

DOI: 10.15804/tner.2023.71.1.13

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Emotional Arousal and Valence and the Effects of Civic Education*

Abstract

The paper discusses the influence of FaceReader-coded emotional arousal and valence on the effectiveness of civic education. The experimental design allowed the authors to observe relationships between emotional responsiveness and memorisation, attitude change, and prosocial behaviour. In the study with 90 adult participants, we video-recorded facial expressions while watching three parallel versions of a narrative on anti-communist opposition in Poland. The analysis of collected data suggested that emotional arousal is associated with prosocial behaviour and the valence of signalling with an attitude change, while cognitive effects are not related to emotional responsiveness. Moreover, civic education depends on the triad of emotions: sadness, happiness, and disgust.

Keywords: *arousal, valence, civic education, prosocial behaviour, attitude change*

Funding: This work results from the research project *Role of emotions in an influence of remembrance narratives. Multi-level analysis*. Funding institution: National Science Center, Poland, grant no. DEC-2016/21/B/HS5/00188.

Acknowledgements: Dr Wawrzyński would like to thank Katarzyna Myślińska-Szarek, Marek Muszyński, Aleksandra Wypych, and Jan Nikadon for their involvement in the realisation and designing the study.

Introduction

In his classic work on political knowledge and engagement, Galston (2001, pp. 223–224) suggested that civic education shapes political socialisation and mobilisation patterns in democracies. It provides a broader understanding of *enlightened self-interests*, promotes democratic values and tolerance, makes voters more consistent, stabilises political attitudes, limits mistrust, prevents radicalisation, and increases political participation. Therefore, civic education has a transformative influence on society as it translates core values into political actions and attitudes (Sika, 2016).

Galston (2007, pp. 625–636) listed issues affected by the standard of civic education, including trust in the state and local government, faith in other people, patriotism, interest in public affairs, party affiliation, participation in voting, social mobilisation, and prosocial behaviour. Civic education regulates citizens' deliberative and reflective capacities, moderating political engagement (Costa, 2006). In a more recent review, Campbell (2019, p. 34) confirmed the relationships between political knowledge and participation, emphasising the understanding of what works in civic education and how it should address today's scepticism of democracy.

It is a core of political socialisation and provides political knowledge, shaping norms and contextualising political culture. It may well be formally institutionalised in the national education system, yet, often, civic education is more informal and less performance-oriented (Žilinčiková, 2020). The first approach has its limitations, as Brezicha and Mitra (2019, p. 66) noticed that standardised “civic education focuses only on knowledge building. (...) The memorisation of facts does little to develop deeply committed citizens who become and remain engaged in our democracy”. The second strategy positively influences political knowledge and participation (Abendschön et al., 2022); still, it does not limit the risks of politically biased information proliferation and radicalisation (Rak & Rezmer-Płotka, 2022).

Jackson (2019, p. 2) stated that “civic education is the main approach to teaching how to live together”. However, it might be used to promote conflicts, exclusiveness, and intolerance when *living together* is deeply contested. Therefore, in democratic societies, it has become critical to enhance the quality of civic education, improving its impact on inclusiveness and political participation, as it “does make a difference for students, (...) does have an association with political engagement” (Siegel-Stechler, 2019, p. 249). Thus, in this paper, we investigate the relationships between the effects of civic education and emotional responses to a narrative, exploring how emotional arousal and valence correspond with different results of civic education in the experimental framework.

Emotional Expressions, Arousal, and Their Measurement

Ekman's theory of basic emotions was a breakthrough in the research on facial expressions of human feelings, delivering a precise system for coding emotional signals (Ekman & Friesen, 2003, p. 19). He theorised features that distinguish basic emotions, including distinctive signs, physiology, antecedents, automatic, quick, and spontaneous onset, brief duration, and coherence (Ekman, 1992, pp. 174–189). He recognised emotional expressions as involuntary communication, suggesting that they developed independently from human languages (Ekman, 1997, pp. 335–336).

Today, we know that his understanding of human emotions was oversimplified, as neuroscience informed us that they are not merely products of distinctive neural circuits but are also constructed in the culture as conscious experiences. Thus, there are both biological and contextual, automatic and aware at different stages of arousal (Barrett, 2017, pp. 25–41). Despite the criticism of Ekman's theoretical framework (Barrett et al., 2019), we still assume that facial expressions are evolutionary tools for nonverbal communication of central (pre)emotional states of human brains (Scherer & Grandjean, 2008) and reflections of affective and cognitive processes (Hess et al., 1998).

The theory of basic emotions resulted in the Facial Action Coding System (FACS), enabling researchers to code signals of neutrality, happiness, sadness, anger, fear, surprise, disgust, and contempt. Applying machine learning and artificial intelligence opened the possibility for automated coding with Ekman's FACS, increasing its efficiency and accuracy of scoring (Lewinski et al., 2014). The software for automatic coding facilitated a more detailed analysis of recorded videos of participants, offering an opportunity to investigate changes in facial expressions, emotional valence, and arousal (Hadinejad et al., 2018, p. 132). The most popular solution is FaceReader, developed by Noldus, which has been applied to study emotional communication in advertising, consumer science, social psychology, education, media research, and user experience studies (Lewinski, 2015).

FaceReader offers an analysis of **emotional valence** but also scores **arousal**. Valence represents a vector of the experience, ranging from negative to positive. Arousal identifies the mobilisation motivated by emotional experiences but not directly measuring physiological stress (Li & Lajoie, 2021, p. 303). Pichierri et al. (2021, p. 1187) explained that “it generates a sense of readiness to take action or interact with the surrounding environment”, suggesting that it could inspire

individual responses to narratives, altering people's behaviour and decisions (see Latour & Rotfeld, 1997).

Höfling et al. (2020) in their work compared FaceReader's decoding of emotional valence and arousal with the psychophysiological measurement of emotionality (Facial Electromyography) and excitement (Skin Conductance) to test the potential of the automated coding in research on emotional responses. They noticed valence could successfully differentiate pleasant experiences, but it is less effective than electromyography in separating neutral from unpleasant responses. However, arousal was not correlated with physiological reactions in skin conductance but corresponded with self-reported emotional valence. Thus, the results proved that FaceReader's arousal could not be considered information on the activity of the sympathetic nervous system determined by a stress response. However, it represents the intensity of motivation to take action resulting from emotional experiences; therefore, it provides a new axis to explain differences in human reactions to communication.

In this paper, we investigate the effectiveness of civic education narratives in the context of inspired emotional responses, considering FaceReader's arousal and valence as possible tools to predict the efficiency of manipulation. We predicted that emotional negativity would substantially impact recipients, while higher arousal corresponds with a decreased influence on participants (Groenendyk & Banks, 2014). Thus, in the experiments, we observed how valence and arousal are associated with memorisation, attitude change, prosocial behaviour, and perceived valence of the narrative while controlling other variables, including age, gender, voting attendance, political preferences, and empathy.

Research Design and Methods

In the paper, we discuss the study's results on links between civic education narratives and their influence on experiment participants. We recruited 90 adult volunteers from Poland for the experiment on facial expressions. They were randomly assigned to watch one of three versions of the narrative on anti-communist opposition representing different emotional valences: a neutral one for the control group, a pride-related one, and a compassion-related story. The sample was dominated by young adults (18–64, $M=28.47$) and women (64 females, 26 males). 44% of participants had a university degree, while almost 60% participated in the last elections. On average, they were neither interested nor not interested in

history, had moderate attitudes toward collective remembrance, and did not share radicalised political preferences.

Participants started with an online CAWI survey in Polish, measuring attitudes toward collective remembrance, empathy, and political preferences. Their answers ranged from 1 (strongly disagree) to 5 (strongly agree). At least one week later, we invited them to participate in the study – they separately watched a 3-minute-long recording in silence using tablets. While watching the video, a camera recorded their facial expressions. Later, participants filled out the second set of questionnaires: the self-report on engagement, interest, and emotional experience, the test of presented details, and the retest of attitudes toward collective remembrance. Then, they were notified that they might donate any amount of their reward (0–100 PLN) to help a foundation caring for Poland’s opposition veterans – the choice was selected privately and secretly in the web application.

We studied three dependent variables in all experiments: memorisation, attitude change, and prosocial behaviour. In the study on facial expressions, we also investigated emotional arousal, valence, and the intensity of neutrality, happiness, sadness, anger, surprise, fear, and disgust. We used the automated coding of FaceReader 8.1 for each 1/10 second and analysed collected data with descriptive statistics, variances, correlations, and regression analysis.

Memorisation was examined with the multiple-choice close-ended test of information discussed in shared parts of paragraphs (one question per paragraph, 0–6 points). Attitude change was considered a difference between the test and the retest results of attitudes toward collective remembrance (five-point Likert scale, four reversed questions, 22–110 points). Prosocial behaviour was observed as donating any amount from the reward (0–1) and the amount of contribution (0–100 PLN). The facial expression study followed the general experiment with 364 participants and the neuroimaging study with 75 participants (Wawrzyński & Marszałek-Kawa, 2022).

The experimental manipulation was delivered as a short video recording of a civic education story with a professional actress as a narrator. We divided the contents into six paragraphs (approx. 30 seconds long) with different conclusions (6–10 seconds), representing three parallel versions of a story about an invented hero of the *Solidarity* movement in Poland. The narrative ended with an evaluation of the nation’s political and social transformations in the 1990s, which corresponded with the emotional dynamics of the version. Editing parallel stories, we applied the Nencki Affective Word List and the results of the two-stage focus group study on narrative remembrance of anti-communist opposition.

Results

The automated coding of facial expressions in FaceReader showed a relatively moderate average arousal of 28.44% and valence oriented toward negativity (see Table 1). Neutrality was displayed in 77.67%, while emotionality was dominated by sadness, followed by anger, happiness, surprise, and disgust. The assigned story version had the highest impact on **arousal** (ANOVA, $F=2.835$; $p=.06$) and **facial neutrality** (ANOVA, $F=2.594$; $p=.08$), while emotional valence and signals of disgust were determined by individual emotionality of participants.

In the control group, average emotional arousal was the highest and scored 31.43%, while average valence was -0.1129 . Neutrality prevailed, and the core emotions were sadness, anger, and happiness; disgust, surprise, and fear were limited. In the pride-related group, arousal was lowered, suggesting a calmative effect of the positive narrative presentation. The average valence equalled -0.1243 as participants signalled sadness, some anger, happiness, disgust, surprise, and slight fear – the story promoted sadness and disgust while reducing anger, yet neutrality remained dominant. In the compassion-related group, arousal was also lowered, and negative emotions decreased average valence, reducing the neutrality of facial expressions to 71.47%. Facial signals expressed sadness, some anger, surprise, and disgust, while happiness and fear were limited. Negative labelling reduced enjoyment, increasing expressions of sadness, disgust, surprise, and fear while not affecting experienced anger.

Table 1. Average results of emotional arousal, valence, and signalled emotions

Group	Arousal (%)	Valence	Neutrality (%)	Sadness (%)	Fear (%)	Anger (%)	Disgust (%)	Surprise (%)	Happiness (%)
All participants (n=90)	28.44	-0.1217	77.67	13.57	0.17	4.25	1.05	1.63	1.77
Control Group (n=30)	31.43	-0.1129	81.47	10.90	0.09	4.66	0.72	0.72	2.44
Pride-Related Group (n=30)	26.73	-0.1243	80.21	12.89	0.19	2.91	1.65	1.58	2.03
Compassion-Related Group (n=30)	27.27	-0.1276	71.47	16.82	0.31	4.50	1.80	2.56	0.81

Source: Automated coding of facial expressions with FaceReader 9 (Noldus), each 1/10 sec.

In all groups, **emotional arousal** significantly reduced the donated amount ($F=3.28, p<.05$), making low-arousal participants more likely to contribute more than 20 PLN and high-arousal participants avoid any donations. It suggests that the recipient's emotional mobilisation reduces the value of prosocial behaviour, and the effect was most potent if subjects watched the compassion-related story ($F=4.26, p<.01$). Experiencing emotional negativity without arousal made participants willing to contribute more than 30 PLN. However, even a moderated mobilisation highly reduced donations at all. Arousal results corresponded with participants' self-reported engagement ($F=3.43, p<.05$), but the influence was more significant in the pride-related group. In that group, arousal increased the self-reported interest in the presented story ($F=5.25, p<.01$), yet, this relationship did not occur in other groups.

Experienced emotions inspired higher arousal as it negatively influenced average results of face neutrality ($F=9.23, p<.01$); however, the effect was reduced in the pride-related group. Likewise, the intensity of neutral expressions corresponded with **emotional valence** ($F=24.46, p<.01$) regulated through signals of sadness, happiness, and disgust but not anger, surprise, or fear. While arousal is associated with prosocial behaviour, emotional valence helps predict attitude change. In the study, more negative signalling increased support for collective remembrance after watching a narrative ($F=4.75, p<.01$); however, the relationship was more robust in the control and the compassion-related groups. Interestingly, in the control group, expressions of emotional negativity corresponded with lowered self-reported engagement and comprehension of the narrative, while in other groups, that effect was not present.

Civic education was more arousing for older participants ($F=4.94, p<.01$), and it remained more significant in the compassion-related group, where signals of enjoyment played a critical role in inspiring arousal. In that context, smiling did not suggest pleasant feelings but was an expression of disdain or arrogance. Thus, a decreased donation is a natural result of the emotional response to the narrative. Moreover, xenophobia corresponded with reduced arousal ($F=6.29, p<.01$), especially in the pride-related group, suggesting a limitation of possible emotional mobilisation among conservative nationalists. Appeals to pride in civic education were successful in lowering arousal in religious fundamentalists ($F=3.53, p<.05$), showing a broader role of this emotion in right-wing responsiveness.

The age of participants regulated emotional valence in the control group ($F=3.85, p<.05$), strengthening negativity; yet, appealing to emotions reduced that effect and lowered its significance. We noticed that experienced valence influenced attitude change, but how participants responded to the narrative was quite individ-

ual. In some cases, empathy regulated responsiveness – in the control group, higher results in personal distress highly influenced more positive emotional signalling ($F=6.75$, $p<.01$), while perspective-taking corresponded with more pleasant expressions in the pride-related group ($F=3.75$, $p<.05$). In general, we observed that valence was regulated through sadness, happiness, and disgust, but individual emotionality influenced the two first. In contrast, signals of disgust increased with age ($F=7.86$, $p<.01$) and were lowered by empathetic caring ($F=4.30$, $p<.01$). Therefore, experiencing this emotion seems to be important in the self-evaluation of civic education narratives.

Remarkably, the significance of emotional arousal was not distributed equally in time. Limited mobilisation in the third paragraph – discussing the hero's role in the anti-communist opposition – determined more prosocial behaviour after watching the civic education narrative. Arousal in the second paragraph (introducing the hero), the fourth paragraph (considering the agenda of *Solidarity*), and the fifth paragraph (achievements of the hero) also influenced the effectiveness of manipulation. However, the introduction about the democratic opposition in communist Poland and the final part with an evaluation of the nation's transformations regulated self-reported engagement and interest in a story. Still, it did not affect prosocial behaviour or attitude change. Successful civic education requires more personalised narratives about individual heroes and less generalised statements on social movements or political processes (Wawrzyński & Marszałek-Kawa, 2018).

Emotional Responses and Civic Education

In the research design, we predicted that negative emotions would determine responses to the narrative and regulate prosocial behaviour. Moreover, we assumed that emotional arousal might decrease the effectiveness of experimental manipulation as it represents readiness to act but reduced compliance to persuasion. Automatic coding with FaceReader only partially supported these hypotheses. Emotional valence influenced attitude change, but its relations with self-reported engagement and comprehension were limited to the control group. Emotional arousal determined a donated amount and self-reported engagement, yet, it was more significant in parts of the narrative's hero than in generalised statements. Neither valence nor arousal affected the memorisation of presented information – in the general experiment, we noticed that age and gender determined better cognitive effects.

In the past, researchers suggested that the effectiveness of civic education is regulated mainly by individual features and responsiveness (Isac et al., 2011). This

paper explains some roots of these differences, showing how emotional expressions might be used to target audiences in civic education. Arousal increased by *populist* emotions of anger, fear, and enthusiasm (Groenendyk & Banks, 2014) decreased prosocial behaviour. Valence was related to attitude change, promoting more support for collective remembrance if a narrative inspired stronger negative emotions; yet, it did not impact prosocial behaviour or memorisation. Moreover, we noticed a regulative role of the emotional triad of sadness, happiness, and disgust, which regulated individual responsiveness. It indicates that these three emotions might be crucial for the effectiveness of civic education.

Considering between-group differences, in the control group, we observed the highest donation probability (72%) with an average amount of 17 PLN. Appeals to pride reduced the share of donators to 53% but increased the average amount to 19 PLN. The most effective strategy was the compassion-related version, with a probability of 63% and an average of 27 PLN – as a result, the total donation was almost half more generous than in other groups. Attitude change was most successful in the compassion-related group (+5.49%), differing from the control group (+5.21%) and the pride-related group (+3.14%); these results indicate that emotional dynamics of a narrative might influence cognitive reappraisal.

The findings lead to the following suggestion – civic education might be more effective if it inspires emotional responses and focuses on personalised stories rather than generalised statements. Furthermore, the application of FaceReader delivered interesting results in civic education and political communication; thus, automated coding of facial expressions offers new possibilities for research on education and communication. Finally, we endorse further investigations of the issue that would benefit our understanding of the role of emotional arousal and valence in the effectiveness of civic education, protecting democratic societies from violent radicalisation.

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