

Virtual Reality as a Tool for Alleviating Gender Dysphoria: A Pilot Study

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Abstract

Gender affirming care, defined as psychological and medical care for transgender and gender non-conforming (TGNC) individuals to align with their gender identity, is not a universally accessible resource. It can be unsafe to access, and those who do have access tend to experience extensive wait times, even waiting for years at times. This leads to the need for alternative ways to alleviate gender dysphoria, i.e., the feeling of distress felt by not identifying with one's assigned gender at birth. In this paper, we explored if simulating a mundane, everyday scenario in a virtual reality (VR) game can help to alleviate gender dysphoria. A simple puzzle game based on a grocery store setting was created. We explored if the game platform (desktop vs. virtual reality head mounted display), and the non-player character interactions (with either correctly gendered or gender-neutral language) further affected gender dysphoria feelings. TGNC participants ($n = 16$) created a custom character with their preferred pronouns, and played the game in VR or on desktop, with either gendered or non-gendered language. They answered the Kiel Gender Dysphoria Questionnaire (KGDQ) before playing the game and one week following the experiment. The KGDQ showed a decrease in gender dysphoria for all groups. Given the absence of a control condition and the small sample size, the results should be interpreted as preliminary. Nonetheless, they could suggest that character customization, detailed pronoun input, and playing as said character in a mundane scenario may be worth exploring. We discuss implications and further research to help this community.

CCS Concepts

• **Social and professional topics** → **Gender**; • **Applied computing** → **Psychology**; • **Human-centered computing** → **Virtual reality**; *Empirical studies in HCI*.

Keywords

Virtual reality; Transgender; Gender Non-Conforming; Serious Games; Gender Dysphoria.

ACM Reference Format:

Dom Doesburg, Tanja C. W. Nijboer, and Albert Ali Salah. 2026. Virtual Reality as a Tool for Alleviating Gender Dysphoria: A Pilot Study. In *Companion of the INTERNATIONAL CONFERENCE ON MULTIMODAL INTERACTION (ICMI Companion '26)*, October 05–09, 2026, Napoli, Italy. ACM, New York, NY, USA, 5 pages. <https://doi.org/10.1145/3776591.3833842>



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ACM ISBN 979-8-4007-2319-3/2026/10
<https://doi.org/10.1145/3776591.3833842>

1 Introduction

Transgender and gender non-conforming (TGNC) individuals are people who identify as a gender identity different from their assigned gender at birth (AGAB). This community is a target for discrimination, which can lead to feelings of gender dysphoria [29], namely the feelings of distress a person has when their gender identity does not match their AGAB [6]. The discrimination has also spread into healthcare, with access to gender affirming care (GAC) becoming more limited. Because of this, there is a need for research on improving their quality of life, specifically alternatives for the resources that are being limited or taken away.

Many TGNC people seek GAC as a means to align themselves with their gender identity and help to minimize or alleviate their gender dysphoria. This can be done through psychological help like therapy and counselling, and/or medical transition, through hormone replacement therapy and surgical options. It is important to note that not all TGNC people seek GAC, and that it is just one option in a journey of exploring, accepting, and existing with their gender identity. For those seeking GAC, it is not always accessible and can even be unsafe to seek out [4].

The rise in transphobia, violence, and laws has made access to gender affirming care and resources increasingly unsafe for many TGNC people [29]. Further, for individuals who are able to access resources in their communities, the wait times can be extensive. Van de Grift et al. studied gender affirming medical care in the Netherlands in 2019 and found that for 10 out of 20 available treatments, the wait time exceeded a year [24]. This shows the need for alternative means to alleviate gender dysphoria that are safe and accessible. One such alternative is gamified gender affirming care, explored here through virtual reality (VR).

Our research aims to explore whether a VR game can be used to alleviate gender dysphoria in transgender and gender non-conforming individuals, and if so, whether interactions with synthetic characters can be engineered to positively impact the symptoms of gender dysphoria. The research question and sub-aims are the following:

- **RQ1:** Does simulating a mundane, everyday scenario in a virtual reality game help to alleviate gender dysphoria in transgender and gender non-conforming people?
- **RQ1a:** Does the virtual reality experience of a game have an increased positive impact on gender dysphoria than a desktop experience of the same game?
- **RQ1b:** Do users experience a decrease in gender dysphoria over short time, e.g. one week after the experience?
- **RQ1c:** Does encountering different language, i.e., correctly gendered versus gender-neutral language, have an effect on the change in gender dysphoria?

2 Method

To explore if a VR application is able to help TGNC people alleviate gender dysphoria, a game was developed. To examine platform effects, both VR and desktop versions were prepared, and variants where non-player characters used correctly gendered language or gender-neutral language. A user study was conducted where users played one of the combinations of platform and language, and answered questionnaires about their dysphoria and about usability.

2.1 Initial Survey

First, a Qualtrics survey with multiple open-ended questions was distributed to TGNC subjects to discover what situations they felt the most gender dysphoria and euphoria in their everyday lives. Each answer was categorized in themes, with multiple categories per answer permitted. Based on the responses, the themes that make TGNC people feel the most dysphoric were established as misgendering, clothing, and self-viewing. With regards to the questions about situations that feel the most gender euphoric, three common themes emerged: correct gendering, clothing that expressed gender identity, and feeling connected to the TGNC community, respectively. These results were in line with previous research (e.g. [8, 12]), and were the main considerations in the development of the game.

2.2 Apparatus and Software

The game was developed in Unity (version 6000.3.6f1), with a Meta Quest 3S as the head-mounted display (HMD). For character customization, the Genies Avatar SDK was used [9]. This SDK was chosen as it was open source, had multiple sample scenes made directly for Unity including a VR implementation, and had a development team that answered questions in a timely manner. Furthermore, avatars were saved in a database, and were thus able to be created on a desktop and directly applied in the VR application. The most important aspect of this SDK was that the customizer did not force the user to choose between two binary options of ‘male’ or ‘female’ when starting the creation, which was a limitation mentioned in previous literature [7]. All customizable aspects of the avatar were independent of each other, making it the most diverse customizer, compared to competitors like Viverse [26] (which forced users to choose between male and female characters) and VRChat Creation [1] (which did not have preset clothing options or easy export to different Unity scenes).

2.3 Participants

In all, 16 participants volunteered ($M_{age} = 25.75$, $SD = 3.80$), and were not compensated otherwise. Of the 16 participants, three people identified as trans men/masculine, seven as trans women/feminine, three as gender fluid, and three as non-binary. For gender affirming care, 12 participants indicated receiving hormone replacement therapy, two indicated not receiving it but wanting to, and two indicated not receiving it and not wanting to. The study was approved by the Utrecht University Ethics Committee of the Research Institute of Information and Computing Sciences, and all participants gave their informed consent for inclusion in this research.

2.4 Game Design

The themes present in the initial survey led to developing a game that included pronouns and gendered language options to let users experience correct gendering during interactions with game agents, as well as reflective windows in the environment to give the player an opportunity of self-viewing their created avatar. Half the participants (eight users) played the game on a desktop computer, and the others played in a VR HMD. Within each of these two groups, half had NPC dialogue that did not include pronouns or gendered terms (Group GN, $n = 4$ per platform), and the other half had NPC dialogue that includes gendered language with the correct pronouns and chosen terms (Group G, $n = 4$ per platform).

The game began outside a convenience store, representing a mundane situation recommended by Reyes and Fisher [19]. Before starting the game, users inputted their name, preferred pronouns, preferred gendered terms, and if their pronouns needed plural verb conjugations. Having manual input for pronouns was also based on Reyes and Fisher’s research, as giving users flexibility in their pronoun choices, and not just a preset, can help reduce gender dysphoria. The users were given a grocery list of illegible items made up of random characters, and needed to speak to different non-player characters (NPCs) to gather hints regarding these items. Each NPC was given a different ‘personality’. The first NPC was a friendly character and the second was sassy. The third encounter was an interaction with two NPCs, one being a confused old lady and the other a friendly man.

2.5 Usability Testing

Based on the work by Nielsen and Landauer, the optimal sample size for usability testing is five users [18]. The usability testing was done to determine if the game made logical sense, the instructions were clear, and if there were any bugs that had been missed. Several issues were identified and corrected, including UI improvements (text readability, button sizes, grocery list visibility) and gameplay adjustments (item placement, NPC responsiveness, hint menu addition).

2.6 Experiment

Participants met at a university library, where private rooms with enough space for VR usage were reserved. Participants started by reading over a consent form, followed by a filling in a demographics form. Next, they filled out the Kiel Gender Dysphoria Questionnaire (KGDQ) [16] to determine their level of dysphoria in the previous week. Once completed, the users created their avatar that represented their ideal gender goals and were set up in the game, either on desktop, or in the HMD. Assignment of language and platform was fixed based on the order participants signed up and was counter-balanced. Once the game was finished, participants answered a question on what they liked and disliked about the game, and then completed the System Usability Scale questionnaire [13]. One week following the experiment, participants received an email with a Qualtrics survey link to answer the KGDQ again. The experiment took on average 45 minutes to complete. No participants requested breaks or reported feeling motion sickness from using the VR equipment.

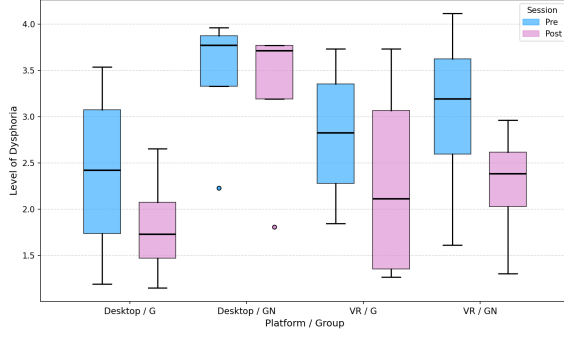


Figure 1: Averaged score distribution of the KGDQ by platform, group, and time.

3 Results

The results from the Kiel Gender Dysphoria Questionnaire (KGDQ) and System Usability Scale (SUS) were presented in the following section. Platform refers to virtual reality and desktop, and group is the language: GN is gender-neutral, G is gendered, respectively.

3.1 Kiel Gender Dysphoria Questionnaire

Participants were asked to complete the KGDQ once before playing the game and one week following this. Examining the univariate type III repeated-measures ANOVA between subject effects of the KGDQ responses, there was no significance between desktop and VR ($F = 0.07, p = 0.760$) versions of the game. There was a trend towards difference in language groups that was not significant ($F = 2.15, p = 0.168$), and no significant interaction between platform and language groups ($F = 1.63, p = 0.227$). Within subject analysis showed a significant change from the pre- to post-answers across all platform and language group combinations ($F = 27.85, p < 0.001, ges = 0.092$), which shows a small-to-medium effect (Figure 1). The pre- and post-mean scores were $M = 2.92$ and $M = 2.41$ respectively, showing a drop of 0.51 points. A pairwise contrast confirms this effect ($t(12) = 5.28, p = 0.0002$). The interaction effects showed similar changes between platform and time ($F = 1.76, p = 0.210$), and similar change between language groups and time ($F = 0.11, p = 0.751$). The interaction between platform, group, and time was not significant, however there was a trend ($F = 2.98, p = 0.110$). The drop from pre and post for groups GN and G can be seen in Table 1.

The baseline scores between the gendered and non-gendered groups differed by 0.63 points which is larger than the pre to post drop of 0.51. Repeated measures partially controls for this as each participant uses their own baseline, but the magnitude of the between group differences could indicate that the two groups were not equivalent either due to allocation of groups or high variances expected with small samples.

Table 1: Group mean, SD, and drop results.

Group	Pre-Survey	Post-Survey	Drop
GN	3.23 (SD=0.90)	2.75 (SD=0.94)	-0.48
G	2.60 (SD=0.90)	2.06 (SD=0.92)	-0.54

The KGDQ has three sub-scales: ‘Alienation’, ‘Body Dysphoria’, and ‘Gender Role Pressure’, respectively. Each sub-scale showed a significant difference in time, as the score dropped from the pre- to the post-questionnaire. For ‘Alienation’, the time effect was significant ($F = 19.44, p = 0.0009$), and the scores dropped from 2.66 to 2.09, with no significant interaction with platform or group. An Estimated Marginal Mean (EMM) and pairwise contrast for each sub-scale was computed [20]. The EMM showed that participants on desktop had their a -0.41 in their dysphoria ($p = 0.045$) and VR had a drop of -0.74 ($p = 0.0018$), which showed that both platforms reduced Alienation, however, there was no significant interaction between platform and time.

The second sub-scale, Gender Role Pressure, also showed a significant effect on time ($F = 10.85, p = 0.006$), with scores dropping from 2.96 to 2.51. The platform and time interaction showed a trend ($F = 4.01, p = 0.068$), with a larger drop for VR ($-0.73, p = 0.0028$) compared to desktop ($-0.18, p = 0.379$). Further, group G showed a significant drop ($-0.589, p = 0.011$), while group GN did not ($-0.321, p = 0.126$). Finally, ‘Body Dysphoria’ had time effect significance ($F = 11.21, p = 0.006$) with scores dropping from 3.16 to 2.69, but there were no significant interactions with both platform and groups reducing similarly.

3.2 System Usability Scale

To analyze the System Usability Scale (SUS) results, each question was analyzed using Kruskal-Wallis and Dunn’s post-hoc with Benjamini-Hochberg adjustment. For the overall score, normality was checked with Shapiro-Wilk ($p = 0.0446$), homogeneity of variance with Levene’s calculation ($p = 0.996$), and a two-way, between-subject ANOVA was conducted.

The overall SUS total score had no significant differences between any of the groups (KW $p = 0.43$, ANOVA p ’s all > 0.22). All median values ranged from 70 for VR+GN to 85 for Desktop+GN. These scores all fall in the range of “Good” to “Excellent” [3]. For the analysis of each question individually, the Kruskal-Wallis tests showed significant differences for questions 6 and 10 only. Question 6, “I thought there was too much inconsistency in this system”, resulted in $p = 0.014$, with group Desktop+G showing a significantly higher median score than both VR groups. Question 10, “I needed to learn a lot of things before I could get going with this system”, showed significance ($p = 0.021$), with the VR+GN group showing the steepest learning curve.

4 Discussion

4.1 Kiel Gender Dysphoria Questionnaire

The Kiel Gender Dysphoria Questionnaire showed a significant difference between the results before and one week after the experiment. This means that playing the game, regardless of platform or language options, decreased dysphoria overall. Although the experiment was underpowered, these findings could lead to some useful guidelines in game development.

As the feelings of dysphoria changed with all groups, looking at the constants across all participants could lead to understanding what might have caused these changes. In all groups, users had to create a customized character which represented their ideal gender goals, whether that was already achieved or something they were

striving for. From previous research, character customization has been found to help TGNC people explore their identities ([17, 23, 25]) and to express their ideal selves ([2, 10, 27]). This could help to explain the findings, as the ability to play as an ideal self and explore the options of gender expression could help with feelings of dysphoria as it provides a safe environment to explore these aspects of one's identity.

This could also be explained through the self-discrepancy theory [11], which, as Loewen et al. found, showed that when there was a high discrepancy between the actual and ideal self, users preferred creating and playing as an idealized avatar [14]. The Proteus Effect (PE) further describes the internalization and embodiment of characteristics of digital representations [28]. However, the existing literature on PE and self-discrepancy theory mostly examines immediate or short term effects after avatar exposure, rather than a week following. We therefore treat the one-week persistence of the effected as a notable but preliminary finding that should be examined with a dedicated mechanistic investigation, rather than as confirmation of existing embodiment theories.

Another constant across all groups was the pronoun input. Regardless of NPC language settings, all users inputted their preferred pronouns. Multiple participants mentioned enjoying the detailed pronoun options. Although the language options did not show a significant difference in the change of KGDQ scores, talking to an NPC in a custom character that represents one's true self might have an impact on these feelings. The researched questions presented here cannot be accepted nor rejected, as the small sample size led to under-powered results. Reaching a large user base for TGNC individuals is difficult. However, based on the results, the first research question showed some evidence that simulating a mundane, everyday scenario in VR can help alleviate gender dysphoria. The first sub-aim, RQ1a, showed no significance between platforms, although future research might find different results. The second sub-aim, RQ1b, showed significant differences in all groups between the pre- and post-experiment questionnaires. Finally, the last sub-aim showed no significant differences between language groups; more research is needed to either confirm or explore these results.

4.2 System Usability Scale

From the analysis, the final grade average of all groups fell between 70 and 85, which is considered a "Good" to "Excellent" [3]. These scores could show that the system was implemented well enough to not affect the outcomes between groups. Question 6 (inconsistency) showed that desktop groups had more inconsistencies than VR groups, which could be explained by the implementation method, as the VR version was built first and the desktop version was created by editing it. Question 10 showed higher values for the VR platform, which is to be expected as many users had little VR experience.

4.3 Limitations

The main limitation of this research was the quantity of data collected. As 48 people were needed for statistical power and only 16 were recruited, all tests were under-powered. The findings were thus not concrete, and future research will need to be done to fully explore the effects of this type of game. However, related works in

the literature reported user studies with similar subject numbers. For example, a recent study by Skiers et al. investigated VR-based therapy in a user study with 21 LGBTQIA+ participants (and two qualified counsellors) [21].

Furthermore, the Kiel Gender Dysphoria Questionnaire was designed to be answered four weeks following the first responses, however in this research, the second responses were collected one week after. Hardware was also a limiting factor in the VR version; the Meta Quest 3S is not a very powerful device, so some aspects of the game had to be compromised to make the game function smoothly.

4.4 Future Work

After users played the game, they were asked what other situations they would be interested in exploring. Participants mentioned wanting situations that could challenge their gender more, for example a doctor's office, or a clothing store where there are more opportunities to see themselves in reflections. Different levels could also be used to help practice coming out to friends and family, going on dates, or going through the process of legally changing one's name or gender marker. An addition of levels could also add an aspect of replayability, letting users play multiple times.

A longitudinal study could also explore the negative effects of this kind of game. Creed et al. [5] explored what kind of barriers VR has for people with disabilities, and one key finding relevant to this research was the difficulty users had leaving the immersive environment. This could be an issue that arises from games that target gender dysphoria, as users might experience greater dysphoria when leaving their ideal character back to their real body.

Multiplayer options were also suggested, as social VR can be very helpful for gender identity and exploration, and removes the 'fakeness' of preset NPC dialogue [22]. Finally, future research could collect data on how long participants spent looking at themselves in the mirror, to see if that has a correlation with different KGDQ answers, and eight sessions (as suggested in [15]) with KGDQ responses before, during, and after could reveal further trends.

5 Conclusions

The research presented aimed to explore if a virtual reality game could be implemented to help alleviate gender dysphoria in the transgender and gender non-conforming population. A video game presenting a mundane situation with mandatory interaction with non-player characters (NPCs) was implemented for a user study. Two versions of the game were created, one to be played on a desktop, and one in a virtual reality head-mounted display. Within each of these groups, half would interact with NPCs that did not use any gendered language, while the other half had NPCs using their preferred pronouns and gendered terms.

The research question, if a virtual reality game can help alleviate gender dysphoria, showed some promising results, as the VR version did not perform worse than the desktop. However, the experiment was under-powered, with only 1/3 of the needed sample size for statistical power.

The recommendations from users could further be implemented in future work to explore different aspects that can affect dysphoria, and to explore further ways a game can help alleviate these feelings.

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