Article

Reimagize – a digital card-based roleplaying game to improve adolescent girls' body image

Unnathi Utpal Kumar[1], Adhrit Ranjan[1], and Shivam Sahu[2]

[1]Pathways World School, Aravali, India

[2] Indian Institute of Technology Delhi, New Delhi, India

SUMMARY

The perceived importance of beauty and physical appearance in 21st-century society is immense. Research has previously been found that being thin and/or muscular has become associated with being "hard-working, successful, popular, beautiful, strong, and self-disciplined," whereas being "fat" is associated with being "lazy, ignorant, hated, ugly, weak, and lacking in will-power." These stereotypes can negatively affect one's self-esteem and ultimately result in poor performance or eating disorders. With that in mind, Reimagize, a role-playing with decision-making, was conjured, implementing social psychological concepts like counter-stereotyping and perspective-taking. As the game works implicitly to influence body image, it even counters image issues beyond personal body dissatisfaction. This study explored whether a digital role-playing card game, incorporating some of the most common prejudices of body image (like size prejudice, prejudices from the media, etc.) as identified by a digital survey/ questionnaire completed by Indian girls aged 11-21, could counter these issues and reduce personal body dissatisfaction. The real-world effectiveness of the game was tested among 44 high school-age Indian girls using the Body Esteem Scale. In the pre- and post-game phases, there was a significant increase in the scores of the girls in the experimental group, specifically in weight concern and physical condition. Subscores in sexual attractiveness remained stagnant. With this success, there is scope to expand to other genders to improve body image, creating a positive change.

INTRODUCTION

The influence of media on the body image of adolescent females is immense. Previously, reading and viewing fashion magazines increased the use of diet pills and calorie restriction in female 15–18-year-old high school students (1). Similarly, weight control behaviours and binge eating increased in middle and high school students as they read magazines containing diet-related information more frequently (1). Such weight-control behaviours could have negative implications, with many female high school students seeing a dip in self-esteem (associated with higher levels of anxiety and other mental health problems) and some even developing eating disorders to achieve the perfection showcased in beauty and fashion magazines. 70% of Playboy centrefolds, considered the culturally 'ideal' women, are underweight, highlighting the societal pressures on women to be thin and conform to unrealistic body standards. Resultantly, approximately half of the girls aged 12-16 who considered themselves overweight are, in fact, normal weight according to their BMI (Body Mass Index) (2). With the emergence of social media, it has also been found that girls who spend more time refining their social media presence in terms of choosing a photo or editing it, thus engaging in more self-objectifying behaviour, were also more dissatisfied with their bodies (3). Women on Facebook tend to negatively compare their appearance with that of celebrities and their peers (4). Phenomena like "Snapchat dysmorphia" have emerged, where patients seek surgery to look more like the digitally filtered versions of themselves (5). Peers also tend to have a negative impact on adolescent body image, with a significant pressure to conform to appearance standards, and deviations from such standards result in negative peer experiences as well (6).

The purpose of this study is to effectively counter negative and/or unrealistic ideals and prejudices associated with the bodies of Indian teenage girls, concerning weight, strength, an association of physical ability to mental ability, etc., in the hopes of ultimately improving their body images. Improvement of body image can also decrease the chances of teenage girls engaging in unhealthy eating disorders in the future. Eating disorders can be a cause of physical and psychosocial morbidity in women and are much less frequent in men (7). While other factors like genetic predisposition and certain environmental risk factors have been identified, poor body image and reinforcement of appearance-based ideals also makes women display more high-risk eating behaviours (8).

In addition to the increased risk of eating disorders in women, the relationship between contingent self-esteem and weight/body image concerns has found to be stronger in women than men (9). More specifically, it has been found that a majority of 15-year-old girls want to change their body. 51% of girls in this age group consider themselves too fat, 36% view themselves as not good looking, and a total of 28% of 15-year-old girls are already dieting. Another 28% report that they are not on a diet but need to lose weight (10). Asian adolescents have historically reported greater body dissatisfaction than other racial groups (11).

Previously, computer games have been found effective

in improving mental well-being in youth (12), insinuating that computer games could influence the youth psychologically. This study aims to take advantage of the same idea.

Given that adolescent Asian girls, as compared to girls of other racial groups, have been found to have the highest body image dissatisfaction in previous studies, this study tested whether a digital game addressing all the aforementioned factors of the influence of peer pressure, media, and physical ideals on body image would be able to improve the body image of adolescent Indian girls. We developed the digital game, Reimagize. We tested the hypothesis that the body image of adolescent Indian girls can be improved through engagement in a digital card-based game with simultaneous community interaction. The cards in Reimagize address the sources of poor body image, which we identified by conducting a digital survey/questionnaire amongst adolescent Indian girls. The female participants aged 11-18 played Reimagize for one afternoon and took the Body Esteem Scale tests before and after gameplay. Overall, in the pre- and post-game phases, there was a significant increase in the scores of the girls in the experimental group, with an average increase of 3.0 ± 0.2 in weight concern and 2.0 ± 0.4 in physical condition. No scores decreased.

RESULTS

Before devising the game, we validated the secondary research and previous literature on adolescent body image within the context of Indian female adolescents by conducting an online survey with 97 female students, with questions on the influence on the media standards, medical standards, social media, advertisements, and physical ideals on body image. We obtained both qualitative and quantitative information to form the background primary research of the study. One of the qualitative questions asked, for example, was "how do you think Indian advertisements positively or negatively influence your body image?"

To summarize the qualitative results, the respondents raised significant concerns about the general portrayal of women in Indian media, the patriarchal views of Indian society and its association with body image, and failed attempts by Indian brands at inclusivity and representation. The respondents chiefly emphasized their distaste for the objectification of women and the portrayal of overweight characters as laughable in mainstream Indian cinema. Many respondents also stated that due to the patriarchal structure of Indian societies, the "marriageability" of a girl is emphasized, particularly in correlation with a girl's physique or unconventional physique, leading young girls to have low body esteem. Some respondents reported that even gaining some muscle drew backlash from relatives. The other factors pointed out by the respondents were largely in line with previous literature. From the quantitative results of the survey, many respondents (greater than 25%) felt strongly (reporting 5 on a scale of 1 to 5) that physical ideals, advertisements, and social media influenced their body image, thus validating existing literature (**Table 1**).

By analysing the responses, we created a checklist of issues to be addressed by Reimagize and created mission cards, character cards, and twist cards for the game. Played between 2-10 players, Reimagize enables its players to create a narrative using mission cards (challenge the sources of poor body image in girls) and character cards (the player is assigned a character with a superpower). When the narrative stagnates, players can pick out twist cards to continue. The game is thus designed for repetition with various permutations and combinations of missions, characters, and twists. Reimagize was then coded using the development platform Unity Engine and tested with 44 girls (**Figure 1**). The girls were between the ages of 11-18 years. The entire experiment, however, was not disclosed to the girls and they were only told that they would be beta testers for the game to avoid biased results.

To measure the change in body image, we used the Body Esteem Scale (BES) questionnaire for girls. The BES is a 28-item gender-specific multidimensional measure of body esteem for women and men. In women, BES checks for physical condition, weight concern, and sexual attractiveness (13), but has other criteria for men. The respondents of the

Score	On a scale of 1 to 5, how strongly do you think the media influences your body image? (1 lowest, 5 highest)	On a scale of 1 to 5, how strongly do you think social media influences your body image? (1 lowest, 5 highest)	On a scale of 1 to 5, how strongly do you think advertisements influence your body image? (1 lowest, 5 highest)	On a scale of 1 to 5, how strongly do you think physical ideals influence your body image? (1 lowest, 5 highest)
1	3.8%	2.8%	9.2%	10.0%
2	14.1%	7.0%	12.2%	11.7%
3	23.9%	24.5%	19.8%	20.4%
4	30.7%	31.5%	29.8%	27.5%
5	27.5%	34.3%	29.0%	30.4%

Table 1: Summary of Online Survey Results – We surveyed 97 Indian adolescent girls about their opinions on the factors affecting their body image (media, advertisements, physical ideals, etc.). Samples of questions from the survey are shown in the table.

BES rate specific body parts and functions on a five-point Likert scale, from "strong negative feelings" to "strong positive feelings," so that higher scores indicate positive feelings for the body and likely indicate a more positive personal body image.

The girls in the control group did not play Reimagize, and instead participated in random group games during the hour. The girls in the experimental group were further divided into pairs. While Reimagize is designed to be played between 2-10 players, only two girls were allowed to play with each other to ensure that each player had enough time in the gameplay and the effectiveness could be measured maximally. Girls in the control and experimental groups were asked to take the BES questionnaire and not discuss their answers prior to their game play. Then, the girls in the experimental group played the game in pairs for an hour. At the end of the hour, the girls retook the BES questionnaire.

Overall, there were positive differences in the personal body esteem/image of girls in the experimental group. Before playing the game, the average score for the experimental group was 43.8 for sexual attractiveness (out of a maximum of 65), 26.7 for weight concern (out of a maximum of 50), and 30.2 for physical condition (out of a maximum of 45). After playing the game, the average score for weight concern for the experimental group went up by 3.0, then being 29.7, and the average score in physical condition for the experimental group went up by 2.0, then being 32.2 (**Figure 2**). An increase in scores means an increase in positive feelings about the particular dimension (e.g., increase in scores in weight concerns means increased positive feelings about weight). There was, however, no decrease in the scores in the experimental group, which means that the game did not have a negative influence on any of the participants' body image. We analysed the changes in cumulative BES scores with a paired t-test and found that the cumulative BES scores significantly improved after playing Reimagize (pre-game average cumulative BES scores were 100.7 ± 0.5, post-game average cumulative BES scores were 105.9 ± 0.6, $p = 0.028$, $t = 2.466$) (**Figure 2**). A paired t-test was also conducted on the data from the control group ($t = 1.453$, $p = 0.142$). As the p-value is greater than 0.05, the result is not significant, indicating that the null hypothesis fails to be rejected (**Figure 3**).

The body esteem scores increased after the experiment, which provides evidence to suggest that the game had a positive impact on the personal body-esteem of adolescent

Figure 1: Game Screen – An image of one of the screen prototypes of the game. The mission card reads, "convince a stern magazine editor to add a variety of realistic plus-size models to their new beachwear advertising campaign", and the character card reads "an overweight woman who can run at the speed of light, but lacks confidence to speak or perform in public."

Indian girls in the experimental group. The relatable depiction of characters within the game was the most effective in increasing the average participant's body esteem (**Table 2**). From the participants' responses in the post-game survey on whether they see a connection between the game and their body esteem, all participants in the experimental group responded "Yes," indicating a solid connection. The girls in the experimental group also vocalized a desire to play the game again. The average scores (at a 1-hour gap) remained nearly stagnant for the control group (**Figure 3**). With this transformational change in perspective, we found that the Reimagize game is a good vehicle to bring about positive social change, as there was significant improvement in the body image of the girls in the experimental group. Participants were also actively involved in adopting that social change through games, due to higher interest and motivation. Higher interest and motivation stems from the digital game format that likely appeals to young girls and direct involvement in the adoption of social change.

DISCUSSION

Introducing the game Reimagize in adolescent Indian girls' lives increased their body esteem by representing relatable characters in a positive light. The message of body positivity is conveyed engagingly through the gameplay of Reimagize,

Criteria	Average Ranking
Digital Game Format	2.75
Relatable Depiction of Characters	1.25
Community Interaction (playing with friends)	2.00
Storytelling Component	3.75

Table 2: Survey on the features of the game – A table summarizing the results obtained from surveying the participating girls, asking them to rank the game's features.
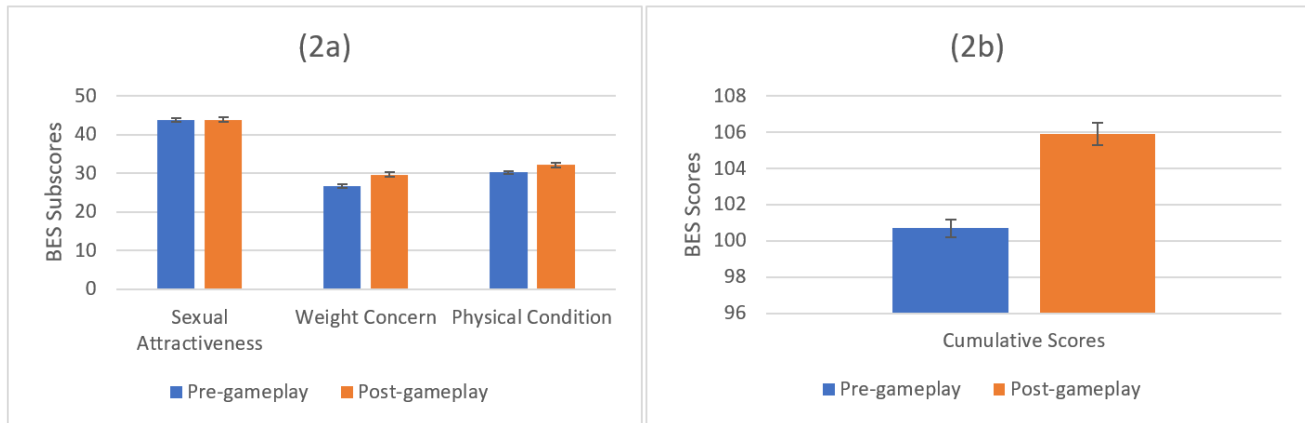
Figure 2: Scores for Experimental Group – 2a shows the average body esteem scale subscores for the experimental group pre- and post- game play; 2b shows the average cumulative body esteem scale scores for the experimental group pre- and post- game play. The error bars represent the standard deviation.
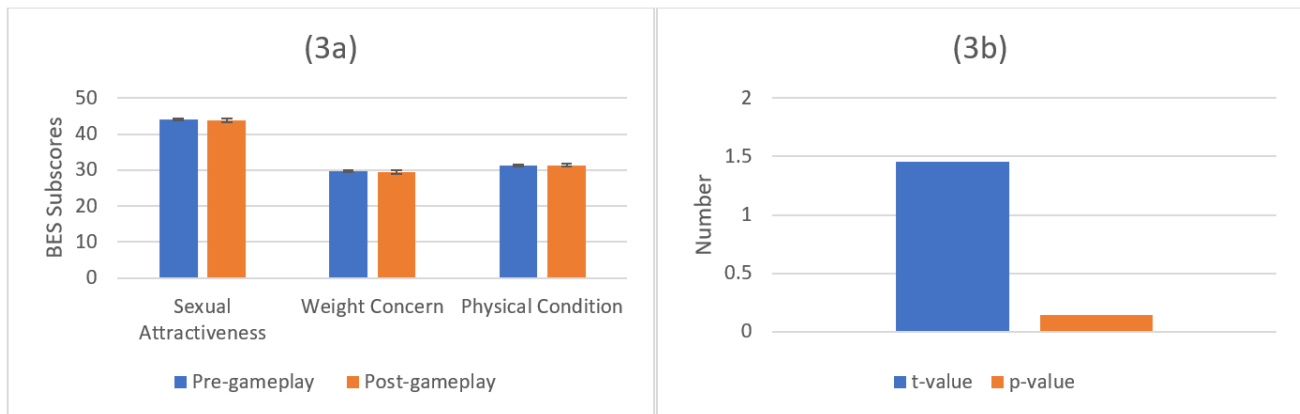
Figure 3: Scores for Control Group – 3a shows the average body esteem scale subscores for the control group pre- and post- game play; 3b shows the relevant values from the paired *t*-test for the control group. The error bars represent the standard deviation.

instead of in a preachy or instructional lesson. There was a significant rise in the personal body esteem of participating girls immediately after playing the game, validating its effectiveness.

There are certain limitations to the study. Firstly, the BES was used as a benchmark for the effectiveness of the game because it is an objective test and would enable the researchers to measure the improvement of body image quantitatively. However, since body image is more commonly associated with feelings rather than numerical evidence, the objectivity of BES questionnaires could have made the participants feel slightly limited in their expression of body image. Also, given that the participants were required to take the BES questionnaire twice, the objective questions and ratings made taking the questionnaire slightly repetitive and monotonous. This was also informally vocalized by the participants, who stated that they did not enjoy taking the questionnaire as much as they enjoyed playing the game. The average scores for the sexual attractiveness subsection did not increase either, likely due to the game not explicitly focusing on sexual attractiveness through visual or written

means (as the survey responses did not highlight the same either), while weight concern and physical condition were directly addressed.

Moreover, the long-term effects of the game are yet to be determined. While the game was effective in improving body image over a short period, it is unclear whether it will yield a long-term effect. Nonetheless, because the game is designed for repetition with various permutations and combinations, participants can play them again and again to keep the newly formed perceptions fresh in their minds. Additionally, our sample size was fairly small.

Future experiments with this game include involving additional participants in the research by conducting more studies to collect more data. We also aim to commercially release this game so that it is accessible as a recreational activity for more people, specifically Indian girls. We are also considering adapting the audience of this game to other genders and races so that the game can be used to create universal change. We intend to conduct more research with a new game that has a universal approach towards improving body image, and then to compare the new game's

effectiveness in adolescent Indian girls with the current iteration to assess the scalability of the current game.

An improved personal body image at a young age can prevent eating disorders later in life. Reimagize, an interactive card-based digital game with community interaction, was able to successfully improve the personal body image of a select number of adolescent girls. Their self-reported body esteem scores rose on the BES, as the game allowed the girls to see different types of bodies in a positive light through counter-stereotyping. The quantitative increase in self-reported body esteem scores shows the effectiveness of the game. Therefore, Reimagize positively transformed Indian adolescent girls' attitudes and personal body image.

MATERIALS AND METHODS
Brainstorming and Game Design:

Before collecting survey responses or developing Reimagize, the idea behind the game was devised. Reimagize was chosen to be a digital game to ensure that testing could be carried out effectively regardless of the COVID-19 pandemic restrictions.

The game Reimagize needs a minimum of 2 players and a maximum of 10 players (the current game, however, only supports 2 players at a time). At the start of the game, each player is assigned, at random, a mission from a deck of 25 mission cards. These mission cards usually challenge the sources of poor body image in girls (determined through the survey responses and analysis of previous literature). For example, one of the mission cards stated, "Convince a stern magazine editor to add a variety of realistic plus-size models to their new beachwear advertising campaign" (**Figure 1**). Then, the player is assigned, at random, a character that they will be representing from a deck of 10-character cards. Each character has a superpower which is diametrically opposite to societal conventions (e.g., an overweight superheroine is the fittest of them all and can run at the speed of light). Taking on the perspective of these superheroines, each player needs to try and steer the game in the direction of completing their mission by collaborating with the other players and effectively utilizing the superpowers of the assigned character, while also understanding their weaknesses. During the gameplay, the players are unaware of each other's missions, but are aware of each other's characters. When the game's narrative begins to stagnate, one of the players can choose to pick at random one of the 30 twist cards, which brings in an unexpected twist into the narrative. To complete the mission at the end, the players must use their experiences from throughout the game. As many of the 'missions' are based on persuasion, the game urges the players to think critically. The players continue to play the game until a winner is found, or the person who first completes their mission in the narrative.

Pre-Design Survey and Development:

To organize survey questions as per previous literature,

Microsoft Excel was used. There was a total of 10 survey questions assessing the influence of certain factors on body image. These factors were chosen from previous research. These factors included media, physical medical standards, social media, advertisements, and physical ideals (**Table 1**).

To conduct an anonymized online survey, considering responses only from authenticated school/college email addresses, we used Microsoft Forms used and the data collected was tabulated in another Microsoft Excel spreadsheet. After manually and automatically (through Microsoft Excel's filtering tools) analysing the survey responses, a checklist of addressable issues for the game was created, then further divided into what would be addressed under "mission cards," "character cards," and "twist cards." Then, using another Microsoft Excel spreadsheet, the content of the mission, character, and twist cards was designed. Meanwhile, Adobe XD (a prototyping tool) was used to design the user interface of the game and the graphics (**Figure 1**). Finally, the game was coded in Javascript (with Node.js) using the Unity Real-Time Development Platform.

Gameplay and Evaluation:

To invite and identify participants for the study, a Google Form (requesting information like name, age, country, and gender), along with a flyer with brief details about the game (listing it as a brief beta test), was shared on select Discord servers, Slack channels, and social media platforms, on which adolescent girls were likely to be found (e.g., women in tech platforms, homework help platforms, etc.). Once an adequate number of form responses were received, a brief information session about the game was conducted and instructions about the game were given to girls identified for the experimental group. There were four 11-year-olds, five 12-year-olds, three 13-year-olds, five 14-year-olds, eight 15-year-olds, nine 16-year-olds, four 17-year-olds, and six 18-year-olds. Of the 44 girls, 22 were put into the control group and 22 into the experimental group. A day was identified for the research to be conducted, keeping in mind schedules of the participants and the researchers. On that day, another Google Form questionnaire was shared with the participating girls, requesting them to fill in the Body Esteem questionnaire, but maintaining that if some questions made them feel uncomfortable, they were free to skip over them. Thereafter, the 22 girls in the experimental group were put in breakout rooms on a Zoom call for 1 hour of gameplay, after which they retook the questionnaire. The control group played games like GeoGuessr and Google Feud over the same time. Informal feedback was also requested from the participating girls on the call itself. The responses were tabulated on a Microsoft Excel spreadsheet and the trends identified both manually and automatically. Statistical tests (such as the paired t-test) were conducted on the data, using Microsoft Excel, to determine the effectiveness of the game.

REFERENCES

1. Lawrie, Z., et al. "Media Influence on the Body Image of Children and Adolescents." *Eating Disorders*, vol. 14, no. 5, 2007, pp. 355–364., doi:10.1080/106402606009525060

2. Katzmarzyk, PT, and C Davis. "Thinness and Body Shape of Playboy Centerfolds from 1978 to 1998." *International Journal of Obesity*, vol. 25, no. 4, 1 Apr. 2001, pp. 590–592., doi:10.1038/sj.ijo.0801571.

3. Salomon, Ilyssa, and Christia Spears Brown. "The Selfie Generation: Examining the Relationship Between Social Media Use and Early Adolescent Body Image." T*he Journal of Early Adolescence*, vol. 39, no. 4, 21 Apr. 2018, pp. 539–560., doi:10.1177/0272431618770809.

4. Fardouly, Jasmine, and Lenny R. Vartanian. "Negative Comparisons about One's Appearance Mediate the Relationship between Facebook Usage and Body Image Concerns." *Body Image*, vol. 12, 2015, pp. 82–88., doi:10.1016/j.bodyim.2014.10.004.

5. Rajanala, Susruthi, et al. "Selfies—Living in the Era of Filtered Photographs." *JAMA Facial Plastic Surgery,* vol. 20, no. 6, 1 Dec. 2018, pp. 443–444., doi:10.1001/jamafacial.2018.0486.

6. Kenny, Ursula, et al. "Peer Influences on Adolescent Body Image: Friends or Foes?" *Journal of Adolescent Research*, vol. 32, no. 6, Nov. 2017, pp. 768–799, doi:10.1177/0743558416665478.

7. Fairburn, Christopher G, and Paul J Harrison. "Eating Disorders." *The Lancet*, vol. 361, no. 9355, 1 Feb. 2003, pp. 407–416., doi:10.1016/S0140-6736(03)12378-1.

8. Ata, Rheanna N., et al. "The Effects of Gender and Family, Friend, and Media Influences on Eating Behaviors and Body Image During Adolescence." *Journal of Youth and Adolescence,* vol. 36, no. 8, 2006, pp. 1024–1037., doi:10.1007/s10964-006-9159-x.

9. Grossbard, Joel R., et al. "Body Image Concerns and Contingent Self-Esteem in Male and Female College Students." *Sex Roles*, vol. 60, no. 3-4, 2008, pp. 198–207., doi:10.1007/s11199-008-9535-y.

10. Meland, Eivind, et al. "Body Image and Perceived Health in Adolescence." *Health Education Research*, vol. 22, no. 3, 2006, pp. 342–350., doi:10.1093/her/cyl085.

11. "Body Image and Ethnic Background." *Mental Health Foundation,* 6 Aug. 2020, www.mentalhealth.org.uk/publications/body-image-report/ethnic-background.

12. Lau, Ho Ming et al. "Serious Games for Mental Health: Are They Accessible, Feasible, and Effective? A Systematic Review and Meta-analysis." *Frontiers in psychiatry* vol. 7, 2017, pp. 209, doi:10.3389/fpsyt.2016.00209

13. "Body-Esteem Scale." *Encyclopedia of Personality and Individual Differences, by Virgil Zeigler-Hill and Todd K. Shackelford*, Springer International Publishing, 2020.