

Preregistration

Playing Alone, Feeling Connected: Do Single-Player Video Games with Social Surrogates Replenish Belonging After Social Rejection?

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Study Information

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|--------------|---|
| Title | Playing Alone, Feeling Connected: Do Single-Player Video Games with Social Surrogates Replenish Belonging After Social Rejection? |
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|--------------------|---|
| Description | <i>Note: This document is a reformatted version of the dissertation proposal available at https://osf.io/jenqd/. Please see the proposal document for more detailed descriptions.</i> |
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People have a fundamental need to belong—to be accepted, loved, and cared for. The COVID-19 pandemic has threatened people’s sense of belonging since people had to isolate themselves from others due to the stay-at-home orders. At the same

time in early 2020, people started to spend more time playing video games; sales and consumption of video games skyrocketed, breaking previous records worldwide. Existing theoretical perspectives suggest one possible reason for this popularity: video games, including single-player video games, may help people feel socially connected. For example, according to the bi-dimensional rejection taxonomy, solo gameplay is a disengaged prosocial response, an attempt to replenish belonging in a hands-off, indirect manner. In addition, according to the social surrogacy hypothesis, solo gameplay can provide social surrogates, symbolic bonds that can replenish belonging. Players can form parasocial relationships (one-way psychological bonds) with a non-player character in the game; players can also immerse themselves in the social worlds and feel like a member of a collective presented in the video game. Although existing theories and qualitative evidence suggest that solo gameplay can benefit belonging, quantitative evidence is lacking to support this prediction. In this dissertation, I will examine whether solo gameplay can replenish belonging after social rejection. In Study 1, I will validate the Heart Manikin—a single-item measure of state belonging, which I will use in the subsequent studies. In Study 2, rejected participants will recall their time playing a video game with vs. without social surrogates. In Study 3, rejected participants will play a custom video game that manipulates parasocial relationships and social worlds. Across studies, I expect that rejected participants who experience parasocial relationships and social worlds will report higher belonging than those who do not. The results will contribute to the bi-dimensional rejection taxonomy, the social surrogacy hypothesis, and the video games literature.

Hypotheses

Study 2

1. Rejected people who write about their favorite video games with social surrogates will report higher belonging than those who write about a non-favorite game. This hypothesis is directional.

Study 3

2. I hypothesize that rejected people who play a video game with higher parasocial relationship content will report higher belonging than those who play a video game with lower parasocial relationship content. This hypothesis is directional.
3. Rejected people who play a video game with higher social world content will report higher belonging than those who play a video game with lower social world content. This hypothesis is directional.
4. As an ancillary hypothesis, I expect an additive effect of parasocial relationships and social worlds: rejected people who play a video game with higher parasocial content and higher social worlds contents will report the highest belonging among all groups. This hypothesis is directional.

Design Plan

Study type

- Study 1 - **Observational Study**
- Study 2 - **Experiment**
- Study 3 - **Experiment**

Experiment. A researcher randomly assigns treatments to study subjects, this includes field or lab experiments. This is also known as an intervention experiment and includes randomized controlled trials.

Observational Study. Data is collected from study subjects that are not randomly assigned to a treatment. This includes surveys, natural experiments, and regression discontinuity designs.

Meta-Analysis. A systematic review of published studies.

Other. Please explain.

Blinding

Study 1

N/A - No experimental manipulation.

Studies 2 & 3

- For studies that involve human subjects, they will not know the treatment group to which they have been assigned.
 - Personnel who interact directly with the study subjects (either human or non-human subjects) will not be aware of the assigned treatments.
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Study design

Study 1

The study is a cross-sectional design.

Study 2

The study is a two-group between-subjects design (Video Game Type: Social Surrogate vs. Non-Social Surrogate).

Study 3

The study is a 2 (Parasocial Relationships: High vs. Low) x 2 (Social Worlds: High vs. Low) between-subjects design.

Randomization

Study 1

No randomization (cross-sectional design).

Studies 2 & 3

I will use the randomization feature of Qualtrics with an option to evenly distribute participants across conditions.

Sampling Plan

Existing data

Study 1

Registration following analysis of the data. As of the date of submission, you have accessed and analyzed some of the data relevant to the research plan. This includes preliminary analysis of variables, calculation of descriptive statistics, and observation of data distributions. Please see cos.io/prereg for more information.

Studies 2 & 3

Registration prior to creation of data. As of the date of submission of this research plan for preregistration, the data have not yet been collected, created, or realized.

Explanation of existing data

Study 1

I will use five existing datasets to validate the Heart Manikin. I have not analyzed data from three of the studies (RPR, RAIv1, and ARv1). I was not the study lead of these studies.

I led the NPSv2 and EVv1 studies. However, I have not taken a look at the relationship between the Heart Manikin scores and other variables in the study.

**Data collection
procedures****Study 1**

N/A - The data have already been collected

Study 2

I will recruit 344 participants from Prolific. Participants will receive \$2.40 (\$9.60 per hour rate x 15 minutes) for compensation. Only participants who have regularly played both video games with social surrogates and video games without social surrogates will be eligible to participate. In a screening survey, participants will first see the description about single-player video games, and indicate whether they regularly played any video games with social surrogates and without social surrogates:

Video games can be played by yourself, where you are not interacting or playing with any other real people (single player modes). Others have the option to play or interact with other real people (multiplayer). We want you to exclusively focus on games that have a single player mode. There are lots of different genres of single player games.

[Social Surrogate Games] One genre is single player role playing games (RPGs). These games always have stories and characters (NPCs), and a storyline about the characters that progresses throughout the game. Classic examples of this type of game are Mass Effect, Zelda, Final Fantasy (single-player version), and Witcher. Question: Have you ever regularly played a video game from this genre? (Yes/No)

[Non-Social Surrogate Games] Other genres do not have these features, meaning they lack a storyline or NPCs and are largely games that focus on the mechanics of completing a specific task like a puzzle, beating the clock while completing a task, or earning points by doing a task. Classic examples are Poker, Solitaire, Tetris, or sports games that do not have

teams like Pro Skater (skateboarding), Lonely Mountains Downhill (off-road biking). Question: Have you ever regularly played a video game from these genres? (Yes/No)

Only participants who indicate yes to both questions will be invited to participate in the study. For social surrogate games, I focused on RPGs because people form strong parasocial relationships with other non-player characters, and people become immersed in the social worlds and stories presented in RPGs.

Study 3

Sample size

- Study 1: N/A - I'm using existing datasets.
 - Study 2: The target sample size is 344 participants.
 - Study 3: The target sample size is 344 participants.
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Sample size rationale

Study 1

N/A - I'm using existing datasets for this study.

Study 2

To my knowledge, only one study tested whether recalling a media with or without social surrogates replenished belonging following social rejection (Derrick et al., 2009, Study 2). I will not use the effect size reported in this study for the following reasons. First, an effect size observed in a single study can be upwardly biased and unreliable (Lakens, 2017; Lane & Dunlap, 1978). Second, the media used in the original study was a TV program, not a video game, and thus the effect size may not be compatible.

Instead, I again use an average effect size estimate ($r = .21$) across 474 meta-analyses as a starting point (Richard et al., 2003) consistent with the procedure in Study 1. As mentioned, the safeguarded target effect size was Cohen's $d = 0.35$. With 90%

power to reduce Type II error and 5% alpha by convention, I plan to recruit 344 (172 per group) participants to detect the effect size of $d = 0.35$ in a two-group design. I will also consider this effect size as the smallest effect size of interest for the equivalence test. Any effect sizes smaller than $d = 0.35$ will be considered theoretically equivalent to zero in the context of the current study.

Study 3

No estimate for the effect size for this study is available, and thus I use the safeguarded effect size in Study 2 as the target effect size ($d = 0.35$). The current study is a 2 (Parasocial Relationships: High vs. Low) \times 2 (Social Worlds: High vs. Low) between-subjects design. I follow a recommendation to base the patterns of group mean differences to estimate an effect size (Lakens & Caldwell, 2019). For the purpose of the current power analysis, I treat Cohen's d as the differences in the group means by assuming the pooled standard deviation of 1. I used the Superpower R package to perform power analysis (Lakens & Caldwell, 2019).

Since the main goal of the study is to test the effects of parasocial relationships and social worlds on belonging, I calculated the required sample size based on the main effect of each. I assumed that the main effects of the parasocial relationship manipulation and the social world manipulation will each have an effect size of $d = 0.35$ (Hypotheses 2 and 3). The resulting target sample size to achieve .90 power and .05 alpha is 344 participants in total (86 per condition \times 4 conditions). This sample size is enough to detect $d = 0.50$ with .90 power and .05 alpha for the ancillary Hypothesis 4 (86 per group). See Figure 7 for the expected pattern of the means used for the power analysis.

| | |
|----------------------|---|
| Stopping rule | For Studies 2 and 3, I plan to stop recruitment when the sample size reaches the target sample size after exclusions. |
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Variables

Manipulated variables

Social Rejection Induction (not a manipulation)

I will induce the feelings of social rejection the social rejection essay used in a previous study (Sunami et al., 2019). All participants will write about a time when they felt rejected by a person or a group of their own age (excluding romantic rejection) for 5 minutes:

We'd like you to write about a time when you felt rejected or excluded by a person or a group about your own age. By "felt rejected" we mean that you felt like a person or persons did not value you or your relationship. That is, describe an episode in which you wanted to spend time with or do something with someone, and that person or persons did not let you do so. Make sure to be as detailed as possible and describe not only what happened, but also how you felt. If the rejection is by an organized group of people, make sure it is of people about your same age. For example, being rejected from a college or job is NOT what we are asking about. Please do NOT describe a romantic rejection, if possible.

Study 2 Manipulation - Social Surrogacy Essay

After completing the social rejection essay, participants will be randomly assigned to either the social surrogacy condition or the non-social surrogacy condition in the video game essay task, adapted from the previous study (Derrick et al., 2009). Participants will spend 5 minutes writing the essay. In the social surrogacy condition, participants will be asked to write about a time they played the video game with social surrogates nominated earlier:

Please think of a time when you played X [the social surrogacy video game]. Who is (are) your favorite character(s)? What was the storyline

of the game you are thinking of? What happened to your favorite character(s)? How did the gameplay make you feel? Write about everything you can remember about this particular game. Be as detailed as possible and try to relive playing the game in your mind as you write this description. You will spend 5 minutes writing about this.

In the non-social surrogate video game condition, participants will be asked to write about a time they played the non-social surrogate game:

Please think of a time when you played X [the non-social surrogate game]. What was (were) the goal(s)? What tasks were you supposed to complete? What was involved in completing the tasks? How did the gameplay make you feel? Write about everything you can remember about this particular gameplay. Be as detailed as possible and try to relive playing the game in your mind as you write this description. You will spend 5 minutes writing about this.

Study 3 Manipulation - Social Surrogacy Video Games

After completing the social rejection essay, participants will play a custom single-player video game, called *Shadows of Gaki*, developed for this study on RPG Maker (KADOKAWA Corporation, 2015). I will program the video game to independently manipulate parasocial relationships and social worlds. In this game, the player takes the role of Higura, the main character who will solve the mystery of a plague affecting the village of Azmar. I will set the gender of the main player character as female for two reasons. First, past research showed that players adopt the characteristics of the player character and change how they play the game accordingly (called the Proteus effect)—such as killing more when playing a male character, and healing more when playing a female character (Yee et al., 2011). I will hold the gender of the player character constant in my game to avoid any influence from the Proteus effect. Second, women tend to prefer a female character over a male character whereas men do not have preferences (Paik & Shi, 2013; Ratan et al., 2019). Thus, both female and male participants may like playing a female player character. For these reasons, I will hold the gender of the player character female for all participants.

The contents presented in this single-player game will vary depending on the experimental conditions. I will manipulate the parasocial relationships via the presence of the companion non-player character Sashu. In the high parasocial relationship condition, the player will have an opportunity to form a parasocial relationship with Sashu. Sashu will guide the player throughout the gameplay and present instructions. In the low parasocial relationship condition, Sashu will not be present in the gameplay, and instructions will be delivered on-screen directly to the player.

I will manipulate the social worlds via the opportunities for immersing into the story of the video game, and thus facilitating the collective assimilation (Gabriel & Valenti, 2017; Gabriel & Young, 2011). In the high social world condition, the player will be presented with story components—they will learn how the player character decides to help the village of Azmar and the story about the calamity Gaki, etc. In the low social world condition, the player will not be presented with these storytelling components.

Measured variables

Study 1

Below are the tables of the measures included in each sub-studies.

Study 1a

Table 1 *Study 1a: Summary of Measures*

| — | | — | | — | | — | |
|---|--|---------------------|--|----------|--|----------------------|--|
| Measure | | Construct | | Validity | | Citation | |
| — | | — | | — | | — | |
| Self-Assessment Manikin | | | | | | | |
| Valence | | State valence | | Con. | | Bradley & Lang, 1994 | |
| Arousal | | State arousal | | Dis. | | Bradley & Lang, 1994 | |
| Dominance | | State dominance | | Dis. | | Bradley & Lang, 1994 | |
| Center for Epidemiologic Studies Depression Scale (CES-D) | | Depressive symptoms | | Con. (R) | | Radloff, 1977 | |
| PROMIS—Short Form 8a - Social Isolation | | Social isolation | | Con. (R) | | Cella et | |

al., 2019; Hahn et al., 2014 |

Beliefs about Biological Differences between Blacks and Whites Scale | False beliefs about biological differences between Black and White people | Dis | Hoffman et al., 2016 |

Interpersonal Reactivity Scale | Tendency to react to another person's experience | Dis. | Davis, 1980 |

Self-Monitoring Scale | Tendency to self-observe and control one's behavior according to social appropriateness | Dis. | Snyder, 1974 |

Paradox Mindset Scale | Tendency to accept and get excited by tensions | Dis. | Miron-Spektor et al., 2018 |

Integrative Complexity Scale | Capacity to acknowledge the competing opinions | Dis. | Zhang et al., 2015 |

Multiple Identity Scale | Membership to different social groups | Dis. | Haslam et al., 2008 |

Note. Con. = Convergent Validity. Dis. = Discriminant Validity. (R) = Reverse association.

Study 1b

Table 2 *Study 1b: Summary of Measures*

— | — | — | — |

Measure | Construct | Validity | Citation |

— | — | — | — |

Self-Assessment Manikin: Valence | State valence | Con. | Bradley & Lang, 1994 |

MacArthur Scale of Subjective Social Status | Subjective social status | Dis. | Adler et al., 2000 |

PROMIS—Short Form 8a |

Social Isolation | Social isolation | Con. (R) | Cella et al., 2019; Hahn et al., 2014 |

Emotional Support | Emotional support | Con. | Cella et al., 2019; Hahn et al., 2014 |

Informational Support | Informational support | Con. | Cella et al., 2019; Hahn et al., 2014 |

Couples Satisfaction Index | Romantic relationship quality | Con. | Funk & Rogge, 2007 |

Inclusion of Other in Self Scale | Closeness between the self and the other person | Con. | Aron et al., 1992 |

Partner Responsiveness Scale | Romantic partner responsiveness | Con. | Gable et al., 2012 |

Relationship Conflict Scale | Conflicts in a romantic relationship | Con. (R) | Ad-hoc |

Ostracism from Romantic Partner Scale | Ostracism from a romantic partner | Con. (R) | Ad-hoc |

Abusive Behavior Inventory—Revised |

Psychological Abuse | Perpetration of psychological abuse against a romantic partner | Dis. | Postmus et al., 2015 |

Physical Abuse | Physical abuse perpetration against a romantic partner | Dis. | Postmus et al., 2015 |

Controlling Behavior Scale—Modified |

Economic Control | Perpetration of economic control | Dis. | Graham-Kevan & Archer, 2003 |

Threats | Perpetration of threats | Dis. | Graham-Kevan & Archer, 2003 |

Intimidation | Perpetration of intimidation | Dis. | Graham-Kevan & Archer, 2003 |

Emotional Control | Perpetration of emotional control | Dis. | Graham-Kevan & Archer, 2003 |

Isolation | Perpetration of isolation | Dis. | Graham-Kevan & Archer, 2003 |

Modified Food Craving Questionnaire—Trait Version | Food craving | Dis. | Cepeda-Benito et al., 2000 |

Dietary Social Support Scale | Support from one’s romantic partner about eating | Dis. | Ad-hoc |

Body Image Questionnaire | Body image | Dis. | Ad-hoc |

Godin Leisure-Time Exercise Questionnaire | Physical activity | Dis. | Godin, 2011; Godin & Shephard, 1985 |

PROMIS Sleep Disturbance—Short Form 4a | Sleep disturbance | Dis. | Cella et al., 2019 |

Single-Item Narcissism Scale | Narcissism | Dis. | Konrath et al., 2014 |

Perceived Stress Scale | Perceived stress | Dis. | S. Cohen et al., 1983 |

Center for Epidemiologic Studies Depression Scale (CES-D) - Short-Form | Depres-

sive symptoms | Con. (R) | Andresen et al., 1994 |

Note. Con. = Convergent Validity. Dis. = Discriminant Validity. (R) = Reverse association.

Study 1c

Table 3 *Study 1c: Summary of Measures*

| | | | | | | | |
|--|--|--------------------------|--|----------|--|----------------------|--|
| — | | — | | — | | — | |
| Measure | | Construct | | Validity | | Citation | |
| — | | — | | — | | — | |
| Self-Assessment Manikin | | | | | | | |
| Valence (Times 1, 2, & 3) | | State valence | | Con. | | Bradley & Lang, 1994 | |
| Arousal (Time 2) | | State arousal | | Dis. | | Bradley & Lang, 1994 | |
| Dominance (Time 2) | | State dominance | | Dis. | | Bradley & Lang, 1994 | |
| Modified Need-Threat Scale—Essay Version (Time 2) | | | | | | | |
| Belonging | | Belonging | | Con. | | Williams, 2009 | |
| Self-Esteem | | Self-esteem | | Con. | | Williams, 2009 | |
| Control | | Control | | Dis. | | Williams, 2009 | |
| Meaningful Existence | | Meaning existence | | Dis. | | Williams, 2009 | |
| MacArthur Scale of Subjective Social Status (Time 3) | | Subjective social status | | | | | |
| Dis. | | Adler et al., 2000 | | | | | |

Note. Con. = Convergent Validity. Dis. = Discriminant Validity. (R) = Reverse association.

Study 1d

Table 4 *Study 1d: Summary of Measures*

| | | | | | | | |
|--|--|-----------------|--|----------|--|----------------------|--|
| — | | — | | — | | — | |
| Measure | | Construct | | Validity | | Citation | |
| — | | — | | — | | — | |
| Self-Assessment Manikin (Times 1, 2, 3, & 4) | | | | | | | |
| Valence | | State valence | | Con. | | Bradley & Lang, 1994 | |
| Arousal | | State arousal | | Dis. | | Bradley & Lang, 1994 | |
| Dominance | | State dominance | | Dis. | | Bradley & Lang, 1994 | |

Rosenberg Self-Esteem Scale (Time 1) | Self-esteem | Con. | Rosenberg, 1965a |
 Need for Closure Scale (Time 1) | Desire for an answer on any topic | Dis. | Roets
 & Van Hiel, 2011 |
 Modified Need-Threat Scale (Times 3 & 4) |
 Belonging | Belonging | Con. | Williams, 2009 |
 Self-Esteem | Self-esteem | Con. | Williams, 2009 |
 Control | Control | Dis. | Williams, 2009 |
 Meaningful Existence | Meaning existence | Dis. | Williams, 2009 |
 Social Judgment Survey (Time 4) | Adherence to the traditional cultural values |
 Dis. | Proulx & Heine, 2008; Rosenblatt et al., 1989 |

Note. Con. = Convergent Validity. Dis. = Discriminant Validity. (R) = Reverse
 association.

Study 1e

Table 5 *Study 1e: Summary of Measures*

| — | — | — | — |
|--|--|----------|--|
| Measure | Construct | Validity | Citation |
| — | — | — | — |
| Self-Assessment Manikin (Times 1, 2, 3, 4, 5, & 6) | | | |
| Valence | State valence | Con. | Bradley & Lang, 1994 |
| Arousal | State arousal | Dis. | Bradley & Lang, 1994 |
| Dominance | State dominance | Dis. | Bradley & Lang, 1994 |
| Experiences in Close Relationships Scale—Short Form (Time 1) | | | |
| Avoidance | Attachment avoidance | Con. (R) | Wei et al., 2007 |
| Anxiety | Attachment anxiety | Con. (R) | Wei et al., 2007 |
| Fear of Negative Evaluation Scale—Brief Version (Time 1) | Apprehension in ex- pecting negative judgment from others | Con. (R) | Leary, 1983 |
| Rosenberg Self-Esteem Scale (Time 1) | Self-esteem | Con. | Rosenberg, 1965a |
| MacArthur Scale of Subjective Social Status (Time 1) | Subjective social status | Dis. | Adler et al., 2000 |
| Rejection Sensitivity Questionnaire—Short Version (Time 1) | Rejection sensitivity | Con. (R) | Downey & Feldman, 1996; Romero-Canyas et al., 2010 |
| Modified Need-Threat Scale (Times 3 & 5) | | | |

Belonging | Belonging | Con. | Williams, 2009 |

Self-Esteem | Self-esteem | Con. | Williams, 2009 |

Control | Control | Dis. | Williams, 2009 |

Meaningful Existence | Meaning existence | Dis. | Williams, 2009 |

Note. Con. = Convergent Validity. Dis. = Discriminant Validity. (R) = Reverse association.

Study 2

After completing the video game essay, participants will complete the Heart Manikin (Time 2), the modified Inclusion of Self in Other Scale (Aron et al., 1992), the modified Parasocial Interaction—Process Scale (Schramm & Hartmann, 2008), the modified Single-Item Immersion Scale (Reysen et al., 2019), the modified Narrative Engagement Scale (Busselle & Bilandzic, 2009), and the Enjoyment Subscale of the Game User Experience Satisfaction Scale (GUESS; Phan et al., 2016). Participants will also answer the year that they regularly played the games, frequency, and duration of play in open-ended questions for the game in their essay. These responses will be used for exploratory analyses (“When did you play game X?” [Example answer: 2010-2012]; “How frequently and long did you play the game X?” [Example answer: 2 times a week for 6 months]). Finally, participants will complete the attention check.

Study 3

After playing the video game, participants will complete the Heart Manikin. Then, participants will indicate whether they interacted with the non-player characters in their essay (Yes or No). If the answer is Yes, they will complete the modified Inclusion of Self in Other Scale (Aron et al., 1992) and the Parasocial Interaction—Process Scale (Schramm & Hartmann, 2008). Lastly, participants will complete the Enjoyment Subscale of the Game User Experience Satisfaction Scale (GUESS; Phan et al., 2016) and the attention check items.

Indices Below is the table of measures and indices for across studies.

| | | | | | |
|--|----------|-----------------|----------|--------------------------|--|
| | ———— ——— | Measure Index | ———— ——— | Heart Manikin raw score | Self- Assessment Manikins raw score |
| | | | | | Study 1a: Mass Testing CES-D sum score |
| | | | | | Beliefs about Biological Differences between Blacks and Whites Scale. average (11 items) |
| | | | | | Interpersonal Reactivity Scale. average score |
| | | | | | Self-Monitoring Scale sum |
| | | | | | Paradox Mindset Scale average |
| | | | | | Multiple Identity Scale average |
| | | | | | Study 1b: RAIv1 |
| | | | | | PROMIS Social Isolation, Emotional Support, and Informational Support—Short Form 8a average |
| | | | | | Couples Satisfaction Index—4-item version average |
| | | | | | Inclusion of Other in Self Scale average |
| | | | | | Relationship Conflict Scale average |
| | | | | | Abusive Behavior Inventory—Psychological Abuse & Physical Abuse Subscales average |
| | | | | | Controlling Behavior Scale—Modified average |
| | | | | | Modified Food Cravings Questionnaire—Trait Version average |
| | | | | | Dietary Social Support Scale average |
| | | | | | Body Image Questionnaire the weekly leisure-time activity scores: (9 x Strenuous) + (5 x Moderate) + (3 x Mild). People with the scores of 24 and more had lower body fat percentage and higher maximum rate of oxygen consumption (VO2 max) than those with scores of 23 or less (Amireault & Godin, 2015) |
| | | | | | PROMIS Sleep Disturbance—Short Form 4a average |
| | | | | | Single-Item Narcissism Scale raw score |
| | | | | | Perceived Stress Scale average as an index |
| | | | | | Study 1b: ARv1 |
| | | | | | Social Interaction Anxiety Scale average |
| | | | | | Modified Need-Threat Scale—Essay Version average |
| | | | | | State Self-Esteem Scale average |
| | | | | | Study 1c: EVv1 |
| | | | | | Need for Closure Scale average |
| | | | | | Social Judgment Survey raw score |
| | | | | | Study 1d: NPSv2 |
| | | | | | Modified Need-Threat Scale average |
| | | | | | Experiences in Close Relationships Scale—Short Form average |
| | | | | | Fear of Negative Evaluation Scale—Brief Version average |
| | | | | | Rosenberg Self-Esteem Scale average |
| | | | | | MacArthur Scale of Subjective Social Status raw score |
| | | | | | Rejection Sensitivity Questionnaire—Short Version average across the product of (a) anxiety and (b) expectation and averaging |
| | | | | | Study 2 |
| | | | | | Modified Inclusion of Self in Other Scale—Parasocial Relationship with Characters raw score |
| | | | | | Modified Narrative Engagement Scale average |
| | | | | | Enjoyment Subscale of the Game User Experience Satisfaction Scale (GUESS) average |
| | | | | | Study 3 |
| | | | | | <i>Same as Study 2</i> |

Analysis Plan

Statistical models

Study 1

To examine convergent validity, I will test an association between the measures used in the study and the Heart Manikin. I will use an alpha of .05 as a cutoff point for statistical significance. To examine discriminant validity, I will use an equivalence test (Lakens, 2017) since a non-significant relationship is not an absence of a relationship in a null-hypothesis testing. To do so, I will set the smallest effect size of interest (SESOI) that is the minimal effect size that I consider theoretically meaningful. Any effect size that is lower than this effect size will be considered theoretically negligible, and thus equivalent to zero. To determine the SESOI, I will first use the average effect size ($r = .21$) derived from 474 meta-analytic effect sizes (with more than 25,000 studies) in social psychology (Richard et al., 2003). I first transformed this estimate ($r = .21$) to Fisher's z (Fisher's $z = .21$) for normality (Borenstein, 2019). To safeguard against the inflation of effect size, I consider the lower bound of the 60% confidence interval as the target effect size (Perugini et al., 2014). To calculate the confidence interval, I first calculated the standard error for the Fisher's z using the sample size of 474, treating each meta-analytic effect size independently, $SE_z = 1/\sqrt{474} = 0.046$ (Borenstein, 2019). Then, I calculated the confidence interval using the normal distribution. The lower bound of the 60% confidence interval was Fisher's $z = 0.17$ (Fisher $z = 0.21$, 60%CI[0.17, 0.25]), which was equivalent to $r = 0.17$ and Cohen's $d = 0.35$. Thus, I will set the SESOI as $r = .17$. I will compare any non-significant observed coefficient with the SESOI to see if the observed effect size is significantly smaller. To examine the test-retest reliability, I will calculate ICCs and interpret them as poor ($<.50$), moderate (.50–.75), good (.75–.90), and excellent ($>.90$) based on existing guidelines (Koo & Li, 2016). Studies 1b, 1c, 1d, and 1e include data where participants completed the Heart Manikin and other measures across multiple time points. To account for the dependency in data, I will use a linear mixed model. I will describe fixed predictors under each study section. I will first include both random intercept and the random effect of Time. If the model does not converge, I will remove the random effect of

Time from the model. If the model converges, I will retain the random Time effect. To determine the structure of the residual variance-covariance matrix (R matrix) and the random-effects variance-covariance structure (G matrix), I will test models with different structures and choose the one that fits the data best. For the R matrix, I will test diagonal, compound symmetry, and unstructured structures. For the G matrix, I will test identity, variance components, and unstructured structures.

Study 1a

Study 1b

Study 1c

Study 1d

Study 1e

Study 2

I will perform Welch's t-test to compare the belonging of rejected participants who wrote about the social surrogacy video game with rejected participants who wrote about the social surrogacy video game. Based on the social surrogacy hypothesis, I expect that participants who wrote about the social surrogacy video game will have higher belonging than those who wrote about the non-social surrogacy video game. If the obtained p-value is greater than .05, I will perform the two one-sided tests of equivalence to examine if the obtained effect size is theoretically equivalent to zero (Lakens, 2017). I will consider the effect size of $d = 0.35$ as the smallest effect size of interest (SESOI). Thus, any effect sizes between $d = -0.35$ and $d = 0.35$ are theoretically equivalent to zero. To compare the observed effect size with the SESOI, I will calculate the 90% confidence interval around the observed effect size. Then, I will compare this confidence interval with $d = -0.35$ and $d = 0.35$. I will set the confidence to 90% because the TOST procedure involves two one-sided tests each with a 5% alpha (Lakens, 2017). If the observed effect size estimate falls

within $-0.35 < d < 0.35$, and its observed confidence interval does not include $d = -0.35$ or $d = 0.35$, I will consider that the observed effect size is equivalent to zero.

Study 3

I will run a 2 (Parasocial Relationships: High vs. Low) x 2 (Social Worlds: High vs. Low) ANOVA on the belonging scores. I plan to test the main effect of the parasocial relationships (Hypothesis 2) and the main effect of the social worlds (Hypothesis 3). In addition, I plan to compare the belonging scores of those in the Low Parasocial Relationships and Low Social Worlds condition to those in the High Parasocial Relationships and High Social Worlds condition to test Hypothesis 4. For each analysis, I will use $p = .05$ as an alpha level. Based on the social surrogacy hypothesis, I expect that (a) participants in the higher parasocial relationship condition will report higher belonging than those in the lower parasocial relationship condition, (b) participants in the higher social world condition will report higher belonging than those in the lower social world condition, and (c) participants in the higher parasocial relationship and higher social world conditions will report higher belonging than those in the lower parasocial relationship and lower social world condition.

Transformations

Study 1a

No transformations.

Study 1b

The fixed effects of Time will be coded as 1–3 categorical variable. The scores of a measure will be centered.

Study 1c

- each measured score (centered)
- Social Rejection ($-0.5 = \text{Rejection}$, $0.5 = \text{Acceptance}$)

- Essay Target ($-0.5 = \text{Stranger}$, $0.5 = \text{Close Friend}$)

Study 1d

- each measured score (centered)
- Time (categorical)
- Confederate Desire ($.5 = \text{high}$, $-.5 = \text{low}$)
- Rejection ($.5 = \text{rejection}$, $-.5 = \text{acceptance}$)

Study 1e

- a dummy categorical variable (Grouping Dummy) representing the four experimental conditions for Participant Desire and Confederate Desire to reduce the number of interactions in the model (coded as 0-3)
- the measured scores (centered)
- Time (categorical)
- social rejection (rejected = $-.5$, control = $.5$)

Inference criteria Across studies, I will use $p = .05$ as an alpha level

Studies 2 & 3 Main Analysis. If the obtained p-value is greater than .05, I will perform the two one-sided tests of equivalence to examine if the obtained effect size is theoretically equivalent to zero (Lakens, 2017). I will consider the effect size of $d = 0.35$ as the smallest effect size of interest (SESOI). Thus, any effect sizes between $d = -0.35$ and $d = 0.35$ are theoretically equivalent to zero. To compare the observed effect size with the SESOI, I will calculate the 90% confidence interval around the observed effect size. Then, I will compare this confidence interval with $d = -0.35$ and $d = 0.35$. I will set the confidence to 90% because the TOST procedure involves two one-sided tests each with a 5% alpha (Lakens, 2017). If the observed effect size estimate falls within $-0.35 < d < 0.35$, and its observed confidence interval does not include $d = -0.35$ or $d = 0.35$, I will consider that the observed effect size is equivalent to zero.

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|-----------------------|---|
| Data exclusion | For Studies 2 and 3, I will exclude any participants who fail to complete the entire study procedure or fail the attention check. |
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|---------------------|---|
| Missing data | I will exclude any participant who has a missing score. |
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| Exploratory analyses (optional) | |
|--|--|

Study 2

Probing Effectiveness of Rejection Induction. I will probe the effectiveness of the rejection induction by comparing using the Heart Manikin scores at Times 1 and 2. I will create a regression model predicting the Time 2 Heart Manikin scores with the following predictors: Time 1 Heart Manikin scores, Video Game Essay (Effect-Coded as Social Surrogates = 0.5 and Non-Social Surrogates = -0.5), and the Time 1 Heart Manikin x Video Game Essay interaction. I will perform simple slope analyses to estimate whether belonging changed over time within the social surrogacy and non-social surrogacy game conditions, separately.

Exploratory Manipulation Check. To explore the effectiveness of the video game essay manipulation in inducing parasocial relationships, I will use the combination of two sources of information: the yes/no question about the presence of parasocial interaction (i.e., whether participants interacted with the non-player characters in their essay), and the modified Inclusion of Self in the Other Scale (Aron et al., 1992). I will code each participant into three groups as follows. If a participant indicates that they did not interact with non-player characters (answering no to the yes/no question), they will be coded as “did not interact with non-player characters” (Group 1). If they indicate yes, and they score 0 on the modified Inclusion of Self in the Other Scale (Aron et al., 1992), they will be coded as “interacted with non-player characters but did not form parasocial relationships” (Group 2). All others will receive a code “interacted with non-player characters and formed parasocial relationships” (Group 3). I will run a two-way chi-square test (Essay: Social Surrogacy vs. Non-Social Surrogacy x Groups: 1, 2, vs. 3) to examine whether those in the social surrogacy essay condition (vs. the non-social surrogacy condition) indicated they interacted with an NPCs (Group 2) and formed parasocial

relationships (Group 3) rather than they did not interact with non-player characters (Group 1). This procedure allows participants to indicate that they did not interact with non-player characters, a response option not available in the modified Inclusion of Self in the Other Scale (Aron et al., 1992).

To explore the effectiveness of the video game essay in inducing social worlds, I will run a Welch’s t-test to compare the scores of the Single-Item Immersion Scale (Reysen et al., 2019) and the Narrative Engagement Scale, between social surrogate vs. non-social surrogate video game essay conditions. I expect that rejected participants who wrote about the social surrogacy video game will report higher immersion compared with those who wrote about their non-social surrogacy video game.

Note that both the Inclusion of Self in the Other Scale (Aron et al., 1992) and the Single-Item Immersion Scale (Reysen et al., 2019) have never been validated to measure social surrogates in video games, and thus I treat these analyses as exploratory. A failed manipulation check in this context can be ambiguous—such results can imply that (a) the manipulation was ineffective to induce parasocial relationships and social worlds, or (b) the measures were ineffective to capture the manipulated constructs. Accordingly, I will not conclude the effectiveness of the manipulation based on these exploratory analyses.

Exploratory Analysis of Enjoyment across Social Surrogacy vs. Non-Social Surrogacy Games. To explore whether levels of enjoyment differed for social Surrogacy vs. non-social Surrogacy video conditions, I will perform Welch’s t-test on the enjoyment scores. I have no a priori hypothesis for this analysis.

Study 3

Exploratory Manipulation Check. To explore the effectiveness of the parasocial relationship manipulation, I will again use the procedure in Study 2 to code the participants into three groups: “did not interact with non-player characters” (Group 1), “interacted with non-player characters but did not form parasocial relationships” (Group 2), and “interacted with non-player characters and formed parasocial relationships” (Group 3). Then, I will run a two-way chi-square test (Parasocial Relationships: High vs. Low x Groups: 1, 2, vs. 3) to examine whether those in the social surrogacy essay condition (vs. the non-social surrogacy condition) indicated

they interacted with NPCs (Group 2) and formed parasocial relationships (Group 3) more, rather than they did not interact with non-player characters (Group 1). For the social world manipulation, I will run Welch's t-test to compare the scores of the Single-Item Immersion Scale (Reysen et al., 2019) and the Narrative Engagement Scale between the High vs. Low social worlds conditions. I expect that participants who played a video game with higher social worlds will report higher immersion to the social worlds than those who played a video game with lower social worlds. Consistent with Study 2, I will treat the manipulation checks as exploratory and will not conclude the effectiveness of the manipulation based on these exploratory analyses.

Exploratory Moderation Analysis. I will explore whether the gender or race of participants moderated the effect of the parasocial relationships and the social worlds on belonging using regression. For each demographic characteristic, I will construct a regression model predicting belonging with the following predictors: Parasocial Relationships (.5 = high, -.5 = low), Social Worlds (.5 = high, -.5 = low), Gender (.5 = female, -.5 = male) or Race (four dummy variables representing: American-Indian, African American/Black, White/Caucasian, Asian/Pacific Islander, and other), and their fully-crossed interaction terms.

Other

Other (Optional) Enter your response here.

References