults with depression, where their use was accompanied by a decrease of depression symptoms by the participants [26]. Clinicians have also expressed interest in using socially assistive robots with their clients, to aid in monitoring certain aspects of their lives, such as the amount of sleep their clients are receiving [11].

SARs use has also been shown to increase happiness in those without depression symptoms [18]. They have been implemented with children going through cancer treatments to reduce anxiety and depression [3]. As well as robotic designs having been explored for Behavioral Activation therapy, with those with depression [24].

B. Role-Play: Therapy and Design

Games have been explored as design tools that can support different aspects of design, such as conceptualizing designs, or changing designers' perspectives to enable them to see through another individual's experience [7]. However, the combination of games as design tools and role playing brings with it the potential for not just the design, but also the use of the designed devices.

Role-playing has been described as "the practice of group physical and spatial pretend where individuals deliberately assume a character role in a constructed scene with, or without, props." [29]. That is, role-playing gives participants the opportunity to express themselves in various situations, without having to physically be in the exact situation, and allowing them to work through another perspective.

Role-playing has also been used in the creation of designs as a type of participatory design technique. This includes aiding designers in understanding the roles of various users, and stakeholders who may be influenced by their design [2, 6]. Role-playing is used within therapeutic settings as well. This includes studies with children with autism, working through various scenarios to improve interactive social skills [22]. Role-play has been used to give voices to clinicians in design, developing a model which allows them to provide optimal care to their clients [25].

III. Methods

We used a game like study design to get a better understanding of how individuals with depression might use a socially assistive robot in their everyday life and explore related robot design factors. In this game design, which took place during a period of around 1.5 hours via the online whiteboard platform MIRO, through the use of role playing within an in-home setting, we allowed participants to react to and address various mental health and depression situations within the home. This was then used to give insight into how participants might use the robot that they have developed for this game after familiarizing themselves with the needs of (via character sheets) and designing for an individual with depression, and to see what robot traits, abilities, and sensors participants find most useful.

A. Character Sheets

Each participant was given one of 4 pre-made character sheets (fig. 2). On this character sheet, participants were given a description of an individual that they would role-play throughout the game. This description included information such as name, age, occupation, and some interesting facts (such as living far from home) about the individual.

This sheet also lists 7 common depression symptoms with 20 points assigned (see Fig. 2), with higher intensity symptoms having more points. The depression symptoms listed on the character sheets were developed through research collected through interviews from sources such as YouTube via interviews with those with depression, as well as multiple academic research articles [19]. Suicidal ideation was removed from this list, due to the sensitive nature of the topic.

This sheet also contained 7 randomly chosen characteristics that the character has, ranging from things such as friendly, to harsh, to foolish, with 10 points distributed among them depending upon intensity. The goal being that due to the less points in the characteristics which would be what the participants used to overcome the depression they would be encouraged to use the robot to aid them.

B. World Layout

In order to keep the setting as an easily controllable area, participants were given the layout of a one bedroom apartment where their character lives (fig 1). This allowed for the researcher to have some predictive control on the participants movements and allowed for the focus to remain on the use of the robot as it would be used in the home.

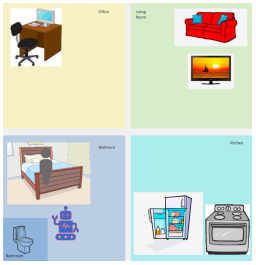

Fig. 1 The Home Setting

Each map had an office, living room, bedroom, bathroom, and kitchen. The game map also had a indicator of the character (in grey) and the robot, as pieces that could be moved around the map. These pieces would move around the map as participants described their movements and actions within the game, moving to the corresponding room. Pictures on the map were kept minimal, to allow for participants to imagine things that may exist in the character's home that were outside of the preset icons. However, some basics were included to aid participants in understanding which room each item might be found in.

C. *The Companion Sheet*

Each participant was given a blank companion sheet to fill out at the beginning of the session. This companion sheet is a representation of their robotic companion which they design with their character in mind. This sheet allows space for a name, description, a place to draw a visual representation of the robot, a section for traits and abilities of the robot, and sensors that the robot may use to interact with the user as well as the environment.

While the description of the robot could be whatever the participant desired, the traits and abilities section must specifically be what the participant saw the robot doing, and how it would react to the world or user. They had a total of 10 points that they could distribute among the 5 traits that they chose, with more points in a certain trait indicating that it was more important, and less points indicating less important. Participants also had 5 points to distribute among the 3 sensors that they identified as potentially valuable from a list of sensors, though they were also given the option to create their own sensor if they wished.

D. *How the Game is Played*

In this current version of the game, participants were assigned 1 of 4 characters that they would play and represent within the game. They were given four goals that the character must complete throughout the day, though they were allowed to interpret these goals as they liked. The game was played with either a single participant, or two participants, with the researcher acting as the game master. The participants never interacted in the game, but were allowed to discuss with one another.

One goal is to start the day, the second goal is to get some work done, the third goal is to do something to relax, and the fourth goal is to end the day. These goals were left intentionally ambiguous, so that participants describe how they might go about fulfilling them.

At the beginning of the game participants first introduced their character to the other player, and researcher. They would do this after having read through their character sheet and becoming more familiar with their character.

Once participants had become familiar with their character, they would then move to the companion sheet where they would name the companion robot that they were designing for their character. They would also type up a description of the robot, which they were free to describe as much or as little as they desired. Participants would then add and abilities to their robot they felt might be helpful to their character during their daily life. Once they had the traits identified as desired, they were asked to distribute points amongst the traits and abilities, with more points going to the those they felt were most important. Finally, they would choose sensors that they felt would be helpful for the robot to have in order to interact with the fictional world and their character, again with points distributed. Once participants were familiar with their character and had created their companion robot they would get a brief description of the gameplay.

The game is played in the following manner:

Participants would describe an action that they wished their character to do, such as "going to sleep" This action could either automatically be achieved or could trigger a reaction from one of their depression symptoms. In this case, if a character had a high insomnia score, they would face difficulties falling asleep and may be unable to complete that action. If this was the case, the researcher would roll a single six-sided die for the depression symptom and add the corresponding depression number (intensity) to that roll. This would be the "depression roll" for that action. Participants would then choose a characteristic from the list and make an argument for why that characteristic would help them overcome their depression symptom. They would then also roll a single six-sided die and add the corresponding characteristic number (intensity) to create a characteristic score. If the characteristic score is larger than the depression score, participants were allowed to complete that action, successfully "defeating" that depression symptom and moving forward in their day.

For Example, if the participants insomnia score was 6 (fig 2), and the researcher rolled a 6 on the die, the depression score would be 12.

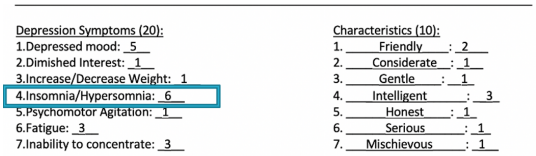

Fig 2 Depression chart with intensity numbers

Then the participant would choose a characteristic, such as serious (fig 3), with an intensity score of 1. Then the participant would roll the die, and in this example they rolled a 6, making their total characteristic score a 7.

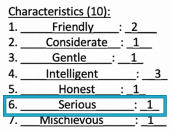

Fig 3 Characteristic chart

If the characteristic score was lower than the depression score, participants were prompted with "What does your robot do?" from the researcher. Participants would be allowed to choose a trait/ability or sensor that the robot they had created and make an argument for why that particular choice would aid them in completing their action. Once they had chosen the trait or sensor of the robot, they would then roll a single six sided die, and add the trait/sensor number to that roll. This would be the robot score.

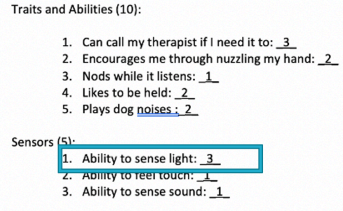

Fig 4 Robot Trait and Ability and Sensor Chart

If the robot score plus the characteristic score added together are more than the depression score, than the participant can complete the action that they described. If it does not, they are allowed to move forward and face a penalty of adding an extra point to one of the depression symptoms or wait until their next turn to try again.

Using the example from above, if the participants final depression score was 12, and the final characteristic score was 7, then they would fail to perform that action without the robot. The participant could choose to use the robot, and choose the ability to sense light, which has an importance score of 3. They would then roll a six-sided die for their companion robot, who rolled a 6. Added together that would be a 9. The 9 from the robot, plus the 7 from their characteristic score beats the depression score of 12 and they complete the action.

Throughout the game participants may make any actions that they wish, without leaving the home. They are allowed to add items to their homes that may not be pictured or interact with the world however they wish (including calling others). Participants are not given any strict rules other than that they must complete the four goals given at the beginning of the game. Once participants felt they had achieved all 4 goals the game was over.

E. Post game interview

After participating in the game, participants participated in a short 5 minute interview regarding what they enjoyed about the game, if anything, what they would change about the game, and if they felt the game was useful.

IV. Results

In total there were 16 participants, all of whom indicated that they were students. Participants were recruited through Indiana Universities classifieds system, or through word of mouth, once approval was given through Indiana Universities IRB. Participants were not required to disclose if they suffer from depression. All data was analyzed using an inductive open coding system by the first author, then later a second researcher coded two excerpts per participant, using Cohen's Kappa (*irr* = .91). The coding scheme describes the main themes played throughout the game and identified by participants in their descriptions of the robot. These main themes (such as physical design, features, sensors, and companion actions) were then broken into subcategories for analysis. By creating these themes researchers hope to identify trends in user perceptions which can guide future socially assistive robot design, particularly when these role-play based methods are later performed with adults with MDD.

A. Physical Design

The most common physical design choice that participants indicated desiring for the robot was to have four limbs (n = 10). Though having more animal-like features was also common, such as looking like a cat (n = 1), or dog (n = 2).

B. Features

Participants also chose features they wanted their robots to have. Overall participants indicated wanting the robot companion to have some sort of emotional understanding or support (n = 10). This included things such as being able to give good advice, being comforting, and being able to sense when the owner is sad and making noise to distract them. The second most common type of feature was the ability to cook or clean for the user (n = 7).

C. Sensors

Participants were also able to choose which sensors they wished their companion to have to aid them throughout the day. Participants were given a list of sensors that they could choose from but were also allowed to design their own if they wished. Overall, the most common sensor that participants indicated wanting their robot to have was the proximity sensor (n = 10) so that the robot would be aware of people in its surroundings. This was followed closely by the ambient sound (n = 7) and camera (n = 7). Participants never used their sensors when facing a depression symptom in the game; this could potentially be due to not fully understanding the sensor capabilities or unfamiliarity with sensors in general.

D. Companion Actions

The companion robots' actions to support the participants throughout the game were incredibly varied. There were 41 different types of actions that participants chose for their robotic companion to support their character while overcoming their depression symptoms.

Overall, being able to touch or respond to being touched was the most common robot action that participants used when responding to depression symptoms (n = 4).

"My thought is that because the robot gives good cuddles and hugs, that that can help stop the fidgeting." P9

Some of the most common types of robot actions were more practical. Cooking was mentioned by the participants (n = 3) as a way of supporting their characters.

"It can cook, and George (character) likes to cook, so it can make him look forward to cooking with the robot." P10

Being able to clean was also mentioned (n = 2), as well as providing a summary of the actions to do, or having been done throughout the day (n = 2).

Supporting character through providing encouragement (n = 2), or telling motivational quotes (n = 2) was also mentioned by participants.

Researcher: "You know, you're just really tired."
P15: "I'd like, start the day off with some motivational quotes."

Actions that were more about relaxing such as gaming with the participants (n = 2), telling jokes (n = 2), playing music (n = 2), or singing (n = 2), were also common in order to aid participants in overcoming various depression symptoms.

E. The Action Choices – Without Depression

All participants made the choice to get out of bed, do some work, and go to bed, as described in their goals of the game. However, many different actions were taken for relaxation, as well as extra actions throughout the day, which did not relate to their depression symptoms.

Robot Related Actions: While the robot was indicated by participants to be used most often during times of facing depression symptoms, some participants indicated petting the

robot (n = 1), or cuddling the robot (n = 1) during times of relaxation.

"I'd like to give them some attention. Maybe like, let them play with them, cuddle them." (P1)

Relaxation Actions: The actions that participants took when fulfilling the "do something to relax" requirement were quite varied. The most common action was to watch TV (n = 6), though this could possibly be due to the fact that there was a TV pictured on the map. Making a phone call was the second most common action (n = 4), either to family or to friends.

"What about like, his friendliness, so he phones a friend, maybe?" (P4)

Other relaxation items that participants mentioned were things such as meditation (n = 2).

F. Depression Symptoms and Actions

Overall, there were 62 total instances of depression symptoms that participants faced as they moved through the day in the life of their character. These symptoms included the inability to concentrate, depressed mood, fatigue, hypersomnia, decreased or increased weight, insomnia, lack of interest, and psychomotor agitation.

When faced with a depression symptom participants were allowed to choose a character characteristic that they felt would help them overcome that symptom. Participants often chose more positive traits, such as intelligent (total times participants used intelligent = 8). But would also use less positive traits such as foolish (n = 1) arguing for the positive outcome.

G. Feedback On The Method

Overall, 4 participants found that they enjoyed making the robot the most out of the entirety of the game.

“I like coming up with a robot. I think that was fun.” P4

Participants also found that after they played the game, they were interested in changing their robots’ traits to better fit the character that had depression (n = 10).

A majority of participants also found the game enjoyable.

“I thought it was more fun too. Because it was like different rounds. It gave me more time to think about like a strategy.” P5

“I guess having to think outside of the box and really putting myself in the shoes of somebody who’s been diagnosed with depression. And trying to figure out what would help me the best if I were in that situation.” P15.

Only a single participant indicated not enjoying the game, due to the sensitive nature of depression.

We found that participants initially had a hard time getting into the mindset of their character that they were assigned (n = 8), or could only partially do so (n = 5).

V. Discussion and Future Work

This method allowed participants to actively move through a day in the life of a character that had depression. Rather than thinking more generally about what they might do in a day, they were instead focused on exactly what they would want to do in each moment. By including minute things such as going to the bathroom and cooking food, participants gave information that relating to how and where a robot designed for them might be used.

While participatory design of robots has been done previously [33], and role play has been used in design settings [2], this method allows these to come together to create a novel approach to thinking through how a SAR should be designed to be useful for someone as they go through a day in the life with someone with depression. Through using the character’s characteristics to "battle" depression symptoms, and a personally designed robotic companion to aid participants, this approach seeks to get a better understanding how role play might be able to better explain the uses of socially assistive robots in the home. Participants reported having a hard time getting into the mindset of their character. This could potentially be due to the characteristic differences between themselves and their characters, as our participants were not selected based on suffering from depression themselves. Instead, participants first ended up designing the robot for themselves, and then later wished to go back and change the robot to better fit the character with depression. This does suggest that roleplaying games might serve as a method of sensitizing participants and designers to context-specific needs and relevant design considerations for robots in ways similar to (though likely not as significant) as actual experiences with robots in the home or other daily use contexts [26].

Sensors were the least used item that participants listed on their companion sheet. This might be because participants are less familiar with the notion and uses of each of these sensors, and care should be taken in the future to fully explain what each sensor is capable of doing. However, this approach gives the opportunity to work through the day with the participant, allowing them to indicate how they might directly use some of the traits, abilities, or other uses of their robot that they created. Participants thought creatively about how they might use these traits and abilities to overcome their depression symptoms, often relying on the robot for support. Participants mentioned doing actions which didn’t have visual cues on the map that they were given, as they moved through their day, but were prompted by thinking about the time of day and what goals they had. Often they included the robot in the room, and in some cases chose to include the robot in their actions.

Future versions of this game played as those without depression should allow opportunity for participants to remake their robot at the end of the session, to allow for new insights into what the life of someone with depression is like. The map should also be more tailored to the participants and their living situation, as participants indicated sometimes feeling constrained by the layout of the current map (n = 5). Future versions of this game as played by those with depression should allow for participants to have a more hands on approach to designing their living space.

VI. Conclusion

Through this table-top role-playing game participants were faced with depression symptoms and daily tasks. While not all participants suffered from depression themselves, they went through the day as a character who had varying degrees of struggles regarding their depression symptoms. While participants often indicated that they didn't play as the

character, but rather as themselves, they did find that after playing the game they wished to go back and re-tailor their robot to better fit the character with depression. After having experienced the day in the life, through role play, of a person with depression, new ideas emerged regarding the uses and scenarios that the robot might be most helpful in. Future versions of this game will be played by those with depression, for further insights into the use and design of SARs in daily life.

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