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Experiencing organ failure in virtual reality: Effects of self- versus other-embodied perspective taking on empathy and prosocial outcomes

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Abstract

This study capitalizes on the unique capability of virtual reality (VR) to examine the efficacy of self- versus other-embodied perspective taking in promoting kidney donation in Singapore. The study used a 2 (self- vs other-embodied) × 2 (mirror vs photo presentation) between-subjects VR experiment ($N = 128$), wherein participants played the role of a patient needing a kidney donation, either as themselves or as a typical organ-failure patient. Our findings showed that self-embodied perspective taking triggered self-oriented emotions (i.e. personal distress) and subsequently egoistic motivations that resulted in alternative prosocial behaviors (e.g. monetary donation, volunteering) than kidney donation. We found that embodying the other, rather than the self, had the practical benefit of inducing other-oriented emotions (i.e. empathy) and hence altruistic motivations that promoted kidney donation. This study clarified the conditions under which embodied perspective taking promoted different prosocial outcomes, and the specific mechanisms through which it achieved those outcomes.

Keywords

Avatar, embodiment, empathy, perspective taking, prosocial, virtual reality

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Introduction

Virtual reality (VR) has the unique capability of inviting people to take the perspective of another individual, by allowing them to embody an avatar in virtual environments. There are at least two different ways in which a perspective can be taken: an individual can imagine either how *they themselves* would feel if they were in that situation or how *another person* would feel in the same situation (Batson et al., 1997). Applying this distinction to the context of VR, an individual can embody an avatar either as themself or as another person. Despite the potential for triggering differential emotional and prosocial outcomes (Batson et al., 1997), past VR studies have not accounted for this critical distinction in perspective taking and have instead focused exclusively on either embodying another person in VR (Banakou et al., 2016; Groom et al., 2009) or embodying themselves (Fox et al., 2013; Oh et al., 2016).

At the same time, the specific mechanisms through which embodied perspective taking in VR leads to prosocial outcomes are still not fully understood. We postulate that different emotional responses, be they self- or other-oriented, are at the heart of this relationship. More specifically, we suggest that VR users' self-embodied perspective taking triggers more self-oriented emotions, such as personal distress, which in turn lead to prosocial outcomes that are aligned with their egoistic motivation. In contrast, we expect an other-embodied perspective to produce other-oriented emotions (i.e. empathy) and a completely altruistic motivation to help those in need.

To address these gaps in the literature, we compared the relative contribution of self- and other-embodied perspective taking to emotional responses and subsequent prosocial outcomes within the context of organ donation in Singapore. Although research finds that one deceased donor can save as many as eight lives (Berki, 2018), the shortage of available organs continues to inhibit this lifesaving practice, particularly in Asian countries. For example, the deceased donor rate in Singapore is around 3.5 per million people (pmp), which is less than one-tenth of the global gold standard (39.7 pmp; International Registry on Organ Donation and Transplantation, 2016). Organ donation offers a suitable context for this study, as the decision to donate one's organs requires that individuals consider their own risk and mortality (linked to egoistic motivation) as well as the needs of others (linked to altruistic motivation) (Parisi and Katz, 1986). This study expects to offer practical insights into the promotion of organ donation, and prosocial behaviors more broadly, with VR.

Literature review

Perspective taking refers to the ability to perceive another person's situation and to adopt their thoughts, feelings, and internal mental states (Epley and Caruso, 2008). It is considered a multidimensional construct, having both the cognitive dimension—inferring the thoughts and intentions of others (Underwood and Moore, 1982)—and affective dimension—understanding how another person is feeling (Enright and Lapsley, 1980).

Perspective taking has generally been linked to positive outcomes across different contexts, such as increased cooperation (Galinsky et al., 2005) and fairness in negotiations (Paese and Yonker, 2001). Yet, in the context of prosocial outcomes, the affective

dimension, rather than the cognitive dimension, serves as a foundation for empathic arousal (Oswald, 1996). Because prosocial behavior is a key focus of this article, our discussion of perspective taking centers on the affective dimension and its related outcomes.

Self- versus other-embodied perspective taking in VR

When taking another person's perspective, individuals can either (a) imagine how the other person is feeling or (b) imagine how they themselves would feel in that situation (Batson et al., 1997). The former involves imagining how the other considers the situation and how that person feels as a result. The latter requires individuals to imagine how they would perceive the situation were they in the other's position and how they would feel personally as a result. Typically, self- and other-perspective taking has been manipulated by means of written instructions. For example, individuals engaging in imagine-other perspective were instructed to "imagine *how the person in the story feels* about what happened and how it has affected his or her life" (Batson et al., 1997). However, researchers have criticized such manipulation for being cognitively taxing (Zaki, 2014) and having limited control over what and to what extent people could actually imagine (Blascovich et al., 2002; Macrae and Bodenhausen, 2000). Perspective taking in VR has the potential to address these limitations, as it presents the exact same experience through digital mediation and requires fewer mental resources (Herrera et al., 2018).

The efficacy of perspective taking in VR can be explained by the sense of embodiment that provides a link between the self and the avatar, which comprises three components: a sense of self-location, agency, and body ownership (Kilteni et al., 2012). The sense of self-location refers to the perception of being inside a body, which can be achieved by giving the user the same point of view as the avatar. The sense of agency refers to the conscious experience of exerting control over an avatar. This is achieved when the user controls the avatar, usually by moving the limbs, using input devices such as handheld controllers. Finally, the sense of body ownership refers to the user's assuming ownership of the avatar's body as their own (Tsakiris et al., 2006), which can be achieved through a morphological similarity between the avatar and the user (Slater et al., 2010). Together, these three components form a user's sense of embodiment and thereafter provide a connection between the user and the avatar to engage in perspective taking in VR.

Studies have compared embodied perspective taking with traditional perspective taking within various contexts (e.g. Ahn et al., 2013; Herrera et al., 2018; Oh et al., 2016). For example, Oh et al. (2016) compared the influence of embodied versus traditional perspective taking in reducing ageism, and found that the former was more effective in improving attitudes toward the elderly among those with more negative outgroup attitudes. In another study, participants who took on the perspective of a homeless person in VR were thereafter more likely to sign a petition supporting the homeless compared with those assigned to a traditional perspective taking condition (Herrera et al., 2018). Collectively, these studies suggest greater efficacy of embodied perspective taking at changing prosocial attitudes and behaviors compared with the traditional method.

However, only a few studies have tested for the effects of different forms of perspective taking in VR, despite the potential for triggering different emotional and prosocial outcomes. One study found that participants who embodied Sigmund Freud as a counselor in VR had stronger mood improvements, compared with those who embodied themselves (Osimo et al., 2015). However, in this case the participants were reporting their mood improvements as someone receiving advice from the counselor. Ultimately, the study did not measure the outcomes of how the participants felt themselves as a direct result of embodying themselves or the other. As Herrera et al. (2018) emphasized, there is a need to examine self- versus other-perspective taking in VR, in order to better understand the mental processes involved in VR, and how such experiences can lead to different motivations and prosocial behaviors. We take up this challenge with this study.

Emotional and motivational consequences of self- versus other-perspective taking

Researchers have suggested that self- and other-perspective taking have different emotional and motivational consequences (Batson, 1991; Batson et al., 1997). There are two distinct emotional reactions linked to another's need: (a) empathy, which is other-oriented emotions (e.g. feeling sympathy or touched) and (b) personal distress, which is self-oriented emotions (e.g. feeling troubled or disturbed). Batson et al. (1997) stated that imagining how the other person is feeling evokes purely empathic emotions, whereas imagining how one would feel in the situation evokes a more complex mixture of empathy and personal distress. For example, participants who took an imagine-other perspective as they viewed videos of people in pain reported more empathy and less personal distress, when compared with those who had taken an imagine-self perspective (Lamm et al., 2007).

Different emotional reactions, triggered by self- versus other-perspective taking, are associated with either altruistic or egoistic motivations. Personal distress reflects self-oriented aversive emotions and thus generates more direct feelings of discomfort and an egoistic motivation to remove one's own distress. This can manifest itself through psychologically distancing oneself from the person in need of help (Batson et al., 1997). On the contrary, empathy evokes an altruistic motivation to relieve another's distress, as it reflects other-oriented emotions in response to the plight of another (Batson, 1991). The type of emotional reactions and motivations that are triggered by self- versus other-perspective taking is closely related to the adoption of prosocial behaviors. We extend this theoretical claim by considering different types of prosocial behaviors that vary by motivational orientations.

Classification of different types of prosocial behaviors

Prosocial behaviors are voluntary, intentional actions that result in benefits for another person (Dovidio et al., 2017). However, the motive is often unspecified and can be either unselfish or self-serving. In fact, researchers have addressed the complex and ambivalent nature of prosocial behaviors, which are often decided based on the tension between social values (e.g. altruism) and egoistic concerns (e.g. utility) (Hirschberger, 2006). In

deciding to engage in prosocial behaviors, an individual may employ a cost–benefit analysis by assessing the benefit provided for the party in need with the cost incurred by oneself (Batson, 2011). Moderate costs may be accepted in enacting prosocial behaviors, while acts of extremely high cost may result in one making egoistic considerations and seeking lower cost alternatives. As such, prosocial behaviors can be placed along the continuum of purely altruistic to egoistic orientations.

On one hand, purely altruistic prosocial behaviors are meant to benefit others without the expectation of receiving rewards or avoiding negative consequences (Eisenberg and Miller, 1987), and often performed at a cost to oneself (Aronson et al., 2013). As in the case of organ donation, the donor is clear about the costs imposed on the self (e.g. permanent loss of an organ), but does so purely for the benefit of others. On the other hand, some prosocial behaviors can be motivated by self-interests, besides altruism, aimed at personal gain or protecting oneself from harm or punishment (Batson, 2011). For example, studies have suggested that monetary donations (Buraschi and Cornelli, 2014) and volunteer work (Omoto and Snyder, 1995) are not solely based on altruism, but rather driven by egoistic motivations such as personal development and self-enhancement. Thus, when considering the type of prosocial behaviors to engage in, individuals are likely to weigh the potential costs and benefits, which will be influenced by their altruistic and egoistic orientation on that occasion.

Altruistic and egoistic motivations in the context of organ donation

The distinctions between altruistic and egoistic motivations and different types of prosocial behaviors are highly relevant within the context of organ donation. Generally, people hold positive attitudes toward organ donation out of altruism (Morgan et al., 2003). However, very few actually decide to donate their organs, partly because it requires them to confront their own mortality or physical harm, which triggers egoistic motivations (Harel et al., 2017). Terror management theory (TMT) (Pyszczynski et al., 1999) serves as a useful theoretical framework to understand how altruistic and egoistic motivations are negotiated in deciding to donate one's organs.

TMT suggests that humans tend to avoid thinking about death, but when their mortality is made salient, they become anxious and thus engage in the anxiety buffering process, involving proximal (e.g. the suppression of death concern) and distal defenses (e.g. the maintenance of cultural worldview and self-esteem) in a temporal sequence (Pyszczynski et al., 1999). As a distal defense against death anxiety, individuals need to believe that some valued self-aspects will continue after death, in the form of an afterlife or extension of the self (e.g. children, achievements). This anxiety buffering process occurs unconsciously and can manifest as the adoption of prosocial behaviors, which helps to boost self-esteem and to maintain worldview (altruism). However, studies have found that not all prosocial actions are triggered by mortality salience, but rather depend on the utility of the prosocial actions in buffering death anxiety (Harel et al., 2017).

One study found that being reminded of one's own death decreased compassion toward people with disabilities (Hirschberger et al., 2005). In another study, Hirschberger et al. (2008, Study 2) found that mortality salience reduced organ donation-card signings,

but increased monetary donations to charity. Because individuals need to confront their mortality in deciding to donate organs, it is counterproductive for the suppression of death concern (proximal defense) and is likely to trigger egoistic motivation to protect oneself from harm. This, in turn, makes individuals turn to alternative prosocial behaviors that are available at a more acceptable cost to the self (e.g. monetary donation, volunteering) as a form of distal defense against death anxiety.

One important unanswered question is whether personal distress triggered by self-perspective taking functions similar to the death anxiety caused by mortality salience. Like personal distress, death anxiety is also a self-directed negative emotional reaction. At least in the context of organ donation, imagining oneself (vs someone else) as an organ-failure patient is likely to generate concerns of one's own death or physical harm. Thus, it is plausible that greater personal distress induced by self-perspective taking could lead to egoistic (or less altruistic) prosocial behaviors that help to buffer their anxiety—monetary donations or volunteer work. Instead, imagining someone else (vs oneself) as an organ-failure patient may prompt empathy, as Batson et al. (1997) suggested, thus prompting purely altruistic motivations to donate an organ.

We examine this possibility within the context of a VR experience where an individual takes on the role of a patient in need of a kidney donation. In doing so, we compare self- with other-embodied perspective taking. Individuals who control avatars whose faces match their own (i.e. self-embodied perspective taking) see themselves as the person in need of the organ donation because of the enhanced body ownership that comes with the morphological similarity between the avatar and the user (Slater et al., 2010). Thus, they will more likely feel personal distress, which in turn prompts an egoistic motivation. This then leads to intentions to engage in alternative prosocial behaviors, such as monetary donations or committing to voluntary work.

Conversely, individuals who embody an avatar other than themselves (i.e. other-embodied perspective taking) will be more likely to experience empathy, which is associated with purely altruistic motivation to relieve another's distress (Batson et al., 1997), leading to greater intention to donate a kidney. We propose the following hypotheses:

When compared with the other-embodiment condition:

H1. The self-embodiment condition will lead to (a) lower empathy and (b) greater personal distress.

H2. The self-embodiment condition will lead to a greater intention to (a) volunteer to help kidney patients and (b) donate money to a kidney dialysis organization.

H3. The self-embodiment condition will lead to lower intention to donate a kidney.

H4. Personal distress will mediate the effect of self-embodiment on intentions to (a) volunteer to help kidney patients and (b) to donate money to a kidney dialysis organization, whereas empathy will mediate the effect of self-embodiment on intention to (c) donate an organ.

Method

This study used a 2 × 2 (self- vs other-embodied perspective and a mirror vs photo presentation) between-subjects VR experiment. Although not hypothesized, we used two different presentation approaches (mirror vs photo) to explore the optimal method of inducing self- versus other-embodied perspective taking in VR.

Participants

We recruited undergraduate students from a large public university in Singapore as participants, randomly chosen from the university's mailing list. They were eligible to take part in the study if (a) they had not received or were not in need of an organ donation and (b) they did not know anyone who received or was in need of an organ donation.

We conducted power analyses for a two-way analysis of variance (ANOVA), which showed that a minimum sample size of 128 was necessary to attain the threshold of .80 power (Faul et al., 2009). Assuming correlations of $r = .4$ between variables, power estimations for mediation analyses indicate that a minimum sample size of 163 is needed for .80 power (Schoemann et al., 2017). After accounting for dropouts, a total of 128 participants took part in the experimental study.

The participants had an average age of 22.6 years ($SD = 1.52$), and 66 were female (51.6%). There were 122 participants (95.3%) of Chinese ethnicity, while the rest were Malays and Indians. A total of 42 participants (32.8%) reported a household income of below SG$36,000, 40 participants (31.3%) reported a household income of between SG$36,000 and SG$72,000, and the remainder had a household income of above SG$72,000. Each condition had between 31 and 33 participants. Participants received SG$5 (equivalent to US$3.69) each, for their involvement in the study.

Design and procedure

After participants had signed up for the study, we asked them to submit a photograph of their face. These photographs were processed using the *Avatar SDK* engine and converted into avatars, to be used in study manipulations (Figure 1). Participants whose faces were covered or directed away from the camera were asked to resubmit a suitable photograph. Participants gave their informed consent to participate in the study, and thereafter completed demographic and organ donation-related questions on a laptop computer. They were then provided with an *HTC Vive* VR headset and handheld controllers. After they had familiarized themselves with the equipment, the participants were randomly assigned to one of the four VR conditions.

The virtual environment was programmed in *Unity* and simulated a typical hospital ward with curtain partitions, a bed, and a small desk. A non-playable character, the patient's next-of-kin, sat on an armchair beside the bed. The players saw themselves seated on a chair in front of the desk, with several items placed on it. To induce avatar embodiment, all four conditions started with an opportunity for the participant to interact with several objects in the VR environment. Specifically, participants were able to perform a series of actions, such as picking up utensils to have a meal, consuming an apple,

Figure 1. Example of participant self-submitted photograph and the corresponding avatar generated through the Avatar SDK engine.

Figure 2. Interactive elements in the VR environment include (a) utensils, (b) apple, (c) pill bottle, and (d) medical clipboard. An other-embodiment with photo presentation condition is shown here.

Figure 3. Depiction of doctor who enters the room and explains patient's health condition.

taking medication, and reviewing the avatar's medical clipboard which was placed on the desk (Figure 2).

Participants were given the freedom to interact with the objects and no specific instructions were given. Interactive objects were highlighted in yellow whenever the avatar's hands hovered above them. A doctor (Figure 3) then entered the room, approached the participant and the next-of-kin, and began to explain the patient's health condition, via a conversation with the next-of-kin. Herein, the doctor spoke about the patient's kidney failure and their need to be registered on the kidney transplant waiting list. The doctor explained that the average waiting time was 8 years for kidney transplants and that the patient would need to undergo kidney dialysis to keep the condition under control during the waiting period. After completing the VR treatment, participants were directed back to the laptop computer to complete posttest measures. The duration of the interaction was 12 minutes on average.

Embodiment: self versus other. We operationalized self- versus other-embodiment as the difference in similarity between the avatar and the user, based on the component of sense of body ownership as a factor of embodiment (Kilteni et al., 2012). This meant that the two embodiment conditions varied depending on the avatar's identity. Participants assigned to the self-embodiment condition embodied an avatar with their own face. Those in the other-embodiment condition embodied an avatar that had the face of a typical patient in need of a kidney transplant.

We created the profile of a typical patient using a two-step process. First, we conducted extensive talks with medical specialists from Singapore General Hospital in order to understand the profile of a typical patient suffering from renal failure. Next, we reviewed statistics from the Singapore Renal Registry, which provided information on

Figure 4. Self- (above) versus other-embodiment (below) in the mirror presentation condition.

the demographics of patients affected by the condition (National Registry of Diseases Office, 2018). This led us to create a male avatar in his early forties as the face of the avatar in the other-embodiment condition.

Presentation: mirror versus photo. The identity of an avatar was shown using either a mirror or a photo on the medical chart. Past studies have used virtual mirrors or photos to disclose the identity of self-avatars (Groom et al., 2009; Osimo et al., 2015). We compared showing a mirror to displaying a photo, to see whether they had equivalent effects

Figure 5. Self- (left) versus other-embodiment (right) in the photo presentation condition.

on self- versus other-embodied perspective taking. In the mirror condition, participants faced a mirror that was directly in front of the desk within the VR environment, and they could see the reflection in the mirror throughout the VR experience. The mirror reflected either the participant's own face or that of the typical kidney transplant patient, depending on the embodiment condition they were assigned (Figure 4). Participants in the photo condition were exposed to either their own or someone else's photo on the clipboard (Figure 5). No photo was shown on the clipboard for the mirror condition.

Measures

Empathy and personal distress. This study adopted eight items to assess empathy and personal distress using a 5-point Likert-type scale (1 = *not at all*, 5 = *extremely*) (Batson et al., 1997; Herrera et al., 2018). To measure empathy, participants were asked about the extent to which they experienced the following emotions: soft-hearted, touched, sympathetic, and compassionate ($\alpha = .86$, $M = 2.71$, $SD = .95$). To measure personal distress, participants were asked to describe the extent to which they experienced the following emotions: uneasy, troubled, distressed, and disturbed ($\alpha = .84$, $M = 2.78$, $SD = .87$). As theorized by Batson et al. (1997), principal component analysis yielded two factor structures: (a) empathy (eigenvalue = 3.74) and (b) personal distress (eigenvalue = 1.87), which showed moderate correlation ($r = .34$, $p < .001$).

Prosocial behaviors. We defined three different types of prosocial behaviors relevant to the context of organ donation: (a) intention to donate a kidney, (b) intention to volunteer,

Table 1. Basic descriptive statistics and Pearson's correlations for all variables of interest.

	M	*SD*	1	2	3	4	5	6	7	8
(1) Empathy	2.71	.95	–							
(2) Personal distress	2.77	.87	.34**	–						
(3) Monetary donation intention (SG$)	1.68	1.50	.09	.32**	–					
(4) Volunteering intention (hours/week)	6.33	6.09	.05	.31**	.23*	–				
(5) Intention to donate kidney to someone they know, while alive	3.31	.93	.24**	−.03	−.09	.08	–			
(6) Intention to donate kidney to someone they know, after passing away	4.48	.73	.27**	−.03	.05	−.12	.10	–		
(7) Intention to donate kidney to a stranger, while alive	2.21	.95	.10	−.02	−.03	.06	.33**	.19*	–	
(8) Intention to donate kidney to a stranger, after passing away	4.20	.90	−.03	−.16	.17	−.02	.01	.21*	.26**	–

*$p < .05$. **$p < .01$.

and (c) monetary donation to a kidney donation organization (the National Kidney Foundation of Singapore).

To measure intention to donate a kidney, we asked about the likelihood (1 = *extremely unlikely*; 5 = *extremely likely*) for the participant to donate a kidney, under four different contingencies. They were (a) the donation takes place when participants have passed away or (b) when they are alive, and (c) their kidney is given to a stranger (M_{alive} = 2.21, SD = .95; $M_{pass\ away}$ = 4.20, SD = .90) or (d) to someone they know (M_{alive} = 3.31, SD = .93; $M_{pass\ away}$ = 4.48, SD = .73). We treated these items separately without creating a composite score to explore experimental effects on different types of organ donation. These measures had low reliability (α = .48) and moderate, small, or no correlations between items (r ranging from .008 to .33).

To assess the intention to volunteer, we asked participants to report how many hours a week they would volunteer at the hospital (on a scale ranging from 0 to 30 hours), to help kidney patients (M = 6.33, SD = 6.09).

To assess intention to make a monetary donation, participants were informed that a portion of their SG$5 study incentive could be donated to a kidney dialysis organization, and asked how much they would like to donate on a scale ranging from SG$0 to SG$5 with SG$0.50 intervals ($M$ = 1.68, SD = 1.50). Upon completion of the study, participants were debriefed and told that their incentive would not be taken for the donation. The correlation between volunteering and monetary donation was small (r = .23, p = .01); thus, we analyzed these measures separately. Descriptive statistics and correlations of all variables of interest are presented in Table 1.

Results

Analytic approach

First, we checked randomization by comparing the conditions in terms of age, gender, and ethnicity, using a series of one-way ANOVA and cross tabs. We found no significant group differences (all $p > .08$); thus, randomization was deemed successful. We also examined age and gender as potential moderators of the experimental effects and found that neither of these factors was associated with our dependent measures, nor did they interact with any experimental conditions on those outcomes. We therefore excluded these factors from the subsequent analyses.

We examined the effects of the embodiment conditions on empathy (H1a) and perspective taking (H1b), and the different prosocial outcomes (volunteering and monetary donation, H2; and organ donation, H3) using two-way ANOVA. Although we did not hypothesize about the effects of the presentation conditions, we entered both embodiment and presentation conditions (mirror vs photo) as fixed effects in the analysis to examine whether the presentation condition altered the effect of embodiment (relevant results reported below).

We used the PROCESS macro (Hayes, 2013) in SPSS to examine the mediation hypothesis (H4). We ran a series of multiple mediation models, using both personal distress and empathy as potential mediators. This approach allowed us to examine the mediation of a particular factor while accounting for the effect of another mediator in the model, thus providing a more stringent test of our theoretical claim concerning the differential roles of personal distress and empathy in forming prosocial behaviors.

Empathy and personal distress (H1)

H1 proposed that the self-embodiment condition (vs other-embodiment) would result in (a) lower empathy and (b) greater personal distress. As expected, participants in the self-embodiment condition reported significantly lower empathy when compared with the other-embodiment condition ($Mself = 2.53$, $SD = 1.04$ vs $Mother = 2.87$, $SD = .81$), $F(1, 124) = 4.36$, $p = .04$, partial $\eta^2 = 0.03$. For personal distress, the scores among the participants in the self-embodiment condition were significantly higher than those in the other-embodiment condition ($Mself = 2.94$, $SD = .97$ vs $Mother = 2.61$, $SD = .74$), $F(1, 124) = 4.41$, $p = .04$, partial $\eta^2 = 0.03$. Neither the presentation condition ($p = .59$, $p = .75$) nor its interaction with the embodiment condition ($p = .59$, $p = .55$) had any effect on these outcomes, respectively. Thus, the results of the analysis supported H1a and H1b.

Prosocial behaviors (H2 and H3)

Volunteering behavior and monetary donation. H2 anticipated that the self-embodiment condition (vs other-embodiment) would lead to a greater intention to (a) volunteer to help kidney patients and (b) donate money to a kidney dialysis organization. For voluntary work, participants in the self-embodiment condition were willing to spend significantly more hours a week helping kidney patients than those in the other-embodiment

condition (*Mself* = 7.47, *SD* = 7.27 vs *Mother* = 5.19, *SD* = 4.39), $F(1, 124) = 4.54$, $p = .04$, partial $\eta^2 = 0.04$. Similarly, participants in the self-embodiment condition were willing to donate significantly more money to a kidney dialysis organization compared with participants in the other-embodiment condition (*Mself* = \$1.97, *SD* = 1.58 vs *Mother* = \$1.38, *SD* = 1.37), $F(1, 124) = 5.55$, $p = .02$, partial $\eta^2 = 0.04$. Neither the presentation condition ($p = .16$, $p = .14$) nor its interaction with the embodiment condition ($p = .08$, $p = .48$) had any effect on these outcomes, respectively. Thus, the analysis results supported H2a and H2b.

Organ donation. H3 predicted that the self-embodiment condition (vs other-embodiment) would lead to lower intentions to donate a kidney. Participants in the self-embodiment condition were significantly less willing to donate their kidney to someone whom they knew needed it when the participants themselves were alive, compared with those in the other-embodiment condition (*Mself* = 3.12, *SD* = .90 vs *Mother* = 3.50, *SD* = .93), $F(1, 124) = 5.77$, $p = .02$, partial $\eta^2 = 0.05$. Similar significant findings were also found when the participants were asked about donating their kidney to someone they knew who needed one, if the participants themselves were to suddenly pass away (*Mself* = 4.33, *SD* = .84 vs *Mother* = 4.62, *SD* = .57), $F(1, 124) = 5.41$, $p = .02$, partial $\eta^2 = 0.04$. Neither the presentation condition ($p_{alive} = .07$, $p_{pass\ away} = .85$) nor its interaction with the embodiment condition ($p_{alive} = .27$, $p_{pass\ away} = .55$) had any effect on organ donation intentions for someone they knew.

For the intention to donate an organ to a stranger, there were no significant main effects for the embodiment ($p_{alive} = .64$, $p_{pass\ away} = .42$) and presentation ($p_{alive} = .77$, $p_{pass\ away} = .32$) conditions nor for their interactions ($p_{alive} = .37$, $p_{pass\ away} = .21$), regardless of whether the participant was still alive or had passed away. Thus, H3 was partially supported.

Test of mediation (H4)

H4 proposed that personal distress and empathy would mediate the effects of self-embodiment (vs other-embodiment) on different prosocial outcomes. We tested for multiple mediation effects, using the PROCESS macro for SPSS (Model 4). In each model, we entered the embodiment condition as an independent variable, with personal distress and empathy entered as potential mediators (see Figures 6 and 7). The models differed in which prosocial outcome served as the dependent variable, with one model each for volunteering behavior, monetary donation, and kidney donation to someone familiar (either when participants were alive or had passed on). We did not run mediation models for organ donation intentions to a stranger, because neither empathy ($p_{alive} = .24$, $p_{pass\ away} = .77$) nor personal distress ($p_{alive} = .86$, $p_{pass\ away} = .07$) was correlated with those outcomes. In all the models, the participants in the self-embodiment condition reported higher distress than those in the other-embodiment condition ($b = .32$, $SE = .15$, $p = .04$). Conversely, participants in the other-embodiment condition reported higher empathy than those in the self-embodiment condition ($b = -.34$, $SE = .17$, $p = .04$).

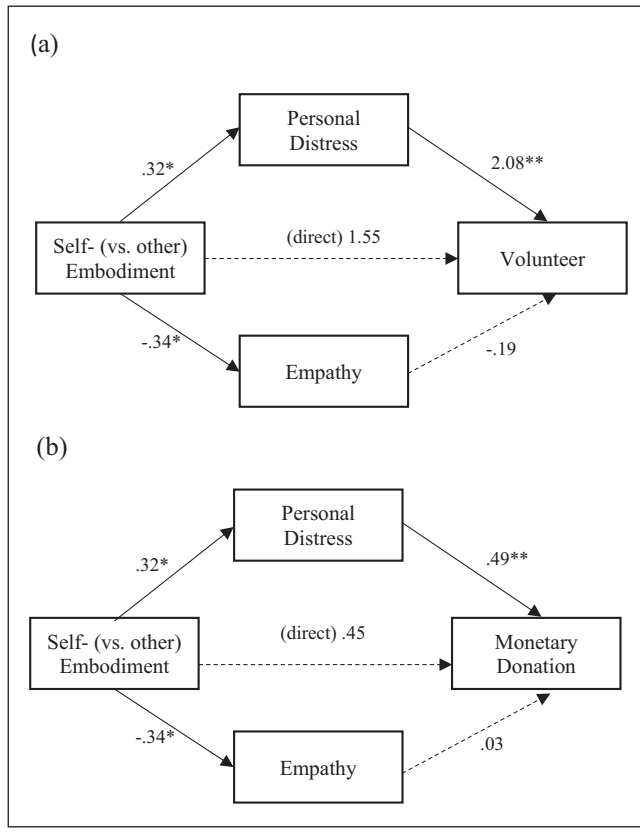

Figure 6. Self-embodiment (vs other-) effects on intentions to (a) volunteer and (b) donate money mediated by personal distress but not empathy.

Volunteering behavior and monetary donation. In the model that predicted intention to volunteer, personal distress was a positive predictor ($b = 2.1$, $SE = .65$, $p = .002$), but empathy was not associated with the outcome ($b = -.19$, $SE = .60$, $p = .75$). Our results showed that self-embodiment (vs other-) had a significant indirect effect on volunteering intention via personal distress ($b = .67$, $SE = .40$, 95% confidence interval [CI] = [.02, 1.55]). The bias-corrected 95% CI for indirect effects of empathy contained zero ($b = .06$, $SE = .27$, 95% CI = [−.47, .64]), indicating empathy was not a mediator for volunteering intention. Thus, H4a was supported.

Similarly, personal distress was positively correlated with monetary donation ($b = .49$, $SE = .16$, $p = .003$), but empathy was not ($b = .03$, $SE = .15$, $p = .84$). Self-embodiment (vs other-) had a significant indirect effect on monetary donation through personal distress ($b = .16$, $SE = .10$, 95% CI = [.00, .39]). This was not the case for empathy, with the bias-corrected 95% CI containing zero ($b = -.01$, $SE = .06$, 95% CI = [−.16, .08]). As such, empathy was not a significant mediator for monetary donation. Hence, H4b was supported.

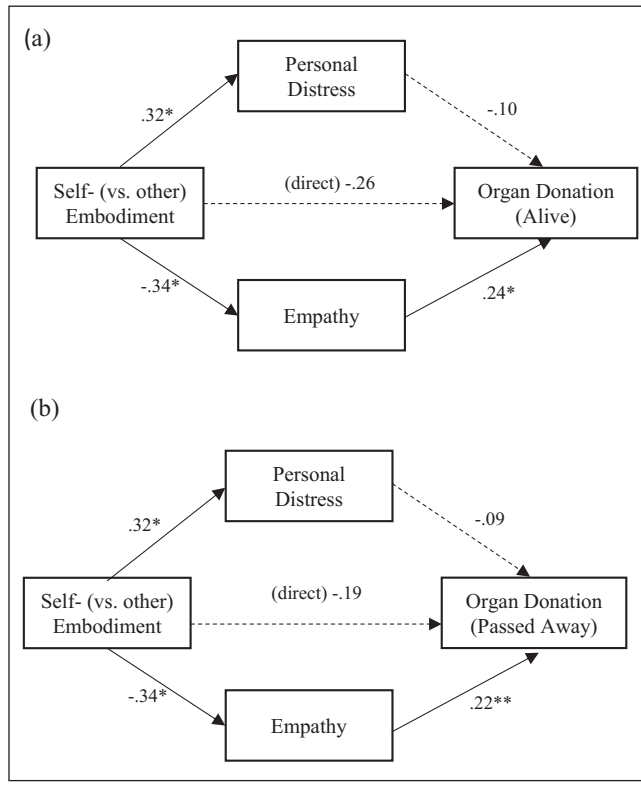

Figure 7. Self-embodiment (vs other-) effects on intentions to donate organ to someone familiar when (a) alive and (b) passed away mediated by empathy but not personal distress.

Organ donation. Empathy was a significant predictor of kidney donation intention while alive ($b = .24$, $SE = .09$, $p = .01$), but personal distress was not ($b = -.10$, $SE = .10$, $p = .34$). Self-embodiment (vs other-) had a significant indirect effect on intention to donate a kidney to someone familiar (when the participant was alive) through empathy ($b = -.08$, $SE = .05$, 95% CI = [−.20, −.01]). The bias-corrected 95% CI for indirect effects of personal distress contained zero ($b = -.03$, $SE = .03$, 95% CI = [−.11, .03]), revealing that personal distress was not a mediator.

Similarly, a participant's empathy was positively correlated with their intention to donate their kidney to someone familiar after they had passed on ($b = .22$, $SE = .07$, $p = .003$), but not for personal distress ($b = -.09$, $SE = .08$, $p = .28$). These results indicated that self-embodiment (vs other-) had a significant indirect effect on intention to donate a kidney to someone familiar (after the participant had passed away) through empathy ($b = -.08$, $SE = .05$, 95% CI = [−.19, −.01]). Bias-corrected 95% CI for indirect effects of personal distress contained zero ($b = -.03$, $SE = .04$, 95% CI = [−.11, .04]), indicating that personal distress was not a moderator. Therefore, H4c was partially supported by organ donation intention, but only for someone familiar.

Discussion

This study compared the influence of self- and other-embodied perspectives on prosocial outcomes concerning organ donation, within the context of VR. Our findings largely supported our supposition that self-embodied perspective taking leads to more self-oriented emotions (personal distress) and fewer other-oriented emotions (empathy), when compared with other-embodied perspective taking. Consequently, these different emotional responses prompted different types of prosocial outcomes, which revealed greater or lesser altruistic and egoistic motivations.

This study contributes to the extant literature on VR and perspective taking in several major ways. First, it extends the theoretical argument of Batson et al. (1997) on the distinction between imagining how another feels and imagining how oneself would feel in a needy situation to the domain of VR. In the past, to manipulate perspective taking, individuals have typically been instructed to imagine being either themselves or another when facing a particular scenario prior to the narrative exposure. An embodied perspective taking experience within VR appears to be effective in triggering different emotional responses in a similar manner to traditional perspective taking tasks.

Next, this study improves our understanding of users' engagement in VR, in particular how they relate themselves to the avatar. Earlier studies used the first-person perspective (1PP), in other words the viewpoint through the avatar's eyes, to induce the imagine-self perspective (Herrera et al., 2018). Our finding suggests that the use of 1PP in VR may not actually be equivalent to the imagine-self perspective, but rather it depends on the identity of the avatar. Users may also undertake an imagine-other perspective while engaging in 1PP.

One possible explanation is that VR users may be able to separate the physical embodiment of an avatar from their mental perspective as to whether to imagine how another feels or oneself would feel. Previous cognitive neuroscience research shows that the frontal lobes of the brain possess the ability to separate perspectives (Decety and Jackson, 2004), which helps individuals to adopt the perspective of another without merging it with their perspective of the self. However, this can result in confusion about who is experiencing certain emotions and the individual's expected outcomes. The future work should further examine the distinctions between visual viewpoints and perspective taking in VR.

This study found that self- and other-embodied perspective taking resulted in different prosocial outcomes. These relationships were explained by different emotional responses: personal distress mediated the effect on voluntary work intention and monetary donations, whereas empathy mediated the effect on intention to donate an organ. When individuals feel personal distress, associated with the egoistic motives that stem from experiencing one's own organ failure (Batson et al., 1997), they may be less inclined to engage in organ donation, as it poses a significant psychological cost to the self (Hirschberger et al., 2008). Because considering organ donation requires individuals to think about their own mortality, signing up for organ donation does not help distressed individuals buffer any anxiety caused by experiencing an organ failure. Instead, they may turn to prosocial behaviors that pose a smaller cost to the self, for example, monetary donations and commitment to voluntary work, which in turn help to suppress anxiety-inducing thoughts about organ failure (Pyszczynski et al., 1999).

In contrast, experiencing someone else's organ failure in VR prompts empathy, which in turn leads to a greater intention to donate an organ. Because empathetic concern is associated with a purely altruistic motivation to help others (Batson et al., 1997), it may motivate individuals to help resolve another's plight directly, through the intention to donate their organs, rather than indirectly contributing through alternative methods.

Overall, previous research suggests that empathy promotes prosocial behaviors; however, these studies may have not differentiated between or compared the types of prosocial behavior that can result from empathy (Batson et al., 2015; Eisenberg and Miller, 1987). We speculated that the different types of prosocial behavior were independent from each other and that their activation depended on corresponding motivation to decide whether the results were egoistic or purely altruistic.

Alternatively, moral licensing might occur when one approach is preferred over another. That is, adopting the most appropriate action in a given situation (i.e. organ donation) may free the individual from the need to take additional prosocial actions, such as monetary donations (Merritt et al., 2010). Because of its exploratory nature, we suggest replicating our study in future work and further examining the important moderators and mechanisms of the empathy–altruism relationship.

Interestingly, although seeing oneself in the mirror would seem to be more interactive than seeing a photograph, the two options did not produce different levels of emotional response or prosocial outcomes. More importantly, the effect of self- versus other-embodied perspective taking did not change depending on the difference in presentation methods. Previous researchers have suggested that body movement is not required to simulate the illusion of body ownership in VR (Maselli and Slater, 2013), although they found that visuomotor synchrony can heighten the illusion (Peck et al., 2013). Similarly, physical interactivity may not be a required condition for users to take on the perspective of either the self or the other in VR; as long as users recognize the identity of an avatar, regardless of the presentation methods, they will assume the role of the avatar and embody it according to the avatar's identity.

When compared with observing a person in need as a bystander in real life, VR may offer the potential to be expedient in promoting prosocial behaviors. It gives an opportunity not only to observe closely but also to become someone else in distress. Although an experience in the real world may seem more authentic, the third-person observation is the closest perspective an individual can undertake, be it through an imagination perspective-taking task or via narratives. A VR experience, however, can provide a sense of the direct experience of being the person in need through virtual embodiment, while simultaneously mitigating some of the realistic concerns involved in observing distressed individuals in real life.

Our study shows how perspective taking in VR can lead to different prosocial outcomes, through the embodiment of oneself or an individual in need within VR. Whereas allowing users to embody themselves in VR could increase immersion levels, it might also have the unintended effect of causing users to feel real distress, as they imagine themselves going through the difficulties faced by the self-avatar. Subsequently, they may choose outcome actions that are more in line with egoistic motivations. Conversely, a VR experience where users embody a stranger might result in outcomes that are aligned with altruistic motivations, as users may feel greater empathy toward the individual in need. Hence, our results

could help developers to understand better whether they should use self- or other-embodied VR experiences, depending on the desired prosocial outcome.

Limitations and future research

This study was not without its limitations. First, although we measured the actual amount of monetary donation to a kidney dialysis organization, we assessed only the intentions to engage in volunteer work and kidney donation. Given the potential disparities between intention and actual behavior (Heckhausen, 1991), future research could examine whether these intentions translate to actual behavioral outcomes. Particularly, because Singapore employs an opt-out system for organ donation, participants' organ donation intentions may not directly lead to actual future donations. Nonetheless, a greater intention to donate an organ may reflect a willingness to continue being registered as an organ donor. Future studies should consider a longitudinal design to examine whether the condition effects last in the long-term to lower the opt-out rates for the organ donation registry in Singapore. Researchers might also consider partnering with a nonprofit or a government organization to measure and track actual volunteering behaviors.

In our VR scenario, participants learned of their kidney failure from a doctor, who described the condition and their need to be placed on a waitlist. However, the experience may not fully simulate the difficulties experienced by kidney failure patients, such as physical pain and the barriers to a normal life. This may limit participants from having a comprehensive VR experience of embodying a kidney patient. While our treatment was sufficient to elicit different types of perspective taking and associated emotional responses, future studies could consider a more detailed VR experience, where users encounter the more compelling psychological and physical issues that real patients have to deal with.

We recruited a sufficient number of participants for the test of two-way ANOVA (power = .80), but obtained a power of .60 for the mediation analyses (Schoemann et al., 2017). When the indirect effects were analyzed separately for each mediator as a single mediation model, the results were consistent with those of multiple mediation analyses.[1] Thus, the null results for some mediators were probably not attributable to a lack of power. Nevertheless, a larger sample size would have provided more robust support for our propositions. Despite the general challenge in participant recruitment and administration of lab experiments, the future work should recruit more participants, in order to establish more conclusive support for the indirect effects.

While this study showed that different forms of embodiment in VR can lead to various outcomes, research into whether VR is demonstrably more effective than traditional perspective-taking tasks remains inconclusive. Here, we only compared self- with other-embodiment, and did not compare these conditions with a control group. It is possible that the other-embodiment condition induced higher levels of empathy only when compared with self-embodiment, and may not show significant differences when compared with people who did not engage in VR experiences. The future work could include control groups, to compare the embodiment conditions in VR with those in traditional perspective-taking techniques. This might provide a greater understanding of the two techniques and their comparative effects.

It could also be important to explore whether immersion—the objective level of fidelity experienced by a VR user (Slater, 2003)—could have a mediating effect on outcome. Various factors, such as display resolution, realism, and frame rate, can determine the amount of user immersion and might affect the user's VR experience (Bowman and McMahan, 2007).

Finally, we used a typical kidney failure patient to represent the other-embodiment condition, based on interviews with subject experts and after reviewing demographic information. This was similar to the approach employed by Osimo et al. (2015) in manipulating self- versus other-perspective taking. However, the use of a middle-aged male patient might have increased the contrasting effect between the self- and other-embodiment conditions for participants with different demographic profiles to the typical patient. To rule out the effect of individual peculiarities, future studies might consider alternative approaches to manipulating the other-condition. For example, they might randomly select a photo of another student to represent the other. Future work could also explore how portrayals of other ethnic groups or gender might affect participants of different races or gender, to better generalize their findings.

Conclusion

This study found that, within an organ donation scenario, embodied perspective taking in VR resulted in feelings of empathy and personal distress, similar to those associated with traditional perspective taking. In addition, embodied perspective taking resulted in different prosocial outcomes, depending on whether the individual undertook a self- or other-embodied perspective. These relationships were mediated by different levels of personal distress or empathy. This study's findings offer important insights for communication scholars and researchers into the design and implementation of VR interventions that aim to effectively promote prosocial behaviors.

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Note

1. We additionally examined single mediation models using the PROCESS macro (Model 4) and entering empathy and personal distress separately. Personal distress mediated the relationship between self- (vs other-) embodiment and volunteer intention ($b_{distress}$ = 2.00, SE = .60, $p < .01$), whereas empathy was not a significant mediator of this relationship ($b_{empathy}$ = .56, SE = .57, p = .33). This was compatible with the relationship between self- (vs other-) embodiment and intention to donate money ($b_{distress}$ = .51, SE = .15, $p < .01$; $b_{empathy}$ = .21, SE = .14, p = .15). Conversely, empathy mediated the relationship between self- (vs other-) embodiment

and the intention to donate an organ to both someone they knew who was alive ($b_{empathy} = .21$, $SE = .09$, $p < .05$) and who had passed on ($b_{empathy} = .19$, $SE = .07$, $p < .01$). However, personal distress was not a significant mediator between embodiment and the intention to donate an organ to someone they knew who was alive ($b_{distress} = .01$, $SE = .09$, $p > .05$) or who had passed on ($b_{distress} = .01$, $SE = .07$, $p > .05$). These results are consistent with those established when both proposed mediators were included in the multiple mediation analyses.

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