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Science to Experience
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Formula 1mpossible

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1. Scientific Insight

During our search for a scientific insight on the theme of 'living,' we realized that each person has their own unique perspectives, experiences and challenges in life. We found it interesting to highlight a specific perspective that not everyone experiences, to demonstrate a unique view or challenge faced by different people. Thereafter, our interest was sparked by the book "Invisible Women: Exposing Data Bias in a World Designed for Men" by Caroline Criado Perez. This book reveals how data bias leads to a world where women are often excluded from research and design. It highlights significant gaps in data and understanding regarding women's experiences and needs. Inspired by this, we looked further into the issue by reading news articles and scientific papers. We came to the insight that most research, especially in the medical field but also in other areas, is predominantly conducted on men. This gender bias in research means that the results and findings are often based on male physiology, behaviour, and responses, which do not always apply to women. The exclusion of women from research is a significant problem for several reasons.

Firstly, the underrepresentation of women in medical research leads to a lack of understanding of how different treatments and medications affect them [1]. Since many medicines and therapies are tested primarily on men, the dosage, effectiveness, and side effects can differ for women, sometimes resulting in harmful consequences. Additionally, women may experience different symptoms or reactions to medications that have been proven safe and effective for men. As a result, women are often left without accurate and effective healthcare solutions, and their specific needs and risks are overlooked. The primary reason for the exclusion of women in medical research is women's hormonal cycles [2]. Women experience regular hormonal changes throughout their menstrual cycle, which can affect many aspects of their physiology. These fluctuations can influence how women respond to medications, treatments, and other interventions. Researchers often find it challenging to account for these variables, leading to more complicated study designs and the need for larger sample sizes to obtain reliable results. Besides, including women in research can lead to higher costs, because it could lead to more complex study designs that require additional resources, time, and funding. Researchers may need to conduct studies at different times of the menstrual cycle or control for hormonal variations, which adds complexity to the research process. These additional requirements can be seen as problematic, leading some researchers to avoid including women altogether.

Another area of research that lacks female representation is car safety. Crash test dummies used in vehicle safety tests are often modelled after the average male body [3]. This means that safety features in cars are designed to protect men better than women, who have different body structures and injury patterns. Consequently, women are at a higher risk of injury or death in car accidents due to safety measures not being optimized for their bodies. The main reason for this underrepresentation stems from historical factors [4]. In the early days of car safety research, men were most likely to be in car crashes and there was limited funding. As a result, no funding was allocated to develop crash test dummies that accurately represented women, since creating a diverse range of crash test dummies that reflect different body types, including those of women, involves higher costs. These financial problems have contributed to the slower adoption of more inclusive testing practices.

2. Our Statement

After establishing our scientific insight and identifying the causes of the exclusion of women in research, we formulated the statement: ''Women are overly complex''. With this statement, we wanted to draw attention to the peculiar reason why women are often excluded from research. While it is an exaggerated way of describing the issue, it is meant to provoke thought and discussion about gender bias in research and the reasons behind it. By framing the issue in this way, we aim to make the point that these challenges, while real, should not be an excuse for gender bias in research. Instead, they should be seen as essential considerations that need to be addressed to ensure that research findings are accurate and applicable to everyone.

3. Experience

For the experience, we intended to give our audience a better understanding of the research gap regarding data on women and the need for inclusive research. Therefore, we chose to make a multiplayer game where a female and male character are pitted against each other in a race. As might be expected, the racetrack for the female character was made 'overly complex,' whereas the track for the male character was made easy. By designing the game with two separate racetracks, we wanted to symbolize the difference between research data on males and females. Nonetheless, the characters in the game do not have to be played by men versus women. The game can be played by any combination of players, whether two females, two males, or any other pairing. These characters represent the disparities in research practices rather than representing the players themselves. In this way, every player could experience firsthand the unfairness and challenges imposed on the female character, regardless of the player's own gender.

3.1 The Title

The title of our work is ''Formula 1mpossible,'' which carries a dual meaning. Pronounced as 'formula onepossible,' it first references Formula 1, the well-known car racing sport. This aligns with the competitive nature of our game, which also revolves around racing. The term 'onepossible' signifies the challenge faced by the female character in our game: the seemingly impossible task of winning the race on a track that is more complex than the male track. Furthermore, the title can be pronounced as 'formula impossible,' suggesting that the 'women's scientific formula' is considered impossible to research due to their perceived complexity.

3.2 The Game

To emphasize that there is an inequality between the two players, one player sits on a more comfortable chair while the other sits on a less comfortable stool during the game. To provide an authentic gaming experience, players use a Nintendo Switch game controller to navigate the race. Upon starting the game, before the race begins, a message appears for both players: ''Collect as much money as possible for your research''. This sets the stage for the players to understand the goal of the game and what it is about. To symbolize the difference between research conducted on males and females, we made the following design choices in the two tracks:

- The male character starts with a higher amount of money and can collect more money during the game. This represents the greater funding and resources often allocated to research conducted on men.

- The female character starts with a lower amount of money and can collect less money during the game. This illustrates the limited funding and resources available for research focused on women.

- The male character's track is smooth without obstacles, reflecting the unproblematic approach taken when research is conducted on men.

- The female character's track includes ten gaps in the road, referring to the gaps in research regarding women. Each time the female character falls into a gap, the character loses money, referring to the higher costs associated with conducting research on female subjects. Furthermore, when the character falls into a gap, a pop-up text appears, providing examples of instances where women have been excluded from research and the resulting implications. These messages aim to educate players about specific challenges and biases in research. The following pop-up texts were implemented in the game:

    1) Oh no.. you need some time to recover from your injuries. Did you know that as a female you are more likely to get seriously injured in car accidents due to safety features designed around the male body? [5]
    2) Ouch! You're feeling intense pain from that crash. Studies have shown that people of the female sex are more likely to have their pain dismissed or inadequately treated in medical settings. [6]
    3) Watch out next time. Medical treatments can be less effective for women. This is often because symptoms that differ from the typical male benchmarks can lead to misdiagnosis or delayed treatment. [7]
    4) Warning! The road ahead might be risky. Much medical research is based on males, meaning drugs developed from this research can be less effective or even dangerous for females. Drive carefully—some medicines might not work as expected for you. [8]
    5) You fell into a hole. Did you know in many biology studies, researchers use primarily male animals for testing? This is because of the belief that female hormonal cycles might affect consistency. This unsupported assumption could leave gaps, much like the one you just drove into… [9]
    6) If you were to be pregnant, recovering from your crash might be even harder. Due to the frequent exclusion of pregnant individuals from clinical trials, we often lack solid data on how to effectively treat them for many diseases and manage their pain. [10]
    7) Struggling with this gap? Consider the challenges of PMS, which affects 90% of women yet is significantly under-researched, with five times more studies on erectile dysfunction. PMS research grants are often rejected because PMS's existence is denied. [6] [11]
    8) Encountered a tricky section? Diagnosing cardiovascular disease in women can also be complex. They often exhibit different symptoms from men, leading to under-diagnosis and inadequate treatment. [7]
    9) Not concentrating on the road? Diagnosing ADHD and autism in females can be as overlooked as the obstacles on this road. Females with ADHD are often unknown unless their symptoms are pronounced, and autism criteria are mostly based on studies of boys. [12]
    10) Whoops! Did you crash while trying to use speech recognition in your car? Keep in mind that speech-recognition software is 70% more likely to accurately recognize male voices. [13]

The game is designed so that the male character finishes first and collects the most money. Because this character finishes quickly, the player can look at their opponent's screen and notice that they are still racing. They may wonder why their opponent is so slow and upon closer observation, they can see that the female character's track is different and filled with gaps in the road. When the female character eventually finishes the race, an end message appears that explains that women are often excluded from research due to difficulties associated with differences in hormonal cycles, and physiological and physical characteristics compared to men, leading to higher costs and less funding. After this message disappears, the game is finished and ghost riders of the previous race are displayed,

allowing players to watch the race again. This feature enables players to calmly observe the differences between the two tracks and better understand the challenges faced by the female character. Moreover, by replaying the race, there is a continuous display of the game for other people passing by to observe, even when no race is currently being played. Through this approach, both players and bystanders are educated about the existence and reasons behind gender bias in research. We hope to inspire our audience to think critically about the importance of addressing bias in research and how it affects research outcomes.

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