

Stranded: a classroom game for implicit bias elicitation and recognition

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Abstract. Implicit biases towards groups of people is acquiring an increasingly stronger focus in many areas of our society. Recognizing these biases is a difficult task, as biases are subconscious and socially unacceptable. We propose *Stranded*, a game in which players are led to reveal and recognize possible racial and gender biases. Players face challenges, inspired by real-world examples of bias-inducing situations, where they must assign the type of person they think fits a particular task, in a group survival context, and with limited time and knowledge. After each round, the ideal character for each task is given away through small hints; ultimately, players will not survive the challenge if they ignore them and rely on prior biases. This spurs players to think more deeply about characters in terms of inner strengths rather than prior biases. *Stranded* is an effective tool for raising interesting classroom discussions, by anonymously collecting the decisions made by all players, and showing their aggregate outcomes per task, which easily leads to a conversation on the motivation for certain decisions. An evaluation of *Stranded* shows that it is effective at provoking players to make biased judgements and that a considerable percentage of players felt more aware of their biases after playing the game.

Keywords: Serious games · Implicit bias · Bias introspection · Bias elicitation · Racial bias · Gender bias

1 Introduction

Biases are shortcuts that people use to make quick decisions in a complex world and are, in general, not strictly negative [24,6]. The main risk with biases is that they operate outside of conscious awareness and yet, influence a person's decision making. This can lead to very real negative consequences, the most apparent one being gender and racial biases in important sections of our society [14,2].

The first step towards mitigating this problem, is to first recognize that you possess biases. Following that, several studies show that when people actively try to think in the perspective of an out group, they become more motivated to mentally change their initial biased responses [9,5]. However, there are considerable hurdles when it comes to addressing biases personally and especially in a group setting.

- first, a bias is a subconscious mechanism: it often does not manifest itself in an overt way and it can be easily masked by motivated reasoning;
- second, there are few spaces where biases can be addressed in a comfortable and proactive manner, due to social stigma.

One of the spaces where this recognition can be done more easily is within a safe classroom context. Due to the smaller sizes of classrooms and because students know each other, it is easier to tackle stigmatized topics, such as racial and gender biases. This is also helped by the goal and mindset of a classroom, where the focus is on learning and understanding, and where the sharing of personal experiences is encouraged [4]. This subconscious mechanism can be made apparent by letting students face situations in a game and allowing them to make biased decisions. Games, as a medium, have long been used in the research field for these types of purposes (Section 2). Our work aims at answering the following question: *how can a serious game provide a safe and comfortable environment for students to discover their own racial or gender biases?*

For this, we designed and developed *Stranded*, a game that presents players with challenges, inspired by real-world examples, which they solve by assigning characters to tasks based on their own judgement of said characters. We minimize other factors that influence player decision, such as long, conscious deliberation or prior knowledge about the qualities of the characters. Afterwards, we stimulate players to wonder why they made a particular decision, by providing in-game feedback, which will only be positive if players did not rely on prior biases (Section 3).

This cycle of problem solving and reflection serves to help players identify biased decision making, while providing an isolated and comfortable environment where they can safely experience the consequences of their biased decisions. Moreover, this reflection can be conveniently amplified in a class setting by revealing the aggregated decisions made by all players at the end of the game, and spurring further discussion on biases within the group (Section 4).

Evaluation of *Stranded* – carried out among vocational college students – has focused on its effectiveness in manifesting biases and raising their awareness among players (Section 5)

2 Related Work

This section gives an overview of previous work related to implicit biases and serious games.

2.1 Effects of implicit bias

Implicit biases are unconscious negative associations a person has towards a particular group in society (professional, racial, geographical, etc.). These biases can cause someone to engage in behaviour that goes against their own avowed or endorsed principles, such as making discriminatory statements or decisions. Research shows that implicit biases drive decision making in many sectors of society, including those that are expected to explicitly counter biases such as education [21], healthcare [19] and justice [14].

However, research also found that biases can be altered, for the better or the worse, by exposing people to new positive or negative associations of a particular social group and through confrontation with one's own biases [3,18].

2.2 Eliciting bias

Measuring implicit bias in an experiment is difficult because it requires test subjects to make unconscious decisions in a repeatable and reliable way. Rudman suggests that implicit bias experiments should try to draw the subjects' attention away from the respective social bias because, otherwise, subjects may control their explicit responses deliberately [16]. A well-known example of implicit bias experiment is Implicit Association Test (IAT) [10]. Participants are asked to sort words into categories with a very limited time constraint. The IAT suggests that one has an implicit preference for a specific type of people if they are quicker to associate this group with positive words. It then measures implicit bias both by looking at objective measure such as response latency. Rudman and Goodwin also found that by repeatedly exposing participants to subverted stereotypes, they started to associate them in different contexts over time, thus breaking stereotypes [17].

2.3 Identifying or mitigating implicit biases using serious games

To help identify and mitigate biases, many forms of media have been used. Especially due to their interactivity, games have become a particularly effective tool for this purpose. Compared to other forms of media, games have the potential to retain a higher engagement rate [8], immerse players in a different perspective [4], and possibly even change their attitude or behavior [13,7]. The responses to the audiovisual nature of serious games have been proven to be more useful in measuring their effectiveness [20]. Related games in the context of bias recognition are mainly separated into two categories: simulation-like games and games based on the association test.

Simulation games Simulation games try to mitigate implicit bias by putting the player in the perspective of an out group. One such example is *Fair Play* [11], which lets the player experience racial bias by playing as a black university student trying to obtain a science degree. The study concluded that players, who had high empathy towards the character they were playing as, had lower levels of implicit bias and that the game, as a medium, made it effective as a tool for bias intervention. However, not all serious games are effective for raising the player's empathy towards an out group. Such an example is *The World of Empa*, where players take the role of a care giver to people with different types of disabilities. It was shown that the group playing the serious game did not show higher levels of empathy, compared to the control group [22]. Another example is *Spent*, where the game simulates the life of a person of lesser income. The player has to make lifestyle choices while trying to keep themselves afloat, when experiencing the hardships faced by many people in the world. Roussos et al. [15] concluded that empathy towards people in poverty did not increase while playing the game, whereas merely observing someone else play did. Furthermore, players

who held a low sense of meritocracy came out with new beliefs that poverty is personally controllable.

Association test games As for association test games, the main importance lays upon bias elicitation by ‘stealth design’, where situations are presented to the player in such a way as to force the player to make decisions based on their own prior knowledge. A game that does this is *Buffalo* [12], a multiplayer card game where players have to shout a noun or name they associate with the word on the card. The biases of the players are then revealed by their own lack of knowledge. Another game, *Macbeth* [1], tries to identify the blind spots of the player by placing them in the middle of a terrorist attack. *Missing* [23] is able to expose confirmation biases by allowing the player to find clues in a missing person mystery.

Some aspects of these games also inspired our serious game, *Stranded*, where we gently lead the player into making associations within a fictive context, with limited information and time, as described in the next section.

3 Game design

The game *Stranded* aims at helping players realize and reflect on their implicit bias, focusing on appearance biases such as gender, race and cultural background. This section gives an overview of the game design and of how it relates to the game’s overarching goal. A more detailed description of its game mechanics is given in Section 4.

3.1 Synopsis

In *Stranded*, you manage a group of shipwreck survivors of diverse backgrounds who are stranded on a deserted island. The game presents you with a sequence of challenges that the survivors encounter during their stay on the island. Each challenge involves a set of tasks that need to be successfully performed. Your goal is to find the best matching character for each of these tasks in order to overcome the problems and, ultimately, have the whole group escape the island.

3.2 Challenge-based gameplay

Each challenge in *Stranded* is designed with a particular kind of bias in mind. This bias becomes visible through how players choose to assign characters to tasks. To increase the effectiveness of showing implicit bias, players need to make their assignment under time pressure.

A challenge could for instance focus on the bias that men should do risky, outdoor tasks and that women should do safe tasks at home. Such a challenge could present the player with the following situation:

- The survivors decide it is a good idea to explore the island and make a map.
- They need someone to navigate through the forest, someone to draw the map and someone to guard against dangerous animals.
- All other characters stay safely on the beach to set up camp.

Players might be tempted to assign the three male characters in the group to do the exploration. In that case, the game will confront them with signals that, in

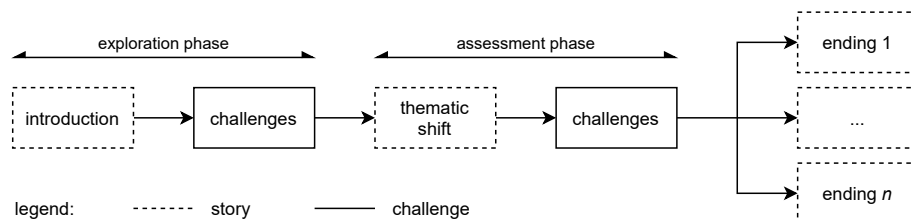


Fig. 1: A high-level overview of the structure of the game over time. There are two types of sections in the game: story sections and challenge sections. These sections are traversed in a predefined sequence until, in the end, the game picks a story ending based on the player’s decision making.

fact, the ideal assignment for this challenge includes two women, one to navigate and one to guard, and only one man, to make the map. Naturally, the characters for this ideal assignment are purposefully designed to go against the above stereotype, so that players who assigned only men realize their bias.

3.3 Overall game structure

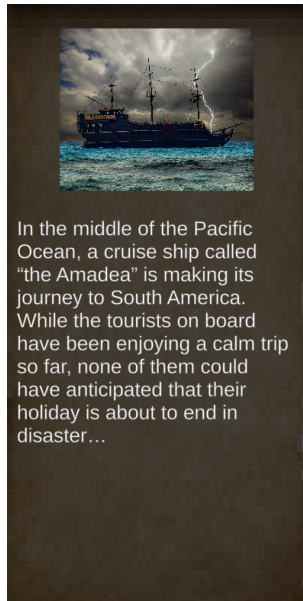
The core game structure is schematically illustrated in Figure 1. The game consists of a sequence of *story sections* and *challenge sections*. A story section simply involves displaying some text and images to help players understand the premise of the game and what is at stake for the characters. This helps to put the subsequent challenges in context. See Figure 2a for a screenshot of a story section.

A challenge section presents the player with a problem in the form of a set of tasks that need to be performed by characters to achieve some goal. For every task in a challenge, only one character can successfully perform it. This character is considered the ‘ideal’ character for the task. It is up to the player to figure out which character is the ideal match for each particular task. See Figure 2b and Figure 2c for screenshots of a challenge section and the character selection screen, respectively.

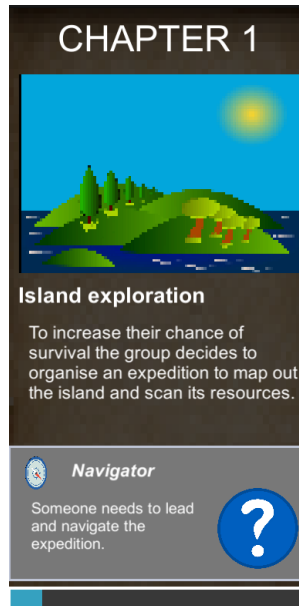
Especially during the first challenge, the player has to base their decision solely on the appearance of characters and a basic description of their personality and physique. The goal of this absence of knowledge is to lure players into making a biased judgement based on the appearance of the characters. After the selection is confirmed, the game confronts players with their possible bias by showing whether they have made some ‘non-ideal’ task assignments. To increase the chance of this happening, the characters are designed to go against typical stereotypes. For instance, the game includes a male nurse character, while stereotypically a nurse is female.

4 Detailed game mechanics

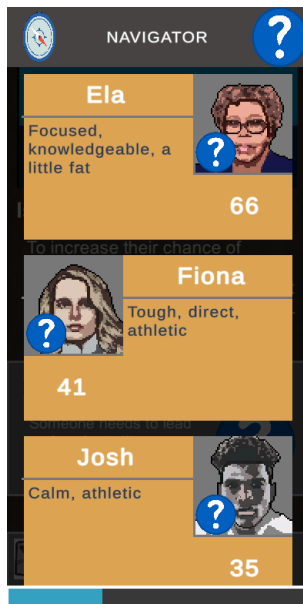
This section provides a detailed description of specific game mechanics, and how these design features fulfill the game’s overarching goal of eliciting bias.



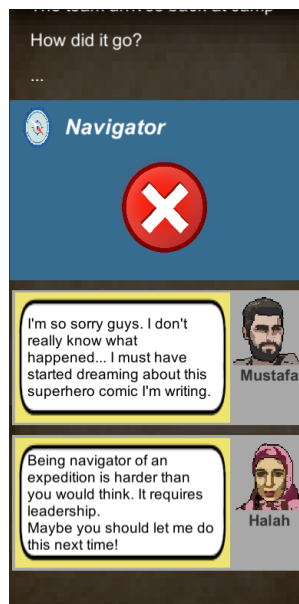
(a) story section



(b) challenge introduction



(c) challenge: character selection



(d) challenge: outcome and feedback

Fig. 2: Four screenshots of *Stranded*, at different stages.

4.1 The exploration phase and the assessment phase

As shown in Figure 1, the sequence of challenges in the game is divided into two parts, referred to as the *exploration phase* and *assessment phase*. This separation helps solve one particular issue: while, over time, players can figure out what type of tasks a character responds to positively, at the start of the game their tentative choices are strategically blind. It would not be fair to assess players for their initial decision making, when they still ignore which characters can best fit which tasks.

In the exploration phase, a first set of challenges is presented that do not count towards the ending of the game. Players, therefore, can ‘fail’ at challenges in this phase and that will not affect their chances of a ‘successful’ story ending. This allows them to make mistakes while exploring the characters, and learn from them at the start of the game.

In the assessment phase, the outcomes of challenges start to matter for the story ending. The tasks presented in these challenges are conceptually similar to tasks that already appeared in the exploration phase. This gives the player a fair chance of making the ‘ideal’ assignment during this phase. Naturally, bias elicited from players is expected to be more pronounced during the exploration phase, when they have not yet been given any hints on the characters’ traits and qualities: their decisions are expected to be based more on intuition and unconscious decision making. Thus, while the assessment phase is more important for the player’s goal of successfully escaping the island, the exploration phase is more important for the ultimate goal of the game, eliciting bias.

Between the two phases, there is a story section containing a thematic shift in the story: a storm approaches and the group needs to find a way to escape quickly. The thematic shift is meant as a subtle way of communicating to the player that their choices start mattering more in the assessment phase. The challenges in this phase are also more closely related to escaping the island than in the first phase, for instance focusing on the characters building a raft. This should also remind players that the ending of the game is fully related to the choices they are making and, consequently, urge them to make deliberate choices.

4.2 Feedback

At the end of every challenge section, players receive feedback on their choices, showing them the consequences of their character assignment. This feedback, given for every task in the challenge, comes in two forms: (i) success/failure of the task and (ii) its explanation as a dialogue among characters, in the form of speech bubbles; see screenshot in Figure 2d. This dialogue is meant to discretely inform the player on who actually was the ideal character for that particular type of job, and why.

There are two different types of dialogue the player might encounter:

1. If the task succeeded, the assigned character gladly expresses that this type of task suits them well.
2. If the task failed

- (a) the assigned character expresses their dissatisfaction with it (giving a hint on which kind of tasks they would rather do), and
- (b) its *actual* ideal character steps in, expressing they wished they had been assigned this task.

The latter type of dialogue is added specifically to ensure that players get the chance to learn about the preferences of all the ideal characters in a challenge, regardless of the assignment they make. Without this, a player who by chance never assigns a particular character during the exploration phase, never learns anything about this character before the assessment phase starts. With it included, the player is guaranteed to get this information because the exploration phase is designed specifically to feature all characters at least once as the ideal character of a task. In short, each player gets a fair chance at achieving a good ending of the game, regardless of the exploration mistakes they made at the start.

This generous feedback system, however, does not make the player’s decision making trivial in the assessment phase. A task never appears in the game more than once, so the player still has to make the right judgment on whether a task in a later challenge is conceptually similar to an earlier encountered task. For example, the player could reason that a character who made a positive comment about a firewood collecting task in the exploration phase might likely be ideal for a fruit collecting task in the assessment phase.

4.3 Time limits

Each section of the game has a timer, which serves two purposes:

1. **To lead the player to make decisions under time pressure.** In this way, players are less likely to overthink their decisions and are more likely to act according to their prior implicit biases. This technique is also used in the Implicit Association Test, although the time pressure in IAT is much harsher, requiring participants to make judgments in mere seconds. That type of high-intensity time pressure does not fit with the design of *Stranded*, where the player should be given enough time to at least interpret the challenge and make a judgement on which characters should perform the tasks.
2. **To keep synchronization among multiple players in a group context.** Preferably, players who start the game simultaneously also end more or less simultaneously. This allows for a smooth transition from the end of the game into a group discussion, preventing players from excessively waiting for each other.

4.4 Facilitating post-game group discussion

All task assignments, i.e. the pairs (task, character), made by each player in a class are sent anonymously to a central server. At the end of the game, we aggregate that data, per challenge and per task. This gives us, for each task in a challenge, a bar chart where the height of the bar indicates the percentage of the class that chose each character for that task. These charts are produced and shown with multiple goals in mind:

1. To concisely show the class what their distribution of assignments was per challenge, revealing where possible biases may lie. In the challenge example of Subsection 3.2, if a majority of the class assigned a male to all three roles, this would typically indicate a gender bias, where the class would mostly see men as capable for those tasks.
2. To show individual players how their own decisions match up with the class, giving them a moment of introspection on whether their (possibly biased) decisions match with the class.
3. If the decisions of the class for a challenge skew towards a particular bias then the teacher has the opportunity to enter a discussion. This can be assisted by showing, in addition to the game data charts, real-world data that subverts the designed bias of a particular challenge.

This is a safe, yet effective way of making players reflect on their bias, because it allows them to personally relate to the exposed and scrutinized averages being displayed, without having their individual bias being exposed to the rest of the class.

5 Evaluation

To evaluate the ability of *Stranded* for eliciting bias and making players reflect on it, we designed an in-class evaluation process, consisting of live playtest sessions done by target group students in a class setting. The results of the evaluations performed so far are presented here.

5.1 Playtest Method

This playtest method was designed to be performed in a classroom of vocational college students, our primary target group. First, the participants are given a brief description of the game story, without stating any further purpose. Then they are asked to play through the game without any mutual help or interference. Afterwards, each participant fills in a survey, divided in two parts: the first part is filled immediately after playing; the second part is filled in after the participants have taken part in a short group discussion about bias, in which they are also told the goal of the game. To aid this discussion, the post-game charts generated by *Stranded* are used, with aggregated data on players' choices.

5.2 Playtest Results

This type of playtest has been conducted in three different classes of vocational college students (n=41). Answers to the three most important questions of the survey are summarized in Figure 3. Firstly, 61% of students did not identify what the topic and purpose of the game was (see Figure 3a). Secondly, 24% of students agreed that the game made them consider their own prejudices (see Figure 3b). Finally, as for the question on whether the game was perceived as uncomfortable, 69% of students stated they did not feel uncomfortable because of the game (see Figure 3c).

The survey also included the open question *when did the 'ideal' character – as prescribed by the game – surprise you?* The most common answers were: 35% of players stated that the character *Josh*, a black middle-aged man, should be

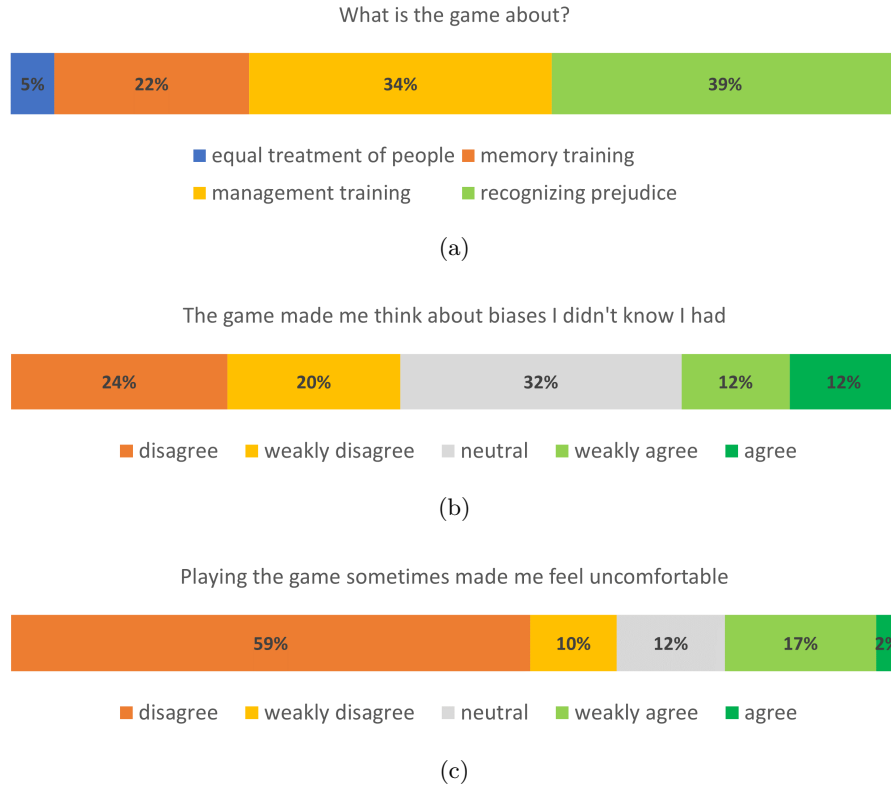


Fig. 3: The answers by 41 players to three multiple choice questions in the survey.

better at physical tasks, 23% that *Halah*, a middle-aged woman with a headscarf, was not expected to be the best at leadership tasks, and 15% that *Ela*, an older Surinamese woman, should not be as good at technical tasks as the game made her be.

Finally, we also included in the survey an open question about how players came to their in-game decisions. Roughly half of the players replied they chose characters for the tasks based on the short character descriptions included in the character selection screen (see e.g. Figure 2c). In contrast, only one quarter of the players answered they chose based on the dialogues and task success (see e.g. Figure 2d).

5.3 Discussion

Based on Figure 3a, we see that 61% of players were not aware what the game was about after finishing the game. We consider this a positive result, because it allows players to make decisions without knowing that they are being tested. Among other advantages, this reduces the chance of them overthinking their

decisions and, in consequence, we can be more confident that biased decisions were not spoiled by other factors.

From Figure Figure 3b, we learned that 24% of players agreed that the game made them think about biases that they did not know they had. Assuming that not everyone in the cohort will be (strongly) subject to biases, and that other players possibly considered themselves already aware of their own biases, we can certainly state that a considerable percentage of players explicitly recognized having biases. We can therefore conclude that the game was effective in raising awareness on players' own implicit biases.

Additionally, we saw that many players were surprised by some of the counter-stereotypical characters in the game, and even explicitly disagreed with some of the game's 'ideal' choices for a task. These reactions show that players took the game seriously and applied their real-world judgement to the in-game challenges, resulting in their internal biases being exposed. In other words, we can conclude that *Stranded* effectively achieved its goal of eliciting implicit bias of players.

Regarding the answers on the basis for their decision-making process, quite a few players seem to somehow have missed the essential role of the dialogues and challenge outcomes, especially in the first half of the game. The game was carefully designed to give the player as little initial information as possible (Section 3): just enough to avoid frustrations in matching characters to tasks. Character descriptions like those in Figure 2c were meant to render decision making 'less punishing', not to be the main input in that process. However, maybe players have regarded them as a kind of 'safe ground truth', which is both undesired and unfortunate. Possibly, *Stranded* could have been even more effective at eliciting bias without these descriptions, or with much shorter ones.

Another unplanned observation came from the fact that the playtests were performed mostly on desktops and laptops instead of mobile phones – the intended platform – because players happened to often prefer playing that way. Since many of the students played on larger displays, it naturally led them to spot on their colleagues, and even to ostensibly start exchanging thoughts with each other about their task assignments.

Although looking at each other's decisions and outcomes and collaborative playing was not originally intended, it is unclear to which extent this has a positive or negative effect on the game's ability to help players reflect on their bias. This might, for example, allow players to start their own discussion on bias, which could be more natural and meaningful to them than a teacher-initiated discussion. But it might also be taking away opportunities of letting players internally reflect on their own choices. In either case, further research is required to determine this.

Finally, we consider as positive the results depicted in Figure 3c, showing that, on average, players did not feel uncomfortable while playing the game: the design of *Stranded* was definitely carefully aimed at never making players feel awkward, regardless of the particular game ending.

6 Conclusion

Biases are a useful tool to navigate the world, but can also lead to negative stereotypes and bad decision making. We presented *Stranded*, a novel serious game that combines a discrete, fun and immersive adventure setting with established elements of the Implicit Association Test, with the goal of eliciting biased responses.

Stranded, presently focusing on gender and race biases, was specifically designed to elicit biased decision making from college students, through assigning characters to tasks, with limited information and time. Then, by providing subtle in-game feedback, players are given opportunity to consider possible biases that were at play while making their decisions. At the end, all individual decisions are anonymously aggregated and shown to the group in the form of charts. These serve as valuable discussion material for the teacher to lead a debriefing about biases in the group.

We have done an evaluation of this bias elicitation and subsequent recognition by playtesting *Stranded* with three different groups of vocational college students. It shows that the game was effective in eliciting biased decision making and that it made a good fraction of players think about prejudices they did not know they had. This evaluation supports the conclusion that *Stranded* helps players recognize their implicit biases, which is a first stepping stone for individuals to act on mitigating identified biases.

We believe that with a different set of carefully designed challenges, tasks and characters, the same design of *Stranded* could also be applied to elicit appearance-driven biases in other domains, such as disability, social status and cultural background. Future research will have to confirm that hypothesis.

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References

1. Bessarabova, E., Piercy, C.W., King, S., Vincent, C., Dunbar, N.E., Burgoon, J.K., Miller, C.H., Jensen, M., Elkins, A., Wilson, D.W., et al.: Mitigating bias blind spot via a serious video game. *Computers in Human Behavior* **62**, 452–466 (2016)
2. Blair, I., Steiner, J., Havranek, E.: Unconscious (implicit) bias and health disparities: Where do we go from here? *The Permanente journal* **15**, 71–8 (04 2011)
3. Blair, I.V.: The malleability of automatic stereotypes and prejudice. *Personality and social psychology review* **6**(3), 242–261 (2002)
4. Blokland, E., Cullinan, C., Mulder, D., Overman, W., Visscher, M., Zaidi, A., Bueno Perez, M., Bidarra, R.: Exploring multiple perspectives in citizenship education with a serious game. In: *Interactive Storytelling - 14th International Conference on Interactive Digital Storytelling (ICIDS 2021)*. pp. 293–306 (12 2021). <https://doi.org/10.1007/978-3-030-92300-6-28>
5. Bodenhausen, G., Macrae, C., Sherman, J.: On the dialectics of discrimination: Dual processes in social stereotyping, pp. 271–290. Guilford (1999)
6. Bodenhausen, G.V., Macrae, C.N., Sherman, J.W.: On the dialectics of discrimination: Dual processes in social stereotyping. UC Davis (2016)

7. Bohm, D., Dorland, B., Herzog, R., Kap, R.B., Langendam, T.S.L., Popa, A., Bueno, M., Bidarra, R.: How can you save the world? empowering sustainable diet change with a serious game. In: Proceedings of CoG 2021 - IEEE Conference on Games. IEEE (2021)
8. Dunbar, N., Jensen, M., Miller, C., Bessarabova, E., Lee, Y.H., Wilson, S., Elizondo, J., Adame, B., Valacich, J., Straub, S., Burgoon, J., Lane, B., Piercy, C., Wilson, D., King, S., Vincent, C., Schuetzler, R.: Mitigation of cognitive bias with a serious game: Two experiments testing feedback timing and source. *International Journal of Game-Based Learning (IJGBL)* **7**, 86–100 (10 2017). <https://doi.org/10.4018/ijgbl.2017100105>
9. Galinsky, A., Moskowitz, G.: Perspective-taking: Decreasing stereotype expression, stereotype accessibility, and in-group favoritism. *Journal of personality and social psychology* **78**, 708–24 (05 2000). <https://doi.org/10.1037//0022-3514.78.4.708>
10. Greenwald, A.G., Krieger, L.H.: Implicit bias: Scientific foundations. *California law review* **94**(4), 945–967 (2006)
11. Gutierrez, B., Kaatz, A., Chu, S., Ramirez, D., Samson-Samuel, C., Carnes, M.: “fair play”: a videogame designed to address implicit race bias through active perspective taking. *Games for health journal* **3**(6), 371–378 (2014)
12. Kaufman, G., Flanagan, M., Seidman, M.: 5. creating stealth game interventions for attitude and behavior change: An ‘embedded design’ model. In: *Persuasive Gaming in Context*, pp. 73–90. Amsterdam University Press (2021)
13. Raateland, W., Chronas, K., Wissel, T., Bruyn, T., Konuralp, B., Bueno, M., Salamon, N.Z., Bidarra, R.: A serious game for students to acquire productivity habits. In: *Games and Learning Alliance. LNCS*, vol. 12517, pp. 335–346. Springer International Publishing (2020)
14. Rachlinski, J.J., Johnson, S.L., Wistrich, A.J., Guthrie, C.: Does unconscious racial bias affect trial judges. *Notre Dame Law Review* **84**, 1195 (2009)
15. Roussos, G., Dovidio, J.F.: Playing below the poverty line: Investigating an online game as a way to reduce prejudice toward the poor. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace* **10**(2) (2016)
16. Rudman, L.: Social justice in our minds, homes, and society: The nature, causes, and consequences of implicit bias. *Social Justice Research* **17**, 129–142 (01 2004). <https://doi.org/10.1023/B:SORE.0000027406.32604.f6>
17. Rudman, L., Goodwin, S.: Gender differences in automatic in-group bias: Why do women like women more than men like men? *Journal of personality and social psychology* **87**, 494–509 (11 2004). <https://doi.org/10.1037/0022-3514.87.4.494>
18. van Ryn, M., Hardeman, R., Phelan, S., Burgess, D., Dovidio, J., Herrin, J., Burke, S., Nelson, D., Perry, S., Yeazel, M., Przedworski, J.: Medical school experiences associated with change in implicit racial bias among 3547 students: A medical student changes study report. *Journal of general internal medicine* **30** (07 2015). <https://doi.org/10.1007/s11606-015-3447-7>
19. Sabin, D.J.A., Nosek, D.B.A., Greenwald, D.A.G., Rivara, D.F.P.: Physicians’ implicit and explicit attitudes about race by md race, ethnicity, and gender. *Journal of health care for the poor and underserved* **20**(3), 896 (2009)
20. Seo, K., Ryu, H., Kim, J.: Can serious games assess decision-making biases?: Comparing gaming performance, questionnaires, and interviews. *European Journal of Psychological Assessment* **36**, 1–12 (09 2018). <https://doi.org/10.1027/1015-5759/a000485>
21. Staats, C.: Understanding implicit bias: What educators should know. *American Educator* **39**(4), 29 (2016)

22. Sterkenburg, P., Olivier, L., Van Rensburg, E.: The effect of a serious game on empathy and prejudice of psychology students towards persons with disabilities. *African journal of disability* **8**(1), 1–10 (2019)
23. Symborski, C., Barton, M., Quinn, M.M., Korris, J.H., Kassam, K.S., Morewedge, C.K.: The design and development of serious games using iterative evaluation. *Games and Culture* **12**(3), 252–268 (2017). <https://doi.org/10.1177/1555412016673262>, <https://doi.org/10.1177/1555412016673262>
24. Tobeña, A., Marks, I., Dar, R.: Advantages of bias and prejudice: An exploration of their neurocognitive templates. *Neuroscience and biobehavioral reviews* **23**, 1047–58 (12 1999). [https://doi.org/10.1016/S0149-7634\(99\)00036-6](https://doi.org/10.1016/S0149-7634(99)00036-6)