

Use of Video Games and Interactive Film to Provide Empathy Training

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ABSTRACT

This study underscores the potential of video games and interactive films in promoting awareness and the development of empathy to establish the positive impact of playing games and taking part in interactive films. Objectives of this study is to explores how video games and interactive films spark empathic online experiences and indicates their potential as tools for empathy experiences and training. This study combined quantitative and qualitative methods, using the Interpersonal Reactivity Index (IRI), Geneva Emotion Wheel (GEW), and empathy microblog for data collection. This analysis, including an experiment and survey, involved a mix of statistical methods and content analysis to examine survey data and identify themes in microblog posts, with 100 participants providing data and testimonials. The results encourage the use of video games and interactive films as tools for providing experience in and training empathy online by exploring the positive impact of playing such games and accessing appropriate films. After the participants had played games or taken part in the interactive film, the cognitive sub-dimension of empathy level of male participants mostly increased, while that of females in the affective sub-dimension. Video games and interactive films are potential media for encouraging empathy, with the potential to generate experiences through natural stories and effective. The findings demonstrate that both interventions successfully enhanced empathetic experiences, with distinct gender-based patterns.

Keywords

Games, interactive film, empathy level, micro-blogging, experience.

1. INTRODUCTION

Empathetic research has become a popular topic among scientists. Researchers have produced a great deal of work on this topic; in 2019 alone, there were almost 2,000 publications related to it. It is contended that empathy is essential for fostering prosocial conduct that is instinctive, reduces social bias, and reduces violence worldwide [1]. In a rapidly globalizing world, there is a need for an empathetic civilization that perceives the Earth and all its residents as one huge social unit. Psychologists believe that empathy is the ‘psychological super glue which attaches people and motivates cooperation and kindness’[2]. Research encourages people to display empathy, thus improving society. Psychologists and educators state that empathy is a skill that can be refined and improved; it is not an inherent, unalterable quality [3]. Educators are learning more about how to teach empathy in the classroom, as research is increasingly indicating that it is a quality that can be acquired [4]. Social theorists and philosophers also believe that the global community must thrive, and that students should be taught this authentically. However, concerns over the seeming

loss of empathy in modern culture are growing. According to a study by the University of Michigan, there has been a 40% decrease in empathy among American college students compared to prior decades, which indicates a worrying development [5]. Increasing materialism, evolving parenting styles, and the echo chamber effect or filter bubble, in which people surround themselves with close-knit communities of like-minded individuals, are some potential reasons for the widening empathy gap. The modern society is therefore suffering from an empathy deficit. People worldwide lack a sense that others care, making the medical, economic, political, and sociological assaults on fundamental trust in the world all the more difficult to bear. Furthermore, increased screen usage among the younger generation, serious public mental health issues, and emotional or behavioral outcomes may contribute to an empathy deficit [6]. According to [7], the rise in youth mental health issues coincides with a decline in empathy.

Research has shown over time that readers of fiction typically have greater empathy skills. A study found that those who read fiction performed better on an empathy test [8]. Research by [9] showed that while the sense of being transported was linked to story-induced empathy, exposure to fiction was linked to trait empathy.

By contrast, [10] suggests that games, despite being a popular form of entertainment, can easily elicit empathy due to their role in presenting players with a perspective-taking experience. Happ contends that, in comparison to other media such as newspapers, books, and movies, narrative games might elicit more intense empathy from players. This is because they are placed in situations that can have multiple meanings and can only relate to or empathize with the characters through the narrative; the game's storyline must be compelling for this to happen [11]. Connection is also a necessary condition for arousing players' empathy [12]. Although there have already been lines of inquiry delving into the intersection of games and empathy, there are very few peer-reviewed articles on the topic [13]. This means there has been limited discussion of the narrowly focused subject of gaming narratives and empathy.

According to [14] and [15], games have the potential to foster global connections between people or to represent a variety of people, cultures, and perspectives. By fostering a sense of familiarity and belonging among players, games may also help them perceive others as members of their group, rather than as “outsiders,” potentially increasing empathy. However, [16] state that there is a lack of clarity in the field of empathy and games, and no comprehensive analysis of current research has been conducted. Therefore, further research is needed to determine how games can support the development of empathy and the beneficial effects of interactive media consumption and game playing on the ability [17]. It is hoped that the study on

the relationship between games and empathy will be enhanced by the findings of this paper, which also provides some useful examples of video games' contributions to education and the games industry.

Movies or films also have the potential to foster empathy. It is important to highlight the lack of scholarly research on this topic, particularly concerning the specific mechanisms through which empathy is produced. One of the new genres of film is 'select your own adventure' or 'pick your own path'. This is known as interactive storytelling, which allows viewers to engage with the narrative and influence how it ends. To construct a compelling and captivating story, text and images are frequently combined, occasionally with the addition of audio and video [18]. In this film genre, video game elements are used, as the narratives of the works sometimes take the form of interactive video games. Viewers can impact the characters and their journey through the narrative. This suggests that to fully comprehend the story and its intended message, viewers must fully immerse themselves in the narrative. If they want to achieve the best possible result, they have to actively pay attention and study what is happening, rather than simply watching everything from the sidelines [19]. This implies that the performers engage with and gaze at the camera as if they are staring back at the viewers via the screen. This point of view cannot be used in any other context; inserting the audience into the narrative increases its intrigue and occasionally strengthens its argument. Cristofi et al. [20] researched the use of virtual reality technology in interactive stories, finding that stories about victims of physical and mental abuse, immigrants and minorities, and those with health conditions were the most effective narrative themes for evoking empathy. In addition, their study findings showed that research in this field has increased over the past ten years. Another study by [21] examined the connections between interactivity, narrative structure, and empathy, revealing that the inclusion of interactivity greatly enhanced participants' empathy.

Although the intersection of games, interactive films, and empathy has been recognized, comprehensive research in this area remains limited [22]. Therefore, this research aims to fill this gap by focusing on the empathetic potential of video games and interactive films. This study aims to address the following research questions:

RQ1: "How do video games and interactive films evoke players' empathy?"

RQ2: "How can an emotion wheel be used to reflect feelings and empathetic experience via the intervention of video games and interactive film?"

Both qualitative and quantitative methodologies were used in this study. For the quantitative method, the Interpersonal Reactivity Index (IRI) and the Geneva Emotion Wheel were used as instrument in quantitative method. For the qualitative method, a microblog tool was used to assess users' experience via textual analysis of microblogs related to empathy.

This study contributes to the demonstration that interactive films and video games are powerful media for developing empathy, thus benefiting moral education. The conclusion, which examines the beneficial effects of playing video games and watching interactive films on empathy, encourages the use of these media as tools for providing experience and training in empathy online.

2. RESEARCH METHOD

Both quantitative and qualitative methodologies were used in this investigation. A questionnaire was used to collect quantitative data using a non-probability sampling technique. The Geneva Emotion Wheel and empathy micro-blog posts provided the qualitative data.

2.1. Instruments and Objects

The three instruments chosen for the study are detailed below.

- Interpersonal Reactivity Index

This is an instrument designed to gauge empathy in specific people [23]. The four parts of the tool each have seven distinct items, with responses provided on a five-point Likert scale. The empathy-related features or sub-dimensions are as follows: (1) 'perspective taking': viewing things from another person's perspective, considered the conduct of those who do this spontaneously; (2) 'fantasy': the act of transforming one's imagined thoughts, feelings, and behavioral patterns; (3) 'empathic concern': referring to sentiments of compassion and empathy for other people, particularly when sharing personal accounts of both direct and indirect experience of another person's pain; and (4) 'personal distress': concerning the suffering of others and personal anguish on managing one's emotional responses, encompassing emotions such as shock, terror, worry, and powerlessness.

- Geneva Emotion Wheel (GEW)

The Geneva Emotion Wheel (GEW) consists of 16 distinct emotion phrases that belong to emotion groups, which are methodically arranged in a circle. These emotion phrases in the circle correspond to discrete emotion response formats. Respondents use a scale to indicate the intensity of their sentiments concerning a limited set of discrete emotions (e.g., happiness or anger). Furthermore, the GEW benefits from the combination of discrete and dimensional approaches: the discrete emotion terms match natural language and improve measurement specificity, whereas the dimensional structure underlies the instrument's usability by making it easier to locate the emotions. The GEW has already been applied in several contexts, including the assessment of bodily movements [24], consumer experiences [25], and the effect of managers during decision-making [26].

- Microblogging

Microblogging is a type of blogging in which the emphasis is on quick posts and quick exchanges with readers. Typically, publishing platforms and social networks are used for this purpose (websites that accept articles include Tumblr and Medium). Microblogging is possible on almost all social media platforms, but other websites and platforms are more suited to accomplishing the objectives of microblogging. The most popular microblogging site currently is X. The concept involves disseminating brief, in-the-moment updates, commonly referred to as "tweets," which are limited to 280 characters [27].

Two experimental objects were selected for the study based on their content. The first object was a video game, and the second was an interactive film. The content of these two objects can evoke empathy.

- Path-Out Game

The autobiographical video game Path-Out employs narrative devices to help players comprehend the protagonist's tale. It

allows users to experience a person's life story through game components. It is an example of an adventure game influenced by a young Syrian artist's autobiography after fleeing his country's civil crisis.

- Brother Across Borders Film

The interactive film Brother Across Borders was inspired by the real-life experiences of Syrian refugees living in Turkey. It describes the living situations and decisions faced by the residents in an engrossing and captivating manner. Laban Stories produced the film for the Red Cross as part of the More-than-a-story initiative. This film tells a story visually while using a decision-making and multiple-choice gaming element. Because the film visits actual sites in Syria and Turkey, it allows viewers to understand what it is like to be a Syrian refugee. Instead of learning about real-life issues from the news and other secondary sources, the audience can experience them firsthand.

2.2. Participants

College students were required as participants, 50 men and 50 women (mean age=18.9, SD=7.43). This experiment focused on a balanced gender distribution to understand the effect of gender and highlight the importance of recruiting non-binary individuals in future research. The participants were students from the Computer Science Department at the University of Lampung, Indonesia. Typically, first- and second-year students were included in the groups. As a reward for participating in the study, they received 10% of their total course credit. They were divided into four groups, each with 25 members.

2.3. Procedure

The experimental procedure was as follows: (1) before starting the experiment, a briefing was held to ensure that the experiment would run properly. An online approach was used to conduct the experiment. In the first phase, the participants were asked to access the online empathy tool that was developed for this study. (2) The participants were asked to complete the Interpersonal Reactivity Index Questionnaire pretest; (3) they were also asked to rate their current feeling condition, emotional control and emotional response, and to choose one of 16 feeling states on the emotion wheel that corresponded to their state and to rate the depth of the experience on a scale of 1 to 4. (4) Members of groups 1 and 2 were asked to play the game Path-Out, whereas members of groups 3 and 4 were asked to view the film Brother across Borders; (5) during the playing of the game or watching the film, the participants were asked to re-select their emotional state on the emotional wheel whenever it changed; (6) after finishing the game or watching the interactive film, they were asked to select their present emotional state and to write or post via an online tool that was developed for this study about their thoughts and feelings; (7) they completed the IRIQ as a follow-up questionnaire or post-test. The experiment took between forty-five and sixty minutes to complete all of the tasks. The 100 participants were divided into four groups, with groups 1 and 2 asked to play the Path Out game, and groups 3 and 4 asked to watch the interactive film Brother Across Borders.

3. RESULT

3.1 IRIQ Indicator Scores and Sub Scale

To compare the IRIQ scores between the male and female game groups and the male and female film groups, we conducted an independent sample two-tailed t-test. T-tests were conducted to determine whether there were significant differences between the four groups (male-game, female-game, male-film, and

female-film) to evaluate the effectiveness of the treatment. When degrees of freedom were adjusted for uneven variances, no significant difference in IRIQ pretest and post-test scores among men and women who played the game was observed.

However, a significant difference was observed between the two gender groups who watched the interactive film, with males' scores being ($M = 93.13$, $SD = 12.24$) and those of females ($M = 100.96$, $SD = 9.24$), $t(48) = 0.014$. As 't' is less than 0.05, the results suggest that the IRIQ scores of male and female film participants differed significantly. The experiment also found a significant difference between the scores ($M = 100.4$, $SD = 7.92$) and the post-test scores ($M = 93.13$, $SD = 12.24$), $t(48) = 0.016$, of males who accessed the interactive film. This shows that there was a statistically significant difference in the pretest and post-test IRIQ scores of males who accessed the interactive film. Notably, a statistically significant difference was found in the pretest and post-test IRIQ scores of males who accessed the interactive film, with scores changing from ($M = 100.4$, $SD = 7.92$) at pretest to ($M = 93.13$, $SD = 12.24$) at post-test, $t(48) = 0.016$.

In the IRIQ subscale analysis, it was observed that 'fantasy', 'perspective taking' and 'empathic concern' subscales were increased among males, while the 'perspective taking' and 'personal distress' subscales increased among females who accessed the interactive film (Figure 1).

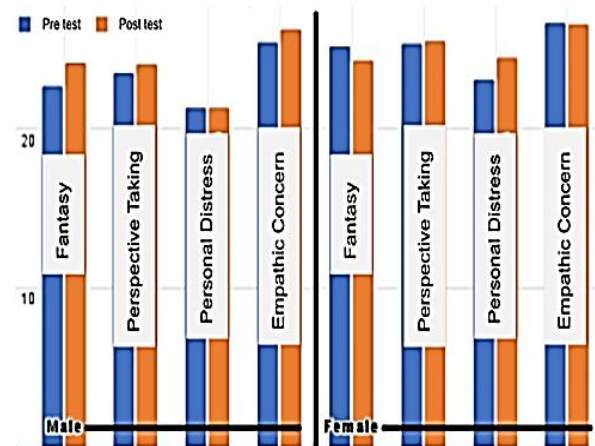


Fig 1: IRIQ film score comparison

The game group's immediate post-test showed a slight increase in all sub-scales among males (Figure 2), while the 'fantasy' and 'perspective taking' sub-scales increased among females who played the game. The fantasy scale assesses a person's propensity to become engrossed in invented narratives, to see themselves in the shoes of fictional characters, and to imaginatively assign their own emotions and behaviors to those of the characters [23]. According to [28], the rise in fantasy following exposure to serious games demonstrates the significance of games, play, and imagination in enhancing learning in such online situations. This also strengthens the idea that playing serious games can stimulate imagination and promote learning by fostering both intrinsic and extrinsic fantasy [29]. In addition, the perspective-taking subscale scores also increased in the female and male post-tests. According to [30], new possibilities for understanding are opened up by the identification of the character that may result in attitude change when other perspectives are introduced, and individuals are persuaded to identify with them.

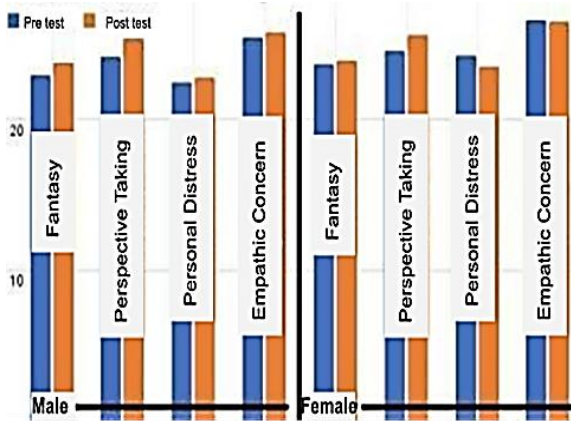


Fig 2: IRIQ game score comparison

3.2 The Emotional Wheel

The Emotional Wheel Indicator was taken from the implementation of the Geneva Emotion Wheel (GEW), which is used to assess emotional feelings. In this method, respondents are usually asked to self-report their feelings by indicating how positive or negative they are, together with how enthusiastic or aroused they feel. The three dimensions of dominance, arousal, and valence are measured [31] by using three sliders: valence (positive to negative), emotion control (strong to weak), and emotional response. The values of the emotion terms on the valence and control/power dimensions should be reflected in their placement within these clusters on the GEW. If the participant feels a change in feelings according to those that the character in the game or film might be feeling similar feelings), this indicates that the participant is experiencing empathy. The feelings that are communicated throughout the exchanges are analyzed, and dynamic feelings are produced. Figure 3 to 6 presents a comparison of the changing feelings that were reported by the male and female participants before (first state), during, and after (second, third, and fourth state) playing the game or taking part in the interactive film.

The female and male game groups showed similar patterns of feeling before, during, and after playing the game. The dynamic feelings of the two groups indicated that the game players experienced similar feelings to those of the game's main character. This was in contrast to what was observed in the female and male film groups, in which the patterns of emotional change did not appear similar. Instead, they were very diverse, indicating that the emotional state felt by some men was not similar to that experienced by the main character in the game.

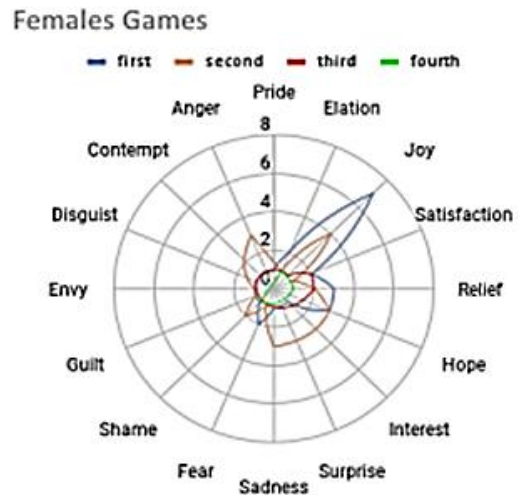


Fig 3: Emotional Wheel Report Females who play Games

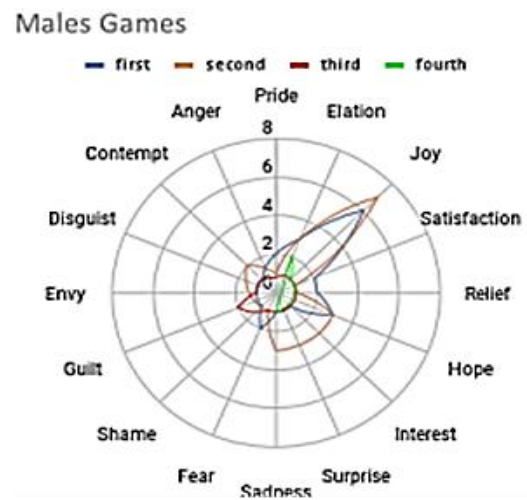


Fig 4: Emotional Wheel Report Males who play Games

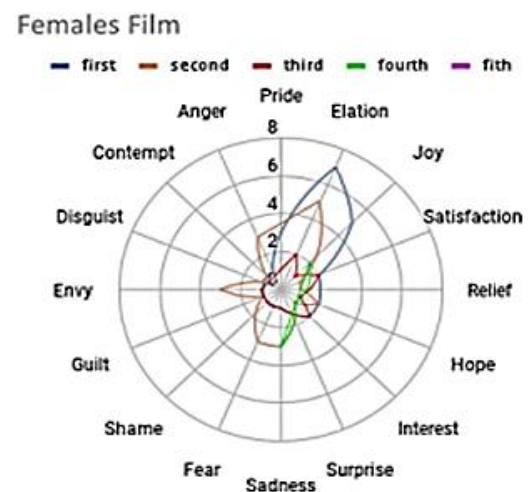


Fig 5: Emotional Wheel Report Females who access Film

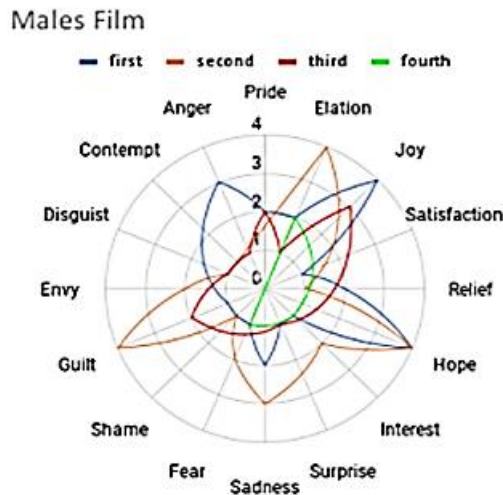


Fig 6: Emotional Wheel Report Males who access Film

Radar charts were used to visualize these patterns in the data. For female game participants, Joy, Elation, and Satisfaction showed the highest intensity initially but generally decreased in subsequent stages, with a notable peak in relief during the second stage. For male game participants, the second measurement showed the highest emotional intensities for Joy, Satisfaction, Interest, and Elation (approximately 4-5 and 3-4 respectively), while negative emotions consistently registered low intensities across all measurements.

The female film group exhibited diverse emotional trajectories across five stages, with the first response showing the highest intensity for Pride (approximately 6) and Elation (approximately 4), while the second response highlighted increased Envy (approximately 4) and Anger (approximately 2). The male film group displayed broad emotional intensity in the second phase (reaching scores near 4 for many emotions, including both negative and positive ones), which then decreased in subsequent phases, with the fourth phase showing significantly lower emotional intensity across all measured emotions.

3.3 Microblog Posting

The microblog posting indicator is an indicator of microblog entries that was used to determine whether the participants felt or experienced empathy after engaging in the interactive film or the game. Microblog content was used as one of the indicators for the game or interactive film based on open-ended questions about what they felt or thought in the microblog format. In specific circumstances, such as during an experiment, asking players about their experiences immediately after a game allows one to assess situational empathy. To maintain objectivity, two evaluators evaluated the microblog to determine whether it conveyed an empathetic experience. In this experiment, the assessment or evaluation of microblogs showed empathy when certain words, such as 'feel', 'understand', 'comprehend', 'carried away', 'concern', or 'empathetic', conveyed emotions that a character in a game or movie could feel. Table 1 shows some examples of the microblog assessment of both evaluators (highlighting words indicating an empathetic experience). Certain microblog contents were interpreted differently by the evaluators. This was because the microblog posts did not truly reveal participants' emotions following the intervention.

Table 1. Microblog postings assessment

Microblog posts	Evaluator
After participating in the Path Out game stage, I was very carried away by the atmosphere in the game; I felt panicked, sad, concerned, and scared because the game described the situation, in which the character in finding his family had to go through many challenges, such as many bombs and mines along the way. Even the access road was very bad and went through dense forests. Many houses were destroyed; therefore, I felt very sad, but I was also grateful because the character arrived safely.	Empathetic
I feel relieved after playing this game and much happier.	Neutral
Overall, the concept of Brothers Across Borders highlights the potential for unity and connection in our increasingly interconnected world. By recognizing our shared humanity and promoting understanding and empathy, we can work towards building bridges and fostering positive online experiences that transcend borders.	Neutral

3.4 Empathy Experience Measurement

An investigation to analyze the effectiveness of games and films in triggering empathy was conducted quantitatively using the IRIQ survey and qualitatively using the Geneva Emotion Wheel and a microblogging tool. We calculated the number of participants in each group who met the empathy experience indicators, namely, higher IRIQ scores, emotional reports, and micro-blog assessments by two Evaluators. A comparison was then made between the four groups (Table 2). We also calculated the percentages of empathy indicators fulfilled. The IRIQ score increased by 56%, the emotional state report by 78%, and the micro-blog by 73%; therefore, the average fulfilment of the empathy indicators was 70%. Figure 7 is a histogram chart that shows that the male-game and female-film groups had higher empathy experiences in the four indicators compared to the female-game and male-film groups. These results imply that intervention using the game Path Out was more effective for males, while the interactive film Brother Across Borders was more effective for females in raising empathetic experience.

Table 2. Number of participants in each group who met the empathy aspect indicators

Group	IRI Questioner	Emotion Wheel	Microblog Evaluator 1	Microblog Evaluator 2
Female game (G1)	15	16	13	15
Male game (G2)	15	18	20	23

Female film (G3)	14	22	21	22
Male film (G4)	12	22	15	18
Average	14	19.5	17	19.5
Percentage (%)	56	78	68	78
Std Dev	1.22	2.60	3.67	3.20

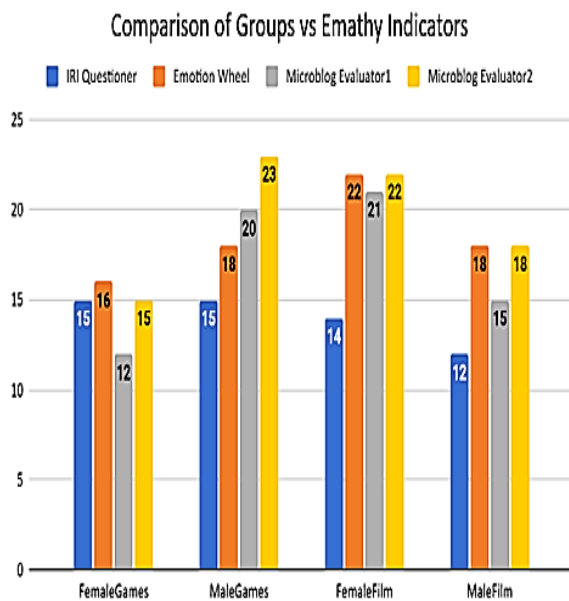


Fig 7: Empathy experience indicators

The analysis of the empathy experience in the initial study only used the IRI questionnaire as an indicator. In later research, microblogs containing participants' thoughts and feelings after the intervention were used. By adding indicators from microblog content, the impact of the game-playing intervention on empathy became easier and clearer to analyze. The results of our follow-up study conducted on a microblog platform demonstrate the value of microblogging tools for gathering qualitative information about the experiences of empathy and the implications of playing games [32]. In our current study, the Geneva Emotion Wheel was added as an indicator to report participants' emotional responses to the intervention. The GEW was included as an additional indicator to record participants' emotional reactions to the intervention. It is a self-report tool that can evaluate introspective, visceral, and behavioral levels of emotional processing, as highlighted by [33]. According to [34], self-reporting allows users to measure their subjective experiences more quickly than with other techniques. Therefore, participants were able to describe their emotional response to the intervention more quickly and readily using the GEW.

3.5 Methodological and Tool Validation

This study enhanced its measurement methodology compared to previous research: while earlier studies only used the IRI questionnaire as an indicator, and later research added

microblog content analysis, the current study added the Geneva Emotion Wheel as an indicator to report participants' emotional responses. This three-pronged approach provides greater analytical clarity and depth.

The Geneva Emotion Wheel is a self-report tool that can evaluate introspective, visceral, and behavioural levels of emotional processing, allowing participants to describe their emotional responses more quickly and readily than other techniques.

The GEW provides an effective tool for both analysis and design, with participants reporting dynamic emotional changes, indicating that they experienced emotions similar to those of the characters in the game and film. The percentage of emotional state reports using the GEW was the highest compared to other empathy indicators (IRIQ and micro-blogs), confirming the GEW as an effective tool for measuring changes in emotional states and empathetic experience.

4. CONCLUSION

Based on the research, here is a comprehensive comparison, table 3 showing this paper's key findings versus relevant previous work:

Table 3. Comprehensive Comparison of similar Empathy Study

Aspect	Current Study (This Paper)	Previous Work Referenced
Research Focus	Examines the empathetic potential of video games and interactive films as tools for empathy training	Limited peer-reviewed research exists on gaming narratives and empathy; research on interactive films and empathy mechanisms is sparse
Measurement Approach	Used three-pronged measurement: IRQ questionnaire, Geneva Emotion Wheel (GEW), and microblogging analysis	Earlier studies primarily relied on single indicators (e.g., only IRQ questionnaire); later research added microblog content analysis
Fantasy Subscale Impact	Males showed increased fantasy scores with video games; females showed increase with interactive films	Previous study demonstrated that fantasy rise following serious games shows significance of games and imagination in learning

Perspective-Taking Impact	Perspective-taking and personal distress subscales increased among females with interactive film	Cohen [30] established that identification with characters opens new possibilities for attitude change and perspective understanding
Gender Differences	Significant differences observed between males and females; males benefited more from games (cognitive empathy), females from films (affective empathy)	Kramer and Grodal [35] noted that individuals' experiences, psychological profiles, and inclinations impact empathy
Emotional State Measurement	GEW measured three dimensions (valence, arousal, dominance); showed highest percentage of empathy indicators (78%)	Bradley & Lang [31] established the foundational three-dimensional framework for emotion measurement
Overall Empathy Effectiveness	Current Study Results: IRIQ score increase: 56%, Emotional reports: 78%, Microblog indicators: 73%, Average fulfillment: 70%	Video games can elicit intense empathy compared to other media (books, newspapers, movies) through perspective-taking experiences
Interactive Elements Impact	Interactive film (Brother Across Borders) more effective for females; game (Path Out) more effective for males	Research shows that inclusion of interactivity greatly enhances participants' empathy
Qualitative Insights	Microblog assessments revealed nuanced empathetic experiences; two evaluators assessed emotional language (feel, understand,	Self-reporting allows users to measure subjective experiences more quickly than other techniques

	comprehend, carried away, concern, empathetic)	
Research Gap Addressed	This study fills the gap regarding comprehensive research on empathetic potential of video games and interactive films	Previous literature shows recognition of intersection between games, interactive films, and empathy but comprehensive research remains limited

The results of the quantitative analysis using IRIQ show an increase in scores after the participants played the video game or engaged with the interactive film. In addition, the qualitative results based on the GEW reports and micro-blogs show that the participants experienced empathy.

Both the video game and the interactive film effectively sparked empathy among the participants. Specifically, playing The Path Out game and viewing Brothers Across Borders increased empathy levels. Male participants showed a significant increase in cognitive empathy after engaging in the video game, whereas female participants exhibited an increase in affective empathy. This suggests that different media formats may affect the cognitive and affective dimensions of empathy.

The results are in line with our previous studies. It is evident that video games and interactive films can be used to teach empathy and influence players' ability to foster empathetic experiences. Based on the findings of this study, video games and interactive films are effective in raising empathetic experiences. Therefore, our first research question has been answered.

In contrast, the results of the self-reporting of emotional states utilizing GEW suggest that the dynamic feelings in the gaming group indicate that the players could compare their feelings with those of the game's characters. This indicates that interventions using video games and interactive films evoke empathy. However, the male participants exhibited a widely varied pattern of emotional fluctuation, suggesting that certain male emotional states differ from those of the game's main character. Kaltwasser et al. [35] state that individuals' experiences, psychological profiles, and inclinations all impact empathy. Furthermore, they emphasize how two forms of empathetic sharing are included in the cinematic experience: feeling the same emotions as the characters and feeling the same emotions as other actual or fictional viewers. By using the GEW for reporting emotional states, this method can determine which emotion families are more commonly associated with a matching expression. This demonstrates the significance of graphical tools for obtaining visual comprehension of the data and overcoming statistical restrictions. Additionally, Coyne et al. [36] suggest that the GEW provides an effective tool for both analysis and design.

The participants reported dynamic emotional changes, indicating that they experienced emotions similar to those of the characters in the game and film. Compared with other empathy indicators (IRIQ and micro-blogs), the percentage of emotional state reports using the GEW was the highest, thus appropriate for the empathy experience indicator (see Table 2).

Therefore, the GEW is an effective tool for measuring changes in emotional states and the experience of empathy. This finding answers our second research question, which asked how an emotion wheel tool could be used to reflect sentiments and empathetic experience via the intervention of interactive films and video games.

The study enhanced its measurement methodology compared to previous research: while earlier studies only used the IRI questionnaire as an indicator, and later research added microblog content analysis, the current study added the Geneva Emotion Wheel as an indicator to report participants' emotional responses.

The Geneva Emotion Wheel is a self-report tool that can evaluate introspective, visceral, and behavioural levels of emotional processing, allowing participants to describe their emotional responses more quickly and readily than other techniques. The GEW provides an effective tool for both analysis and design, with participants reporting dynamic emotional changes, indicating that they experienced emotions similar to those of the characters in the game and film. The percentage of emotional state reports using the GEW was the highest compared to other empathy indicators (IRIQ and micro-blogs), confirming the GEW as an effective tool for measuring changes in emotional states and empathetic experience.

The study revealed that male participants showed a significant increase in cognitive empathy after engaging in the video game, whereas female participants exhibited an increase in affective empathy, suggesting that different media formats may affect the cognitive and affective dimensions of empathy differently across genders. This finding aligns with the observation that individuals' experiences, psychological profiles, and inclinations all impact empathy, and that cinematic experiences involve two forms of empathetic sharing: feeling the same emotions as the characters and feeling the same emotions as other actual or fictional viewers.

Both interventions were effective but through different mechanisms. The interactive nature of gaming appeared particularly suited to cognitive empathy development in males through enhanced perspective-taking and fantasy elements, while the narrative structure of interactive film proved more effective for emotional/affective empathy in females through direct emotional mirroring. This study fills the gap regarding comprehensive research on the empathetic potential of video games and interactive films, as previous literature recognized the intersection between games, interactive films, and empathy, but comprehensive research remained limited. Both the video game and the interactive film effectively sparked empathy among the participants, with playing The Path Out game and viewing Brothers Across Borders increased empathy levels, conclusively answering the first research question regarding effectiveness.

For the measurement methodology, the research answered the second research question regarding how an emotion wheel tool could be used to reflect sentiments and empathetic experiences via the intervention of interactive films and video games, demonstrating the GEW as an effective tool.

The three-pronged measurement approach represents a key methodological innovation in this study. The GEW is noted as providing an effective tool for both analysis and design, capturing emotional changes, indicating that participants experienced emotions similar to the characters.

5. REFERENCES

[1] "Prosocial behavior in children and adolescents: A meta-

analysis," *Curr. Psychol.*, vol. 43, pp. 19690–19707, 2024, doi:10.1007/s12144-024-05762-7.

- [2] J. Zaki, "How to increase empathy and unite society," *The Economist*, 2019. [Online]. Available: <https://www.economist.com/open-future/2019/06/07/how-to-increase-empathy-and-unite-society>
- [3] J. Corliss, "Want to feel more connected? Practice empathy." [Online]. Available: <https://www.health.harvard.edu/blog/want-to-feel-more-connected-practice-empathy-202102221992>
- [4] Zwoliński, G., A. Dubiel, and D. Kamińska. 2026. "Teaching Empathy: A Comparative Analysis of Real, Virtual, and AI-Driven Methods." *Interactive Learning Environments* 34 (5): 3180–96. doi:10.1080/10494820.2025.2563090.
- [5] Konrath SH, O'Brien EH, Hsing C. Changes in dispositional empathy in American college students over time: a meta-analysis. *Pers Soc Psychol Rev.* 2011 May;15(2):180-98. doi: 10.1177/1088868310377395. Epub 2010 Aug 5. PMID: 20688954.
- [6] S. K. Muppalla, S. Vuppapapati, A. Reddy Pulliahgaru, and H. Sreenivasulu, "Effects of excessive screen time on child development: An updated review and strategies for management," *Cureus*, vol. 15, no. 6, p. e40608, Jun. 2023, doi: 10.7759/cureus.40608.
- [7] S. Konrat, "Empathy, narcissism, and visual arts engagement," 2019. [Online]. Available: <https://api.semanticscholar.org/CorpusID:150454032>
- [8] L. Eckerdt, "The relationship between fiction genres and empathy," Ph.D. dissertation, Dept. Psychol., California State University, Stanislaus, 2019.
- [9] L. Bunce and J. Stanfield, "The relationship between empathy and reading fiction: Separate roles for cognitive and affective components," *J. Eur. Psychol. Stud.*, vol. 5, no. 3, pp. 9–15, 2014, doi: 10.5334/jeps.ca.
- [10] C. Happ, "Empathy in video games and other media," Ph.D. dissertation, University of Marburg, 2012, doi: 10.17192/z2013.0404.
- [11] T. Bizocchi and J. Tanenbaum, "Mass Effect 2: A case study in the design of game narrative," *Sage J.*, vol. 32, no. 5, 2012, doi: 10.1177/0270467612463796.
- [12] B. Simon, "Respect, equality, and power: A social psychological perspective," *Gruppendynamik Organisationsberatung*, vol. 38, no. 3, pp. 309–326, 2010, doi:10.1007/s11612-007-0027-2.
- [13] K. Schrier and M. Farber, "Open questions for games and empathy," in *Proceedings of the Connected Learning Summit 2018*, Boston, MA, Aug. 2018, pp. 1–15, doi: 10.1184/R1/7793804.v1.
- [14] P. Darvasi, "Empathy, perspective and complicity: How digital games can support peace education and conflict resolution," UNESCO MGIEP Working Paper 2016-03, Nov. 2023. [Online]. Available: <https://www.gcedclearinghouse.org/sites/default/files/resources/170025eng.pdf>
- [15] K. Schrier, *We the Gamers: How Games Teach Ethics and Civics*. Oxford University Press, 2021. doi:10.1093/oso/9780190926106.001.0001

- [16] K. Schrier, "Designing role-playing video games for ethical thinking," *Educ. Technol. Res. Dev.*, vol. 65, no. 4, pp. 831–868, 2017. doi:10.1007/s11423-016-9489-7
- [17] O. D. E. Wulansari, J. Pirker, J. Kopf, and C. Guetl, "Video games and their correlation to empathy," in *The Impact of the 4th Industrial Revolution on Engineering Education*, M. Auer, H. Hortsch, and P. Sethakul, Eds. Springer, 2019, vol. 1134, pp. 1–15, doi: 10.1007/978-3-030-40274-7_16.
- [18] M. Cavazza and R. M. Young, "Introduction to interactive storytelling," in *Handbook of Digital Games and Entertainment Technologies*, R. Nakatsu, M. Rauterberg, and P. Ciancarini, Eds. Springer, 2017, pp. 1–20, doi: 10.1007/978-981-4560-50-4_55.
- [19] K. McDougland, "Why we need more choose-your-own-adventure movies," 2023. [Online]. Available: <https://movieweb.com/author/katelin-mcdougald/> 5
- [20] C. Christofi, D. Hadjipanayi, and D. Michael-Grigoriou, "The use of storytelling in virtual reality for studying empathy: A review," in *Proceedings of the International Conference on Interactive Media, Smart Systems and Emerging Technologies (IMET)*, Limassol, Cyprus, 2022, pp. 1–8, doi: 10.1109/IMET54801.2022.9929546.
- [21] Nat, Renée van der, Eggo Müller, and Piet Bakker. 2023. "Navigating Interactive Story Spaces. The Architecture of Interactive Narratives in Online Journalism." *Digital Journalism* 11 (6): 1104–29. doi:10.1080/21670811.2021.1960178.
- [22] K. Schrier, E. Torner, and J. Hammer, "World building in role-playing games," in *Role-Playing Game Studies: Transmedia Foundations*, S. Deterding and J. Zagal, Eds. Routledge, 2019, pp. 1–20. doi: 10.4324/9781315637532-20
- [23] M. H. Davis, "Measuring individual differences in empathy: Evidence for a multidimensional approach," *J. Pers. Soc. Psychol.*, vol. 44, no. 1, p. 113, 1983, doi: 10.1037/0022-3514.44.1.113.
- [24] Kwame Baffour, Anthony Williams, John Lee, and Oyewole Oyekoya. 2024. Mapping and Recognition of Body Movements on Another Person's Look-Alike Avatar. In *SIGGRAPH Asia 2024 Technical Communications (SA Technical Communications '24)*, December 03--06, 2024, Tokyo, Japan. ACM, New York, NY, USA, 4 Pages. <https://doi.org/10.1145/3681758.3697999>
- [25] Cardello, A. V., & Jaeger, S. R. Measurement of consumer product emotions using questionnaires. In H. L. Meiselman (Ed.), *Emotion measurement* (2nd ed., pp. 273–321). 2021. Elsevier. <https://doi.org/10.1016/B978-0-12-821124-3.00010-7>
- [26] Serna-Zuluaga, J.C., Juárez-Varón, D., Mengual-Recuerda, A. *et al.* Analysis of the influence of emotions on the decision-making of entrepreneurs using neurotechnologies. *Int Entrep Manag J* 20, 2169–2186 (2024). <https://doi.org/10.1007/s11365-024-00960-y>
- [27] A. Singla, "Microblogging: Definitive guide 2024," 2024. [Online]. Available: <https://masterblogging.com/microblogging/>. [Accessed: Jun. 12, 2024].
- [28] Montalbano L, Gallo L, Ferrante G, Malizia V, Cilluffo G, Fasola S, Alesi M, La Grutta S. Serious Games: A new Approach to Foster Information and Practices About Covid-19? *Front Robot AI*. 2022 May 23;9:830950. doi: 10.3389/frobt.2022.830950. PMID: 35677083; PMCID: PMC9168068.
- [29] Bai S, Hew KF, Gonda DE, Huang B, Liang X. Incorporating fantasy into gamification promotes student learning and quality of online interaction. *Int J Educ Technol High Educ*. 2022;19(1):29. doi: 10.1186/s41239-022-00335-9. Epub 2022 Jun 14. PMID: 35730028; PMCID: PMC9192135.
- [30] J. Cohen, "Defining identification: A theoretical look at the identification of audiences with media characters," *Mass Commun. Soc.*, vol. 4, pp. 245–264, 2001. doi: 10.1207/s15327825mcs0403_01
- [31] M. M. Bradley and P. J. Lang, "Measuring emotion: The self-assessment manikin and the semantic differential," *J. Behav. Ther. Exp. Psychiatry*, vol. 25, no. 1, pp. 49–59, 1994, doi: 10.1016/0005-7916(94)90063-9
- [32] O. D. E. Wulansari, J. Pirker, and C. Guetl, "International journal of emerging technologies in learning (iJET)," *Int. J. Emerg. Technol. Learn. (iJET)*, vol. 18, no. 3, pp. 83–95, 2023, <https://doi.org/10.3991/ijet.v18i03.36291>
- [33] L. Reader and C. McMahon, "Using online product reviews to assist design for emotion," in *Proceedings of the 5th International Congress of International Association of Societies of Design Research*, 2013, pp. 2598–2609. DOI: 10.1108/K-09-2021-0852
- [34] M. Feidakis et al., "A dual-modal emotion: The self-assessment manikin and the semantic differential," *J. Behav. Ther. Exp. Psychiatry*, vol. 25, no. 1, pp. 49–59, 2013, doi: 10.1016/0005-7916(94)90063-9
- [35] Kaltwasser L, Rost N, Ardizzi M, Calbi M, Settembrino L, Fingerhut J, Pauen M, Gallese V. Sharing the filmic experience - The physiology of socio-emotional processes in the cinema. *PLoS One*. 2019 Oct 18;14(10):e0223259. doi: 10.1371/journal.pone.0223259. PMID: 31626656; PMCID: PMC6799930.
- [36] Adam K. Coyne, Andrew Murtagh, and Conor McGinn. Using the Geneva Emotion Wheel to Measure Perceived Affect in Human-Robot Interaction. In *Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction (HRI '20)*. Association for Computing Machinery, New York, NY, USA, 2020. 491–498. <https://doi.org/10.1145/3319502.3374834>