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Is video games' effect on attitudes universal? Results from an empirical study comparing video games' impact on the attitude change of players with different backgrounds

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Abstract

Background: Existing studies confirm that some video games can change players' attitudes. However, since we do not know the specific elements responsible for attitude change, the potential of video games to achieve desired educational or behavioural outcomes often remains unfulfilled.

Objectives: To fill the research gap, our study examined whether the perspective-taking game mechanic in the serious game *Czechoslovakia 38–89: Borderlands*, which had previously been shown to affect attitudes, would have the same effect on another sample of players with different characteristics.

Methods: We have assessed the effect of a historical video game using a perspective-taking mechanic on players' explicit and implicit attitudes. Explicit attitude changes were measured at a general level, meaning a broad evaluation of a depicted historical event, and at a specific level, meaning a more detailed evaluation of specific aspects of the event. Simultaneously, we measured the effect of players' perceived attitude importance on attitude change. The study used a sample of 137 young adults.

Results and Conclusions: This study's results indicate a significant pretest-posttest explicit attitude change on the general level and on a specific level in comparison to the control group. Perspective-taking game mechanics is particularly important for explicit attitude change. No change was found in implicit attitudes. The effect of the perceived attitude importance on attitude change was not confirmed.

Takeaways: As one of the first to focus on the effects of specific game mechanics on attitudes, this study confirmed that perspective-taking has stable, short-term effects on attitude change even across different research samples.

KEYWORDS
attitude importance, explicit attitudes, game-based learning, history representation, implicit attitudes, video games

1 | INTRODUCTION

With over 3 billion players worldwide (Newzoo, 2023; Statista, 2022), video games represent a mainstream medium consumed by a global audience. Several studies have suggested that video games can affect players' attitudes towards the topics that these video games depict. For instance, they can affect attitudes towards prejudice against minorities, as shown in Guillaume and Caspar (2022); attitudes towards food safety, as demonstrated in Quick et al. (2013); attitudes towards mental health, as explored in Cangas et al. (2017); attitudes towards historical events, as discussed in Kolek et al. (2021); and attitudes towards protracted conflicts, as analysed in Kampf (2016a). However, it is important to note that other studies have yielded mixed results or failed to confirm such a video games' effect on attitudes (Barthel, 2013; Peña et al., 2018; Potter et al., 2021). These ambiguous results might be caused by the character of empirical evidence available. The majority of existing studies are designed to focus on the effects of a particular video game on attitudes (e.g., Parisod et al., 2018; Barwood et al., 2020; Greer et al., 2016), rather than delving into specific game mechanics' impact on attitudes. At the same time, most studies do not take into account players' relationships to the depicted topics in video games, even though the limited amount of replication studies suggests there is a possible importance (e.g., Peña et al., 2018; Peña & Hernández Pérez, 2020).

Our objective was to fill this research gap by exploring the effects of a perspective-taking game mechanic on attitudes. This game mechanic allowed players to explore the topic from the points of view of different actors affected by the historical event(s). We investigated whether the same game mechanic that was previously shown to have an impact on attitudes (Kolek et al., 2021) will have the same effect in a different group of players with different characteristics. In order to do so, we replicated the study by Kolek et al. (2021) with a different research sample and extended it to include measurements of attitude importance, that is, the extent to which one perceives an attitude object as relevant to them or groups with whom they identify (Fabringar et al., 2018). Similar to the original study (Kolek et al., 2021), we measured implicit attitudes that are based on immediate affective responses to the object and also explicit attitudes that are based on logical conclusions about the object in question. The previous study focused on short-term and long-term explicit and implicit attitude changes towards the expulsion of the Sudeten Germans, a historically sensitive topic in the Czech Republic and Germany (see Section 2.5 for details), depicted in the video game. Study participants were from the Czech capital city, Prague, which is located about 60 km from the closest border with any of the Sudeten regions. The study used a narrative video game based on personal stories and perspective-taking mechanics. The previous study concluded that the game mechanic resulted in more negative explicit attitude changes towards the depicted topic in the short term and the long term compared to the control group. Meanwhile, no effect was revealed on implicit attitude changes. In the present study, we used the same intervention and research procedure, including measurement tools. However, we departed from the original study in the selection of our research sample, where participants were recruited from three different locations in the Sudeten rural regions: persons living in the regions directly affected by the historical events depicted in the experimental intervention and presumably having a higher level of perceived importance assigned to the depicted historical topics compared to the original sample (see Prokop et al., 2019). Therefore, instead of collecting long-term data, we decided to extend the original study by including a questionnaire asking participants about their levels of perceived attitude importance for the topic of the expulsion of the Sudeten Germans.

Similar to the original study (Kolek et al., 2021) and based on the Associative-Propositional Model (Gawronski & Bodenhausen, 2014, 2007, 2006), we expected that the intervention would affect players' explicit attitudes and that it would not affect their implicit attitudes. We expected that a higher level of perceived importance for the expulsion topic would result in a smaller attitude change, that is, we expected lower attitude changes in our sample than those observed by Kolek et al. (2021).

This study went further than existing literature, demonstrating that games can change attitudes (e.g., Chen et al., 2020; Jacobs, 2018; Kolek et al., 2021; Quick et al., 2013) by examining specific factors that are responsible for these changes. Unique data provided by this study has the potential to enhance our understanding of the prerequisites for attitude change in video games, especially, in the context of players' relationships to the depicted topics.

The paper proceeds as follows: we first provide a theoretical background for attitude change in the context of narrative video games, players' perceived attitude importance, and the results of the original study in Section 2. We then present the procedure and tools used in this study in Section 3 and the methodology in Section 4. Our results are presented in Section 5, with a discussion and information on study limitations provided in Section 6.

2 | STUDY BACKGROUND

2.1 | Mechanisms of attitude change: Associative-Propositional Evaluation model

A person's attitude is "a summary evaluation of an object of thought" (Vogel & Wanke, 2016, p.3). This evaluation is mostly values-based, that is, either positive or negative in relation to the evaluated object (Eagly & Chaiken, 2007). Attitudes are important for our meaning-making process. They possess several functions, making them crucial for the way we work with information (Sanbonmatsu & Fazio, 1990) and, therefore, for the way we see the world around us. We tend to (a) consider information sources providing us with attitude-inconsistent information as less credible and those providing us with attitude-consistent information as more credible: a so-called credibility bias (van Strien et al., 2016); (b) interpret the obtained ambiguous information in an attitude-consistent way (Case & Given, 2016; Pratkanis, 1989; Vogel & Wanke, 2016); and (c) devote more time to a particular source of information with attitude-consistent information and vice versa (Brannon et al., 2007; van Strien et al., 2016).

Our conceptualization of attitude change was based on the Associative-Propositional Evaluation model (APE model), which recognizes explicit and implicit attitudes (Gawronski & Bodenhausen, 2014, 2007, 2006; Hütter, 2022; Moran et al., 2023). In this model, explicit attitudes represent evaluations, which build on information that we already have about the evaluated object. Based on this information, we create our propositional reasoning (a logical conclusion about the object) to materialize our evaluation. In this context, explicit attitudes are based on what one considers to be the truth. Therefore, we cannot have two contradictory propositional reasonings about one object for a long time since it would induce cognitive dissonance (Cooper, 2019; Festinger, 1958; Gawronski & Brannon, 2019), followed by a need to resolve the latter. That can happen either by seeking more information or by refusing one of the propositional reasonings. Thus, we can change our explicit attitudes only when exposed to new information that challenges our current attitude to the extent that we refuse our original propositional reasoning about the object. One's explicit attitudes are measured through self-reported questionnaires. A caveat is that this type of measurement might cause some participants to answer in a socially desirable way, especially when dealing with sensitive topics.

Implicit attitudes represent more affective immediate response to stimuli. This response stems from the associative evaluation of an object, and these evaluations depend on the mental structure of these associations in one's memory (Gawronski, 2022; Gawronski & Bodenhausen, 2014, 2007, 2006; Hütter, 2022). Therefore, implicit attitudes about a particular object rely on the way we evaluate other familiar objects in our mental structure: ones that come to mind during the evaluations. For instance, assume that a person prefers domesticated pets over wild ones. Their implicit attitudes towards cats might be much more positive when they recall, at the moment of evaluation, a mental image of a purring cat (which is related to their associative evaluation of domestic animals) as opposed to the mental image of the cat bringing home some kind of dead animal (which is related to their associative evaluation of wild animals). Which of these mental images will be recalled at the moment of evaluation depends on the links between the different concepts in their mental structure. If one has only had a recurring experience of encountering purring cats, they will probably recall the mental image of a purring cat. This mental structure (their implicit attitudes) can be affected when the concept in question is often encountered or linked to another concept of some positive or negative value for participants. In doing so, it can either strengthen the existing links in one's mental structure or create new ones.

At the same time, which association link will be activated might be dependent on context-dependent information. If participants are exposed to a photograph of a cat bringing home dead animals right before the implicit attitude measurement, they might associate the cat's behaviour with this photograph, which they associate with a negative value. Therefore, the cat will likely be evaluated negatively. Our associative evaluations do not depend on what we perceive to be the truth. Data about associative evaluations is usually collected through response time measurements revealing the associative evaluations (Banaji & Greenwald, 2013; Hütter, 2022; Ingendahl et al., 2023).

2.2 | Perspective-taking in narrative video games and attitude changes

On a general level, the effectiveness of narrative formats in changing attitudes is higher than that of non-narrative ones (Braddock & Dillard, 2016). As suggested by the results of the study by Bullock et al. (2021), the reason for this is that narratives are processed more fluently than non-narratives, which is important for persuasion. We considered narrative video games to be those that possess elements providing meaning to the game systems and rules, for instance, by incorporating storytelling aspects in the game. Narrative video games provide their players with experience with which they can interact, change situations with their actions, and perceive outcomes within the game narratives (Kolek et al., 2021; Smethurst & Craps, 2014). Such a type of agency in exploring game narratives might increase players' immersion in the game. The more the players are immersed in the depicted game narratives, the more persuasive potential the game has. This is because players tend not to take into account counterarguments to the information presented in game narratives (Chen & Yao, 2022; Dal Cin et al., 2004; Green, 2021; Green & Brock, 2002, 2000). As such, these games can deliver a message affecting players' attitudes.

Narrative video games are a broad group that can potentially deliver information about represented topics using various means. In this replication study, we focused specifically on one particular aspect of narrative video games: the game mechanic of perspective-taking (Dishon & Kafai, 2020; Ho & Ng, 2022; Kolek et al., 2023; Todd & Galinsky, 2014). The core value of this game mechanic lies in its ability to deliver a message about the topic from multiple points of view during players' interactions with game narratives. The perspectives provided to players are often complementary, yet sometimes contradictory, with respect to the represented topics. This allows for more complex depictions in video games.

From the perspective of attitude change and the Associative-Propositional model (as described in Section 2.1), this game mechanic should affect explicit and implicit attitudes differently. Regarding implicit attitude change, perspective-taking does not create clear and frequent connections between the depicted phenomenon and some concepts of value since it usually depicts the phenomenon from different perspectives (see Todd & Galinsky, 2014 or the results from the meta-analysis by Kolek et al., 2023). Therefore, perspective-taking's effect on implicit attitudes should not necessarily be significant. Regarding explicit attitude change, explicit attitudes require topic-related information that challenges our current beliefs in order for them to change. Perspective-taking can do this as it provides players with a complex take on the depicted topics in game narratives (Dishon & Kafai, 2020; Kolek et al., 2023). Furthermore, perspective-taking can overcome several mechanisms, usually limiting the persuasive potential of new attitude-related information. It delivers both attitude-consistent and attitude-inconsistent information at the same time, so it potentially limits the effect of a credibility bias or of our will to invest more time in information sources with attitude-consistent information (see Section 2.1). Therefore, perspective-taking might be an effective game mechanic for affecting explicit attitudes.

2.3 | Participants' relationship to the depicted topic and attitude change

The extent to which attitudes have an impact on our behaviour and meaning-making process (see Section 2.1) is assumed to be influenced by their strength. Specifically, weaker attitudes are less likely to affect our behaviour and meaning-making process, while stronger attitudes are more likely to have an impact on them (Wilcox et al., 2021). Weaker attitudes are also easier to change compared to stronger ones (Holbrook & Krosnick, 2010). The literature mentions up to 11 features of attitude strength (for their review, see Fabringar et al., 2018; Howe & Krosnick, 2017); we will further focus on one of them – importance.

Attitude importance is based on one's subjective perception of the significance of a particular attitude object (Howe & Krosnick, 2017). Attitude importance can be expressed as "the degree to which the attitude object is perceived as influencing a person's self-interest, as important to groups or people with which one identifies, and as relevant to personal values" (Fabringar et al., 2018, pp. 117). The perceived importance of a topic can be revealed by the question of how important the attitude object is to a person, or how much they are concerned with it, or how much they care about it (Howe & Krosnick, 2017). There are three main reasons why an attitude becomes important. Those are cases where attitude objects are somehow related to one's self-interest, to social identification, or to one's social or personal values (Fabringar et al., 2018; Howe & Krosnick, 2017). From the perspective of attitude change, attitudes with perceived higher levels of importance are harder to change as they usually have a strong position in one's mental structure of values. At the same time, higher levels of attitude importance seem to be one of the predictors of explicit and implicit attitude consistency (Hofmann et al., 2005).

2.4 | Studies about video games, attitude change, and importance

The existing literature focuses mostly on the effects of video games as a whole rather than on the effects of particular game mechanics or participants' characteristics. There are several studies focused on video games and their effect on explicit attitudes using a control group and pretest-posttest designs. These studies provide mixed results regarding the ability of video games to affect explicit attitudes. Several studies confirm the effect (e.g., Chen et al., 2020; Jacobs, 2018; Quick et al., 2013), while others do not (e.g., Peña et al., 2018; Potter et al., 2021; Soekarjo & van Oostendorp, 2015); or they provide mixed results (Barthel, 2013). More studies are needed to clarify which factors are responsible for attitude changes, both as concerns player characteristics and the characteristics of the game itself.

Much less is understood about the effects of video games on implicit attitudes. As far as we know, there are only five studies involving implicit attitude measurements using a pretest-posttest design with a control group. Based on the meta-analytical evidence (Kolek et al., 2023), video games, in general, have some effect on implicit attitudes, but the effect varies among different studies. More data is needed due to the wide range of elements potentially playing a role in implicit attitude changes.

General research on attitude importance in relation to attitude strength-related features has been plenty (see Bizer & Krosnick, 2001; Fabringar et al., 2018; Howe & Krosnick, 2017; van Harreveld et al., 2000). Attitude importance is assumed to be essential for research on attitude-behaviour correlations that are often low in many interventions (for examples from the public health sector, see Visser, Krosnick & Norris, 2017). Based on our current knowledge, attitude importance seems to be important for the way we process information and take action (Howe & Krosnick, 2017). However, the concept of attitude importance was never directly applied in the context of video game research. Although, several studies did focus on the effect of nationality on video games' effects on explicit attitudes towards the depicted topics (Kampf, 2017, 2016a, 2016b). For example, the results from Kampf (2016b) focused on the topic of the Israeli-Palestinian conflict, collecting data from political science students of four nationalities: two directly involved in the conflict (Israeli-Jews and Palestinians) and two less involved (Turks and Americans). The initial attitudes of all these groups were significantly different, but the effect of the game *Global Conflicts: Palestine*, *which* uses perspective-taking resulted in all these groups ending up with more moderate explicit attitudes compared to their initial state. At the same time, the game's effect on more distant parties was larger than on direct parties to the conflict. This could be theoretically explained by this attitude's lower level of importance for distant parties compared to the direct ones or by the attitude's higher level of importance for the direct parties compared to the distant ones. At the same time, the effect of the game *Peacemaker* (about the same topic in the same study) was not significant. The study author assumed that the reason was that *Peacemaker*'s game mechanics provide players with less impartial perspectives on the conflict compared to *Global conflicts: Palestine*. The importance of playing as a more distant party to attitude change was further confirmed by another of Kampf's studies (Kampf, 2017).

Overall, it seems that perspective-taking has the potential to affect explicit attitudes, but the effects are not universal. They may be related to participants' characteristics, for instance, the importance of attitude as suggested by indirect indicators related to participants' nationality and the latter's relation to the depicted topics (Kampf, 2016b, 2017).

2.5 | Historical background

For both the original and present study, we used a modified version of the game *Czechoslovakia 38–89*: *Borderlands* that depicts mainly one historical event – the expulsion of Sudeten Germans from the Czechoslovakian borderlands[1] in the years 1945 to 1946. The expulsion of the Sudeten Germans is a sensitive historical topic in the

[1]Czechoslovakia existed from October 28, 1918 to December 31, 1992, when it was peacefully divided into two sovereign states the Czech Republic and the Slovak Republic.

Czech Republic. It was an unprecedented, forced removal of up to 3,000,000 German-speaking citizens from Czechoslovakia after WWII. It involved direct casualties of between 15,000 and 40,000 Germans (Abrams, 1995; Czech Statistical Office, 2018; Glassheim, 2000; Staněk, 2005).

The historical discourse on the coexistence of German-speaking Czechs with other segments of the population in Czechoslovakia has evolved over the last century (see Abrams, 1995; Glassheim, 2000; Kolek et al., 2021). However, in Czechoslovakia, the event was predominantly considered to be justified. Even recent, heated public debates have proved that it is still a sensitive topic. This was evident, for instance, during the presidential elections in 2013 (CVVM, 2019; Kenety & Janzer, 2018). The Sudetenland, that is, the border regions of the Czech Republic, which had been inhabited predominantly by Germans since the Middle Ages, was critically impacted by the expulsion. The effects of the population transfers in this region are still visible today in many socio-economic indicators (Boček & Cibulka, 2016).

2.6 | Results of the original study

The original study (Kolek et al., 2021) yielded data from 148 participants in Prague on their short-term and long-term explicit and implicit attitude changes towards the expulsion of Sudeten Germans from Czechoslovakia. It was a pretest-posttest, one-month delayed posttest study with one experimental and one active control group. Regarding short-term explicit attitude changes, those were measured using two questionnaires. One was focused on an expulsion-related topic at the general (Macro) level using bi-polar adjectives; the second was focused on more specific, expulsion-related aspects (Micro) using evaluative statements. The results showed a significant between-group difference in short-term explicit attitudes changes tending in a negative direction both at the Macro level ($d = -0.34$) and at the Micro level ($d = -0.53$). Regarding long-term explicit attitude changes, attitude change between groups remained significant on a specific level ($d = -0.44$), but it was not significant on a general level ($d = -0.16$) in a previous study. The empirical data did not demonstrate any significant implicit attitude change in the experimental group. In the present study, long-term attitude changes were not analysed. Using the analysis of differential item functioning in change (DIF-C, Martinková et al., 2020), the study also showed significantly greater changes in the experimental group in items from the explicit attitudes questionnaire related to the *justness* and *fairness* of the expulsion compared to control group participants' possessing the same overall explicit attitudes pretest score.

3 | THIS STUDY

3.1 | Study design

The aim of the study was both to clarify the effect of perspective-taking on participants' attitude changes and the effect that attitude importance has on attitude change. To do so, we replicated the short-term part of the study (Kolek et al., 2021) on the effect of historical video games on players' attitudes and extend it to include additional measurement. The present study used the same measurement tools for explicit and implicit attitude changes; having a pretest-posttest design with one experimental and one control condition. Compared to the original study, it collected data on participants' perceived levels of importance for the depicted topic, and it operated with a research sample with a different background. We assumed that the research sample from the area directly affected by the events of the expulsion would have more positive attitudes towards the expulsion and higher importance of attitudes towards the expulsion. As already said, sociological research indicates that there exist significant differences in contemporary Czech society regarding the evaluation of our past. It also indicates that some of these divisions seem to correspond to the geographical divide between more central regions (particularly Prague) and the former Sudetenland (Prokop et al., 2019). The aim of the study was not only to deliver more data about the way particular game mechanics affect attitudes but also to show how attitude change corresponds to participants' relation to the depicted topics themselves.

As an intervention in the experimental group, we used the video game *Czechoslovakia 38–89*: *Borderlands*. As an intervention in the control group, we used two games from the *Trader of Stories* series (Trader of Stories, 2017). Both were used in the original study and are further discussed in Sections 4.2.1 and 4.2.2.

During the posttest, we collected data about participants' explicit and implicit attitudes towards the expulsion of the Sudeten Germans (i.e., outcome variables). During the pretest, we collected data about participants' prior explicit and implicit attitudes towards the topic. We also collected data about participants' gender, age, education, and self-reported relation to the depicted topic (representing one's perceived importance of the topic).

3.2 | Rationale for the experimental intervention

For the present study, we decided to collect our data from Czech participants currently living in the areas of the former Sudetenland. In comparison to the research sample in the original study, that is, participants living in Prague, we expected that participants from the former Sudetenland, an area directly affected by the expulsion, would have more positive attitudes towards the event and perceive the topic to have higher importance. The expulsion of the Sudeten Germans as an attitude object possesses the potential to be relevant to these participants' self-interest, social identification, and social or personal values, that is, aspects related to the perceived importance of the topic.

In this context, the video game *Czechoslovakia 38–89*: *Borderlands* represented a match for our study's objective. The game uses perspective-taking as a game mechanic for the depiction of historical events from various perspectives. Including those that are not in line with a predominantly positive discourse on the event (see more about the game in Section 4.2.1). It has also already been proven that the

game is able to change players' attitudes using perspective-taking (Kolek et al., 2021).

3.3 | Hypotheses

Hypothesis 1. The experimental intervention will cause a negative explicit attitude change towards the expulsion.

Similar to the original study (Kolek et al., 2021), we expected that perspective-taking would be able to provide players with a complex take on the depicted topics and simultaneously minimize the factors, usually limiting the potential of counter-attitudinal information to affect our attitudes. Therefore, we expected that participants in the experimental group would experience a negative explicit attitude change towards the expulsion after the intervention. It would moreover be significantly more negative compared to the control group.

Hypothesis 2. Participants' implicit attitudes in the experimental condition will not change compared to those in the control condition.

Similar to the results of the original study, we expected that the perspective-taking would not provide players with frequent, unequivocal connections between the depicted concepts and some other value concepts. The reason was that the game mechanic itself was based on depicting the topic from multiple points of view. Therefore, we did not expect that participants in the experimental group would experience any change in implicit attitudes compared to the control group.

Hypothesis 3. Explicit attitudes of participants in the experimental group who view the topic of expulsion as more important will be less affected by the intervention than the explicit attitudes of other participants in the experimental group.

Explicit attitudes with perceived higher levels of importance are harder to change; however, perspective-taking as a game mechanic seemed to be able to affect them to a lesser extent (Kampf, 2017, 2016b). Therefore, we expected that the participants in the experimental group (with attitudes with perceived higher levels of importance) would be more affected by the experimental intervention compared to the control group, but less so than those participants in the experimental group with lower levels of attitude importance concerning the depicted topic.

Hypothesis 4. Participants with higher levels of perceived attitude importance towards the topic will have more extreme attitudes.

It was assumed that, in the pretest, the attitudes of those persons with higher levels of perceived attitude importance towards the measured topic would have a more extreme, thus more unambiguous, evaluation of the concept (Howe & Krosnick, 2017). Therefore, we expected that participants with higher levels of attitude importance (both in the experimental and the control group) would have attitude evaluations of greater extremity compared to those with attitudes with lower levels of attitude importance towards the measured topic.

Hypothesis 5. Participants in the experimental group will consider the expulsion of Sudeten Germans as less fair and just after the intervention compared to those in the control group.

Similar to the findings in the original study, we expected that respondents in the experimental group would, in the posttest, score lower on items in the Macro (general level) and Micro (specific level) explicit attitude measurements, that is, those related to the justness and fairness of the expulsion, compared to the respondents in the experimental group who had the same total score on the pretest. This meant that the experimental intervention would cause participants to consider the expulsion to be less just and less fair compared to those persons in the control group with the same initial levels of attitudes towards the expulsion. We assumed that this would be caused by the fact that the expulsion is considered justified in Czech historical discourse. Thus, this area of the studied construct could have been the most affected by the intervention.

4 | METHODS

4.1 | Participants

We included in our sample participants speaking Czech. We required at least elementary knowledge of English as the game in the control group was in English. We also focused on participants who were currently living in the areas of the former Sudetenland that had been affected by the expulsion. The study's optimal sample size was identical to the previous study: 64 persons per group to reveal medium, between-group-difference effect size in attitude changes ($d = 0.5$) using a two-sample t-test with a significance level $\alpha = 0.05$ and power $1-\beta = 0.80$.

Our data came from 138 participants who were from three different cities in the former Sudetenland. We advertised the experiment on websites and in local Facebook groups offering short-term jobs. In the advertisement, we described the experiment as focusing on the effects of technology on users and stated that participants would be exposed to video games. We offered participants 300 CZK for their time (approx. 12 EUR).

We further excluded one participant who was originally from Slovakia, leaving us a research sample size of 137 participants: 75 males and 62 females, aged between 15 and 29 years ($M = 18.18$, $SD = 2.88$). As the exploratory analysis in Kolek et al. (2023)

suggested that younger audiences may be somewhat more susceptible to attitudinal changes in relation to playing video games than older audiences, we focused on younger audiences compared to the original study (Kolek et al., 2021). Most of the participants had achieved their highest level of education at the elementary level (elementary: 81%; secondary: 18%, higher education: 1; many of these participants were studying in higher grades of higher education at the time of the experiment. All participants were randomly divided into an experimental ($n = 75$) and a control group ($n = 62$). A slight misbalance between the groups was caused by technical issues in the rented laboratories.

4.2 | Interventions – Video games

4.2.1 | Experimental intervention

We used a modified version of the game *Czechoslovakia 38–89: Borderlands* (http://cs3889.com) as an intervention tool. It is a point-and-click, full-motion video adventure consisting of interactive dialogues, comics, and mini-games. Originally, the game dealt with the crucial years of 1945–1948 during the aftermath of WWII in then Czechoslovakia. The game is based on historical research and personal testimonies from eyewitnesses. The depiction of the narrative in the game is based on perspective-taking as it provides players with multiple, and often contradicting, perspectives on the events of the expulsion, that is, from the neutral standpoint of their character.

In the game, players took on the role of a surveyor going to a village in the Czech borderlands to decide whether it should be declared a monument or demolished. They talked to residents (Figure 1) to learn about the history of local buildings. Furthermore, players found out that their grandfather was involved in events that affected the village's history. While they talked with the locals, players explored memories from the past through dialogues or directly through interactive comics (Figure 2) depicting period events.

We used the same version of the game from the original research (Kolek et al., 2021), which focused only on one of the historical topics: the expulsion of the Sudeten Germans. The game provided players with enough agency during play while also ensuring that they always encountered key information in the story within a similar duration of gameplay. With respect to perspective taking, players were exposed to different game characters with various perspectives on the expulsion(s). The game was divided into two parts. The first part of the game lasted approximately 30.5 min, and the second part approximately 23.5 min.

The first part ran longer as it contained the introduction to the story by a Volhynian Czech who resettled on a former German farm in the Czech borderlands. Then, players experienced the first interactive scene providing historical context. After that, they were exposed to the game's three characters who had been most negatively affected by the expulsion. During the second part, players interacted with characters in favour of, or actively involved in the expulsion.

4.2.2 | Control intervention

We used two games from the *Trader of Stories* series (Trader of Stories, 2017) in our control group. Both *A Grain of Truth* and *Trader of Stories – Chapter 1* are narrative, point-and-click adventures based on personal stories. Regarding the game mechanics, these games are very similar to *Czechoslovakia 38–89: Borderlands*. However, they differ significantly in their narratives. The games from the *Trader of Stories* series are from a fantasy world not related in any way to the historical topics in our experimental condition. Players took on the role of a woman, Myosotis, who lost her memory and, by talking to other characters and discovering the game world, slowly recovers it.

We used the *A Grain of Truth* game in the first part of the experiment and the *Trader of Stories – Chapter 1* game during the second part of the experiment after the pause. Players did not finish the games during the experiment. They played them for the exact amount of time defined by the gameplay in the experimental group: approx. 30.5 min for the first game and approx. 23.5 min for the second game.

FIGURE 1 Dialogue with eyewitnesses in the game *Czechoslovakia 38–89: Borderlands*.

FIGURE 2 Interactive comics in the game *Czechoslovakia 38–89: Borderlands*.

4.3 | Measures

We collected the same data as in the original study. Specifically, we used a questionnaire on demographics, two pen-and-paper questionnaires on explicit attitudes, one questionnaire on players' positive and negative affect, and one computer-based implicit attitude measurement. In addition to that, we included one pen-and-paper questionnaire on participants' perceived attitude importance for the expulsion of the Sudeten Germans.

Background demographic questionnaire. The background questionnaire collected demographic data on participants' gender, age, highest level of education completed, and their hometown.

PANAS. We evaluated participants' positive and negative affect using the Positive and Negative Affect Schedule (PANAS, Watson et al., 1988). PANAS is based on two 5-point Likert scales measuring positive and negative affect with a total score ranging between 10 and 50 points (lower values represented more negative affect and vice versa). The data from this questionnaire was used to control the effect of mood on attitude change as several studies suggest a possible relation (e.g., Schwarz & Clore, 1983).

Macro and Micro explicit attitudes measurement. Explicit attitudes were measured using two questionnaires differing in level of specificity in relation to the expulsion. The first focused on the topic of attitude evaluation from a general perspective (**Macro**). It was a 5-item questionnaire using a 5-point semantic differential scale (Osgood et al., 1957) with bi-polar adjectives. We used these pairs of bi-polar adjectives: unnecessary-necessary, wrong-correct, inadequate-adequate, criminal-righteous, shameful-honest, unfair-fair, and unfounded-justified. Each item was coded on a range of -2 – $+2$ with a total possible score between -14 and $+14$. The second questionnaire focused on more specific aspects of the expulsion (**Micro**). It included 10 evaluative statements about the expulsion, ranked using a 7-point Likert scale (Likert, 1932). Each statement was coded from 1 to 7, where smaller values represented more negative attitudes towards the expulsion and vice versa.[2] The total possible score ranged between 10 and 70. For example, one of the evaluative statements was "The Czechs behaved harshly towards the Sudeten Germans after the war." (For the full list, see Table A1 in the Appendix). Both questionnaires had a high degree of reliability, measured as internal consistency (Cronbach's alpha >0.80; see Table A2 in the Appendix).

Questionnaire on participants' relationship to the expulsion. This questionnaire consisted of four questions. Two questions used 7-point bi-polar semantic differential scales. One focused on the importance of the issue for participants ("Are you interested in the topic of the expulsion of Sudeten Germans?"), the second on their surroundings ("Is the issue of the expulsion of Sudeten Germans being discussed in your area?"). The last two questions were open questions related to the first ones. We asked participants "Please elaborate on your answer to the previous question." These two questions were not further analysed in the context of this study but provided valuable complementary information. Initially, information from the first two items was averaged. For some of the analyses, respondents were further coded as those with a "higher importance level" concerning the expulsion topic (at least one of their answers was greater than 0) and those with a "lower importance level" (both answers 0 or lower).[3]

Single Category Implicit Association Test (SC-IAT). To gather information on implicit attitudes towards expulsion, we used a computer-based implicit attitude measurement tool that collected data on participants' response times while categorizing words into the chosen categories. SC-IAT (Karpinski & Steinman, 2006) is a modification of the original Implicit Association Test (IAT; Greenwald & Banaji, 1995; Greenwald et al., 1998). The original IAT works with four categories, while SC-IAT works with only three categories during the categorization process. As such, it allowed us to measure implicit attitudes towards only one concept and not the relative relation between two concepts as in the original IAT. There is no other more reliable measurement tool for measuring implicit attitudes towards only one concept than SC-IAT (Karpinski & Steinman, 2006). We used the same modified tool as in the original study (for more details, see Kolek et al., 2021) to measure SC-IAT. It was created using Psychopy2 Experiment Builder (Peirce, 2007, 2009) and by adjusting the existing script per (Hussey, 2016) original.

4.4 | Procedure

The data for the study was collected during three weekends in three different cities in former areas of the Sudetenland. This took place at the end of 2018 and the beginning of 2019. We always rented two computer laboratories from local schools for the purpose of this experiment. We collected data during one or two sessions per day and over the weekend. The first data collection period occurred between 10:00 AM and 12:30 PM and the second from 1:30 to 4:00 PM. We organized 3 sessions in Ústí nad Labem, 4 sessions in Teplice, and 3 sessions in Most. The number of sessions was decided upon based on local participants' interest in taking part.

Upon arrival, all participants gathered in the largest room and received general information and instructions about the study. After that, they all signed the informed consent form regarding their participation in the study. Then we collected basic demographic data from all participants and randomized them into the experimental and the control groups. Subsequently, we relocated participants into one of two labs, depending on their group. During each session, we collected data simultaneously in both labs. We collected the questionnaires for the pretest (see Figure 3); that is the PANAS, SC-IAT, and the Macro and Micro explicit attitude measurements. Then, participants played the first part of *Czechoslovakia 38–89: Borderlands* or the first game from the *Trader of Stories* series, depending on their assigned group. After that, they had a 15-min pause before they played the second part of *Czechoslovakia 38–89: Borderlands* or the second game from the *Trader of Stories* series. In the experimental group, we waited for

[2]Negatively formulated items were reverse-coded for the purpose of the analysis.

[3]When using the mean of the two items as a continuous variable in the regression model, the results were the same as with the binarized variable.

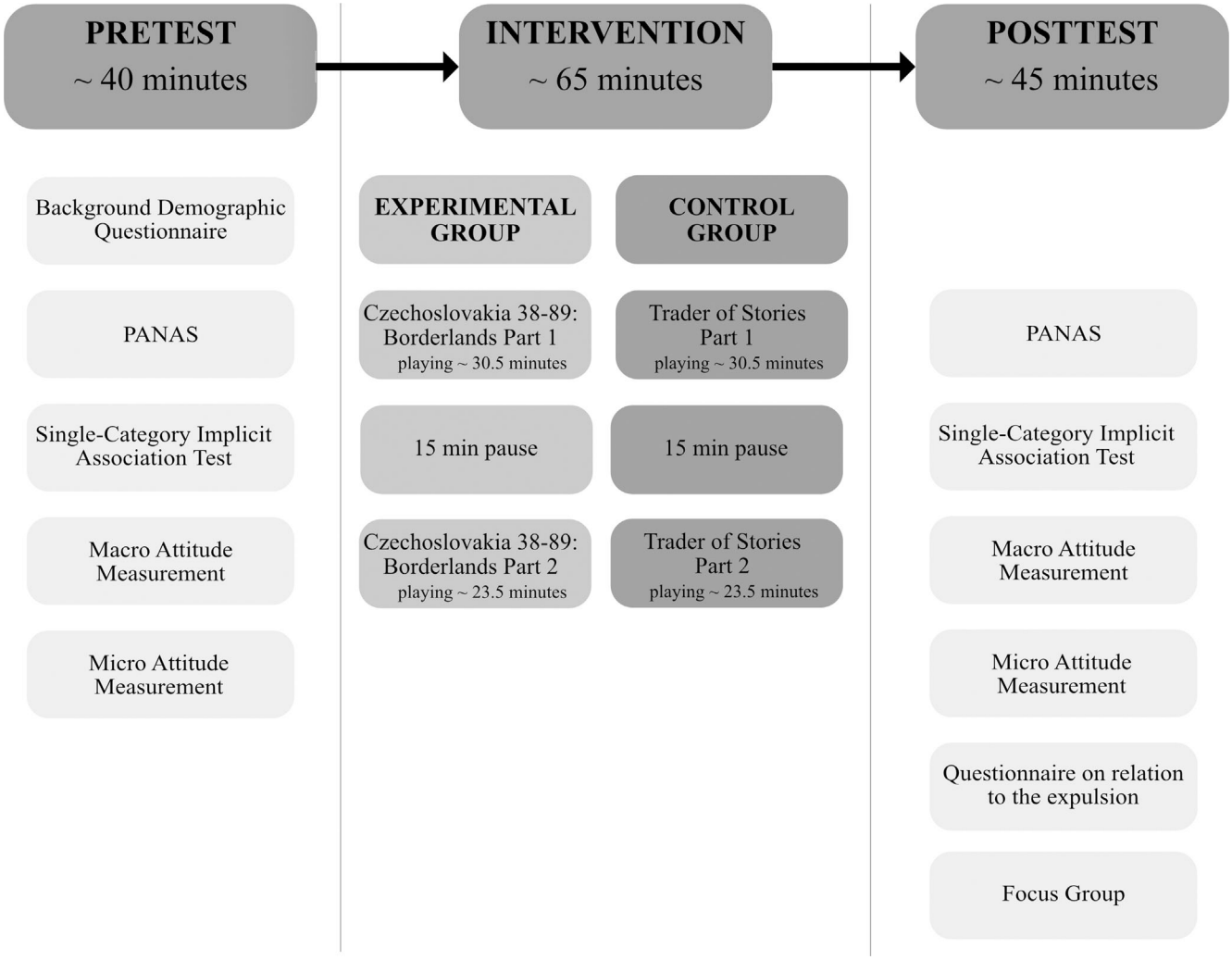

FIGURE 3 Experiment Procedure.

the last participant to finish the game before we proceeded to the posttest phase. The length of gameplay in the control group corresponded to the length of gameplay in the experimental group, that is, approx. 30.5 min for the first part and approx. 23.5 min for the second part.

After the intervention, we collected the same data as during the pretest with one additional questionnaire on participants' perceived attitude importance concerning the expulsion. This questionnaire was collected last so as to avoid social category priming (Kawakami et al., 2003). Finally, after all quantitative study data had been collected, we used focus groups to gather qualitative data on participants' understanding of the questionnaires. Then, we debriefed them.

4.5 | Data analysis

We used two-sample *t*-tests to compare the two groups (experimental vs. control or borderland vs. capital) on the baseline and (experimental vs. control) in the pre-post differences. An X2 test was used for between-group comparison concerning gender ratio.

To analyse pre-post differences in each of the groups, we used paired *t*-tests as an initial analysis, and we used two-sample *t*-tests to compare the two groups in these pre-post changes. To account for respondents' characteristics, we further used regression models in which the post-intervention explicit/implicit attitude score (Micro, Macro, SC-IAT) was modelled as a linear function of the following variables: respective pre-intervention score, respondents' gender, age, education level, pretest positive and negative PANAS, a binarized measure of attitude importance for the expulsion topic (higher/lower), intervention group (experimental, control) and its interaction with pre-intervention scores and with binarized attitude importance scores, as well as the interaction between gender and pre-intervention scores. We then eliminated insignificant effects one by one until the remaining effects or their interactions were significant. For all such models, assumptions of normality, linearity, homoscedasticity, and independence of residuals were evaluated. To support the hypothesis of the experimental intervention effect, we checked for the significance of the group effect and its interactions in the final models. To support the hypothesis of the significance of the effect of levels of attitude importance for the expulsion topic on attitude change, we checked

for the significance of the attitude importance effect and its interaction within the group.

To support the hypothesis that participants with higher levels of attitude importance for the expulsion have more extreme attitudes, we calculated the pre-intervention attitude scores' distances from the middle point (i.e., 0 for Macro and 40 for Micro explicit measurement). We analysed the differences in these distances between the "higher importance level" and the "lower importance level" groups using the two-sample nonparametric Mann–Whitney test. We accounted for the fact that distances from the middle point cannot be assumed to be normally distributed.

To confirm the more detailed information on between-group differences at the item level (namely that the between-group differences would be observable in items on expulsion fairness and justness), we checked for differential item functioning (DIF, Martinková et al., 2017; Martinková & Hladká, 2023) on a baseline level. We also used analysis of differential item functioning in change (DIF-C, Martinková et al., 2020) with a cumulative logit ordinal regression model and pretest scores as the matching variable (as in Kolek et al., 2021). Because we were confirming the results from the previous study, we did not adjust for multiple comparisons in this analysis. All other *p*-values were adjusted to multiple comparisons using the Benjamini-Hochberg correction for multiple comparisons. Analyses were completed using *R* version 4.1.1 (R core team, 2021) and its packages. DIF-C analysis was performed using the packages difNLR version 1.4.1 (Hladká & Martinková, 2020) and ShinyItemAnalysis version 1.4.1 (Martinková & Drabinová, 2018).

5 | RESULTS

Altogether, we gathered data from 75 participants in the experimental group and 62 participants in the control group. Due to technical issues, we collected SC-IAT on both pretest and posttest from only 68 (experimental group) and 42 (control group) participants. The data on perceived attitude importance for the expulsion was collected from only 67 + 53 respondents; thus, the sample size for between-group comparisons for these variables is lower than for other variables.

On the baseline, there were no significant differences in our experimental and control groups (see Table 1). As expected, our sample had more positive attitudes towards expulsion, both explicit and implicit, than the sample in the original study by Kolek et al. (2021), thus validating our manipulation check. However, our sample was also younger and had higher scores on negative PANAS (see Table 2).

5.1 | Hypothesis 1

> **H 1.** The experimental intervention will cause a negative explicit attitude change towards the expulsion.

As expected, we found significant negative pre-post differences in Macro ($d = -0.52$ $p = <0.001$) and Micro ($d = -0.48$, $p = <0.001$) explicit attitudes towards expulsion in the experimental group. This change was significantly more negative than the change in the control group (see Table 3). A significant difference in pre-post change was also confirmed when accounting for other respondent's characteristics in regression models (see Tables 4 and 5 and Figure 4). For example, in Micro measurement, the post-intervention score for a respondent from the experimental group with an average pretest score (37.4) was 2.69 points lower than for a respondent with the same characteristics but from the control group. In Macro measurement, the post-intervention score was approximately 1.7 points lower for respondents from the experimental group than for respondents from the control group with the same pretest score. Hence, H1 was supported.

TABLE 1 Descriptive statistics for experimental and control group in pretest.

	Experimental group			Control group				Experimental vs. control group			
	n	Male	Female	*n*	Male	Female		w	Chi2 stat		*p* adj
Gender (female ratio)	75	42	33	62	33	29		0.01	0.02		.993
		n	*M*	*SD*	*n*	*M*	*SD*	M_{diff}	SD	*d*	*t* stat	*p* adj
Age		75	18.20	2.81	62	18.16	2.98	0.04	2.88	0.01	0.08	0.993
Education (1 ES, 2 HS, 3 U)		75	1.23	0.45	62	1.16	0.37	0.07	0.42	0.16	0.93	0.993
PANAS+ (10–50)		75	28.87	5.46	62	28.31	5.86	0.57	5.63	0.10	0.58	0.993
PANAS- (10–50)		75	16.45	5.06	62	16.59	4.73	−0.14	4.90	−0.03	−0.17	0.993
Macro explicit score (−14–14)		75	1.03	5.71	62	0.47	5.73	0.56	5.70	0.10	0.57	0.993
Micro explicit score (10–70)		75	37.47	9.14	62	37.32	9.81	0.14	9.41	0.02	0.09	0.993
Macro explicit time		75	0.06	0.03	62	0.05	0.02	0.00	0.02	0.09	0.56	0.993
Micro explicit time		75	0.08	0.03	62	0.08	0.02	0.00	0.02	0.00	−0.01	0.993
Interest in the topic – P1, P2 (−3–3)		67	−1.16	1.28	53	−1.32	1.34	0.16	1.31	0.13	0.68	0.993
SC-IAT (−1–1)		70	−0.12	0.27	42	−0.16	0.31	0.05	0.29	0.16	0.80	0.993

TABLE 2 Differences between Prague and borderland group in pretest.

	Borderland group			Prague group			Borderland vs. Prague group		
	n	Male	Female	*n*	Male	Female	w	Chi2 stat	*p* adj
Gender (female ratio)	137	75	62	145	84	61	0.04	0.19	0.665
	n	*M*	*SD*	*n*	*M*	*SD*	M_{diff}	*SD*	*d*	*t* stat	*p* adj
Age	137	18.18	2.88	145	20.88	3.52	−2.69	3.49	−0.77	−7.05	<0.001
Education (1 ES, 2 HS, 3 U)	137	1.20	0.42	145	1.94	0.67	−0.75	0.68	−1.11	−11.26	<0.001
PANAS+ (10–50)	137	28.62	5.63	143	28.84	6.06	−0.23	5.84	−0.04	−0.32	0.747
PANAS- (10–50)	137	16.51	4.90	143	15.10	4.71	1.42	4.85	0.29	2.46	0.019
Macro explicit (−14–14)	137	0.77	5.70	145	−0.82	5.36	1.59	5.58	0.29	2.42	0.019
Micro explicit (10–70)	137	37.40	9.41	145	34.03	8.93	3.37	9.31	0.36	3.08	0.004
SC-IAT (−1–1)	113	−0.14	0.29	144	−0.28	0.29	0.14	0.30	0.48	3.95	<0.001

5.2 | Hypothesis 2

H 2. Participants' implicit attitudes in the experimental condition will not change compared to those in the control condition.

As expected, we were not able to confirm any pre-post changes in implicit attitudes (see Table 3 and Table 6). Hence, H2 was also supported.

5.3 | Hypothesis 3

H 3. Explicit attitudes of participants in the experimental group who view the topic of expulsion as more important will be less affected by the intervention than the explicit attitudes of other participants in the experimental group.

As the effect of the interaction between the binary measure of attitude importance for the expulsion topic and group indicators was insignificant and not included in the final regression models (see Tables 4 and 5), we were not able to support the hypothesis of the significance of the effect of levels of attitude importance for the expulsion topic in the experimental group as relates to attitude change (H3).

5.4 | Hypothesis 4

H 4. Participants with a higher level of perceived attitude importance towards the topic will have more extreme attitudes.

For Macro explicit attitudes, the distance from the middle point was $M = 5.47$; $SD = 3.74$ for respondents with higher levels of attitude importance. Meanwhile, it was $M = 4.43$; $SD = 3.28$ for respondents with lower levels of attitude importance. Similarly, in Micro scores, the distances were $M = 9.12$; $SD = 6.86$ for high and $M = 7.08$; $SD = 5.69$ for low attitude importance (see Table 7). However, the differences between the lower- and higher-importance groups were not significant in either case (Macro or Micro). Thus, we were not able to support the hypothesis that participants with higher levels of attitude importance for the expulsion topic have more extreme attitudes.

5.5 | Hypothesis 5

H 5. Participants in the experimental group will consider the expulsion of Sudeten Germans as less fair and just after the intervention compared to those in the control group.

As in the original study, we were able to confirm the between-group differences at the item level for items on expulsion fairness and justness in Micro measurement. The item in which significant DIF-C was again present was item 10 ("The borderland eviction was carried out fairly."). Moreover, we detected significant DIF-C in item 8 ("Czechoslovaks' confiscation of Sudeten German property after the war was fair.") (Figure 5). With both items, participants from the control group were more likely to give higher scores than participants from the experimental group who had the same score on the micro pretest. For example, a participant from the experimental group with 40 points on the pretest would have a 29% probability of assigning four or more points ("no strong opinion" or more agreement, measured on a scale of 1–7) to Item 10 on a posttest. Meanwhile, a respondent from the control group with the same pretest score would have a 51% probability of assigning four or more points (see dot-dashed lines in Figure 5B).

However, in the Macro measurement, the DIF-C in item 4 (detected in the original study on the Prague sample) was not confirmed in this study with the borderland sample. Hence, H5 was only partly supported.

TABLE 3 Differences between experimental and control groups in posttest-pretest.

	Experimental group								Control group								Experimental vs. control group			
	PRE			POST		PRE-POST difference			PRE			POST		PRE-POST difference							
	n	M	SD	M	SD	M	SD	d	p	n	M	SD	M	SD	M	SD	d	p	M_{diff}	SD	t test	d	P
Macro score	75	1.03	5.71	−1.32	5.68	−2.35	4.55	−0.52	<0.001	62	0.47	5.73	−0.03	5.30	−0.50	3.48	−0.14	0.328	−1.85	4.19	−2.69	−0.44	0.018
Micro score	75	37.47	9.14	33.70	10.27	−3.76	7.91	−0.48	<0.001	62	37.32	9.81	36.09	9.84	−1.23	3.58	−0.34	0.015	−2.53	6.44	−2.48	−0.39	0.018
Macro time	75	0.06	0.03	0.03	0.01	−0.02	0.02	−1.03	<0.001	62	0.05	0.02	0.03	0.01	−0.02	0.02	−1.30	<0.001	0.00	0.02	−0.95	−0.16	0.287
Micro time	75	0.08	0.03	0.06	0.02	−0.02	0.02	−1.20	<0.001	62	0.08	0.02	0.06	0.01	−0.03	0.02	−1.27	<0.001	0.00	0.02	0.83	0.14	0.796
SC-IAT	68	−0.12	0.27	−0.13	0.29	−0.01	0.30	−0.03	0.397	42	−0.16	0.31	−0.14	0.28	0.03	0.37	0.08	0.62	−0.04	0.33	−0.56	−0.12	0.360

6 | DISCUSSION

In this study, we assessed the effect of a historical video game using a perspective-taking mechanic on players' explicit and implicit attitudes towards the expulsion of the Sudeten Germans from then Czechoslovakia. This study followed the procedure used in the study by Kolek et al. (2021) but collected short-term data from participants with more positive initial attitudes towards the expulsion. Furthermore, we investigated the effect of attitude importance on attitude changes. The key study finding, that is, that playing the test video game changed players' attitudes towards the depicted historical events supports the current literature (Cangas et al., 2017; Guillaume & Caspar, 2022; Kampf, 2016a; Mulak & Winiewski, 2022) which claims that video games affect our attitudes towards topics depicted in games. They can, therefore, shape how we think about the topics represented in them. Furthermore, by investigating explicit and implicit attitude change after playing a historical video game that uses perspective-taking mechanics and attitude importance, this study brought new data to the debate on why some games can affect players' attitudes while others cannot.

6.1 | General findings

As expected, our research sample had significantly more positive explicit and implicit initial attitudes towards expulsion than the sample in the original study by Kolek et al. (2021) (i.e., this is a manipulation check). Regarding the hypotheses, the experimental intervention using perspective-taking game mechanics affected players' explicit attitudes towards the depicted historical topic compared to the control group (H1). As was also the case in the original study, the observed change went in a negative direction.

It was hard to predict whether the change in the experimental group would be greater in this study on the borderland sample than the one found in the Prague sample in the study by Kolek et al. (2021), On one hand, the borderland sample had more extreme baseline attitude values (thus presumably greater potential to change). On the other hand, attitudes with higher importance seem to be harder to change (Howe & Krosnick, 2017), and the perceived attitude importance for the expulsion topic was presumably higher in the current sample (respondents from the Sudeten regions) than in the original sample (respondents from the country's capital city). Therefore, it might have been harder to change the attitudes of the borderland sample, but the effect of attitude importance was never directly explored in the context of video games. Nevertheless, for the sake of completeness, we remark that two sample *t*-tests (see Table A3 in the Appendix) did not confirm any difference between the pre-post changes in the borderland sample vs. in the Prague sample used by Kolek et al. (2021).

Furthermore, we confirmed that an intervention game using perspective-taking is unable to affect implicit attitudes (H2) significantly. These results are again in compliance with the original study (Kolek et al., 2021), and they further support the idea that

TABLE 4 Parameter estimates in the final regression model for posttest Macro explicit measurement.

	Estimate	*SE*	*t*	Pr (>|t|)
Baseline (Group C, Pretest Macro 0)	−0.36	0.48	−0.76	0.449
Pretest Macro explicit	0.71	0.06	12.50	<0.001***
Group experimental	−1.68	0.65	−2.61	0.010*

Note: full model: PostMacro ~ PreMacro + Gender + Age + Education123 + PrePANASp + PrePANASn + Group + P1P2bin + P1P2bin:Group + Group:PreMacro + Gender: PreMacro. Multiple *R*-squared: 0.545, Adjusted *R*-squared: 0.538.

TABLE 5 Parameter estimates in the final regression model for posttest Micro explicit measurement.

	Estimate	*SE*	*t*	Pr (>|t|)
Baseline (Group C, Pretest Micro 0, Pretest PANAS + 0)	−7.99	4.00	−2.00	0.048*
Pretest Micro	0.95	0.08	12.24	<.001***
Group experimental	5.79	4.18	1.39	0.168
Pretest PANAS+	0.31	0.09	3.41	0.001***
Pretest Micro: Group Experimental	−0.23	0.11	−2.09	0.039*

Note: full model: PostMicro ~ PreMicro + Gender + Age + Education123 + PrePANASp + PrePANASn + Group + P1P2bin + P1P2bin:Group + Group:PreMicro + Gender: PreMicro. Multiple *R*-squared: 0.668, Adjusted *R*-squared: 0.658.

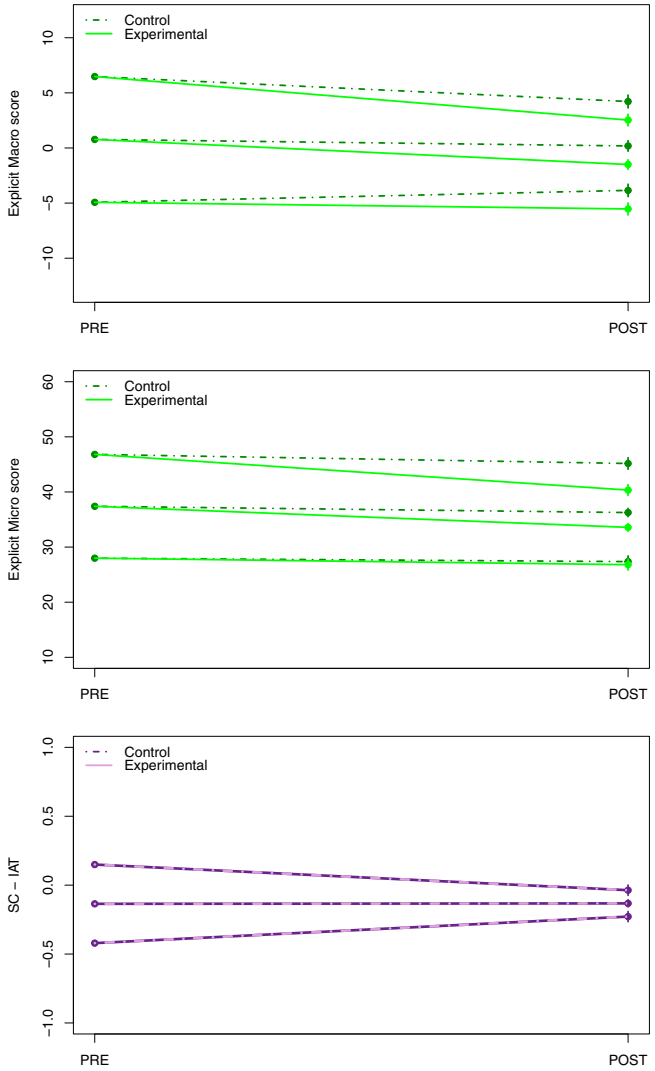

FIGURE 4 Predicted values and confidence intervals for final regression models for (a) macro score, (b) micro score, and (c) SC-IAT score. Displayed for respondents with pretest values equal to the mean value, 1SD above, and 1SD below mean.

perspective-taking does not create unambiguous frequent links between concepts to affect implicit attitudes.

We did not confirm any hypothesis related to the effect of the self-reported importance of participants' attitudes. We were unable to confirm any relation between the level of attitude importance and the magnitude of attitude change (H3) since the effect of the binarized attitude importance variable was insignificant in the regression model predicting posttest attitudes based on pretest scores and respondents' characteristics. At the same time, we were not able to confirm a relation between the extremity of attitude and attitude importance (H4). However, those persons with higher attitude importance had their attitudes marked slightly further from the middle point.

Finally, using the DIF-C analysis, we showed that the intervention affected attitudes towards expulsion especially in those areas related to the perception of expulsion fairness (H5). While item-level measurements are always less precise than those composed of multiple items, we are not surprised that significant DIF-C was not confirmed exactly in the same set of items. On the contrary, the fact that DIF-C was again confirmed only in items related to expulsion fairness suggests the game can affect this area of attitudes.

6.2 | Implications and interpretations in the context of existing studies

This study provides insights not only into how video games can change attitudes. It also has several implications regarding the effects of specific game mechanics, perspective-taking, and players' perceived importance of the depicted topic.

6.2.1 | Perspective-taking

This study has provided data on whether game mechanics perspective-taking provides predictable results on attitude changes.

It confirmed that the effect of perspective-taking is evident on explicit attitudes (similar to, e.g., Kampf 2015; Kampf, 2016a, 2016b) and not on implicit attitudes. This finding was further emphasized by comparison to the original study (Kolek et al., 2021) but with a different research sample. In comparison to the original study, the current research sample had significantly more positive initial implicit and explicit attitudes towards the expulsion, and its participants were younger (see Table 2). In both studies, exposure to the intervention resulted in more negative explicit micro and macro attitudes towards the expulsion in comparison to respective control groups. It also resulted in no significant change in the implicit attitudes in the experimental groups in both experiments. These results suggest that the character of the game used is more important for attitude change than initial attitudes and age. These results corroborate the idea that perspective-taking in a video game might be the crucial factor responsible for attitude change. To further support this point, we suggest that more replication studies with research samples from completely different cultural environments be conducted.

The importance of usage of research samples from completely different cultural environments is to some extent suggested by another set of studies that we can compare our results to. Those are Peña et al. (2018) and the replication study by Peña & Hernández Pérez, (2020), which had research samples from different countries.

TABLE 6 Parameter estimates in regression model for posttest implicit measurement (SC-IAT).

	Estimate	*SE*	*t*	Pr (>|*t*|)
Baseline (PreIATeffect 0)	−0.09	0.03	−3.00	0.003**
PreIATeffect	0.34	0.09	3.62	<0.001***

Note: Full model: PostIATeffect ~ PreIATeffect + Group + Gender + Age + Education123 + PrePANASp + PrePANASn + P1P2bin + P1P2bin:Group + Group:PreIATeffect + Gender: PreIATeffect. Multiple *R*-squared: 0.108, Adjusted *R*-squared: 0.100.

Both studies used the *Papers*, *Please* video game as an experimental intervention to measure explicit attitude changes towards helping immigrants. Findings from these two studies differ since the replication study identified pretest-posttest explicit attitude changes, while the original one did not. In contrast with our results, this would suggest that the game mechanic's effect on explicit attitudes is not universal and that players' initial characteristics, specifically different cultural backgrounds, might have a significant role in impacting attitude change. However, there are two other things to consider in those two studies: implementation of game mechanics and differences in study procedures. Starting with the game mechanic, perspective-taking in the experimental game *Papers*, *Please* in these two studies depicted two general perspectives on the topic of immigration. However, these perspectives were unbalanced. The game mostly accented the perspective of the immigration officer compared to the perspective of immigrants, who were given much less space in the game. However, the study itself measured attitude changes towards helping immigrants, that is, attitudes to the perspective much less represented in the game. We assume that this might also be the reason for the limited effect on attitude changes towards helping immigrants. Regarding the difference in procedure protocol for these two studies, the original study (Peña et al., 2018) collected data on the second posttest during the following day, but it took at least 2 days or more to collect data for the second posttest, which revealed between-group differences in the replication study (Peña & Hernández Pérez, 2020). So, participants had more time between sessions to look for additional information about the topic. Therefore, the effect of different cultural backgrounds is not clear since, for example, higher interest in the topic might have caused the difference.

Yet more empirical evidence (Kampf, 2016a, 2017) suggests that the effect of video games using perspective-taking on explicit attitudes is present and predictable as these studies confirmed the effect of perspective-taking across research samples from multiple countries with various relations to the depicted topics.

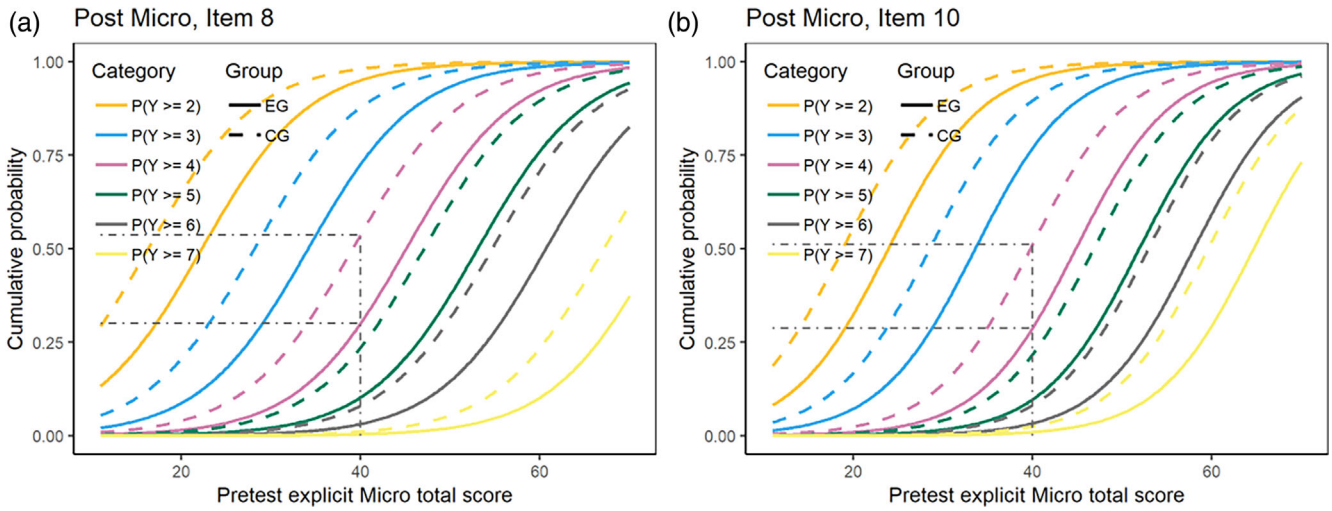

FIGURE 5 DIF-C for pre-post change in micro attitudes for items 8 and 10: Cumulative probabilities are higher for control groups uniformly for all levels of pretest scores.

TABLE 7 Distance of the explicit attitudes from the middle point (0 for Macro, 40 for Micro).

	Higher importance			Lower importance			Difference		
	n	*M*	SD	*n*	M	SD	Mdiff	W stat	*p* adj
Macro score	41	5.47	3.74	79	4.43	3.28	1.04	1852	0.148
Micro score	41	9.12	6.86	79	7.08	5.69	2.04	1892	0.148
IAT score	36	0.26	0.18	58	0.24	0.19	0.02	1134	0.243

6.2.2 | Attitude importance

Our study was unable to identify any relationship between attitude change and players' perceived attitude importance towards the depicted topic. We are not aware of any study that has directly addressed the relationship between attitudinal importance and attitude change in the context of video game playing. However, studies by Kampf (2016b, 2017) showed that the effect of nationality in relation to the depicted topics in a video game is a significant element affecting attitude change in such a way that the more a topic concerns someone, the less they are willing to change their attitudes and vice versa. There was no such observable difference between the findings in the current study, which recruited participants who presumably had higher perceived attitude importance, and the original study (Kolek et al., 2021), with participants presumably having lower perceived attitude importance. One of the potential explanations for this is that the differences between the research samples in both studies (this one and Kolek et al., 2021) were rather subtle compared to the differences between the participants in studies by Kampf (2016a, 2017). Based on our current findings, the present research cannot conclude that players' characteristics are crucial for attitude change. More data is needed, especially information focused on research samples with significantly different cultural backgrounds and on other elements of attitude strength.

6.3 | Limitations

There are several limitations to this study. First, even though our research sample had significantly more positive attitudes towards the historical topics depicted in the video game compared to the original study, the socio-cultural differences might have still been too subtle. Future studies should investigate the effects of the game on players with more diverse cultural backgrounds in relation to the topic of expulsion, for example, Germans or Brazilians. Second, due to technical problems in the labs, we had a slight imbalance between the experimental and the control groups, especially in comparisons of implicit attitudes. Third, our questionnaire on attitude importance was self-reported and rather short. Future studies should investigate possibilities for more robust measurements of attitude importance. We believe that none of the limitations refute this study's findings.

7 | CONCLUSION

There are already multiple studies dealing with video games and attitude change bringing both positive (Chen et al., 2020; Jacobs, 2018; Quick et al., 2013) and negative (Barthel, 2013; Peña et al., 2018; Potter et al., 2021) findings in relation to video games' potential to affect attitudes. The aim of this study was not only to confirm that games can change players' attitudes, but also to explore the elements responsible for this change. Therefore, this study replicated and extended the study by Kolek et al. (2021). It focused on a research sample with different characteristics and collected data about the importance of participants' attitudes towards the depicted topics. That being the case, the present study confirmed that specific game mechanics (i.e., perspective-taking) have stable short-term effects on attitude change, even for different research samples. Both studies especially indicated that perspective-taking affects explicit attitudes and not implicit attitudes. However, we were unable to confirm specific effects caused by players' characteristics. We did not observe any effect from initially more positive attitudes, age, or the level of attitude importance on the topic.

Today, video games are not only entertainment products. They also depict topics from our history, society, culture, or everyday lives. We have enough empirical evidence to confirm that they possess the potential to affect our attitudes towards depicted topics. This fact is making them more important and one of the most widespread popular media used in informal learning. However, as we already have sufficient empirical evidence about video games' general effects on attitudes, future research should aim to identify particular game mechanics or player characteristics that might affect attitude changes. In particular, replication of this study with a research sample that has no relation to the depicted topic would allow for further clarification of players' characteristics' effect on their attitudes. In general, we lack more replication studies or series of studies that would be able to provide systematic evidence of elements responsible for attitude changes.

AUTHOR CONTRIBUTIONS

Lukáš Kolek: Conceptualization; data curation; investigation; methodology; project administration; software; writing – original draft; writing – review and editing. **Patrícia Martinková:** Data curation; formal analysis; methodology; visualization; writing – review and editing. **Michaela Vařejková:** Data curation; formal analysis; methodology; visualization; writing – review and editing. **Vít Šisler:** Conceptualization; methodology; resources; supervision; writing – review and editing. **Cyril Brom:** Funding acquisition; methodology; resources; supervision; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

Authors declare no conflict of interests.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

The human data was collected with APA ethical principles in mind. Participant data was anonymized by assigning numbers to each participant. The data that support the findings of this study beyond those presented can be obtained from OSF at osf.io/w5nf4 (Kolek, Martinková, Vařejková, Šisler & Brom (2023).

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