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Visual perspective in autobiographical memories of self-incongruent episodes

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ABSTRACT

It is widely assumed that autobiographical memory relies on an integration of episodic memory with the self-model. We hypothesise that self-memory integration depends critically on self-congruence. More specifically, self-incongruent experiences such as those that elicit shame or guilt may be more difficult to integrate. Self-incongruence may affect both the semantic reports of memories and their phenomenological characteristics, in particular their visual perspective (1PP or 3PP, i.e., field or observer perspective), their affective valence, and their perceived centrality. Diary based memories were assigned to 4 categories (shame, guilt, negative, neutral) and were rated for the different phenomenological dimensions. We used a deep neural network, univariate and multilevel models to assess differences and relationships between different variables. We found that memories that elicited shame (but not guilt) showed more pronounced 3PP as compared to other experiences. Shameful episodes also elicited the most pronounced negative affect. A multilevel analysis revealed that the amount of shame that an episode elicited, and its semantic similarity with shame episodes, predicted higher 3PP, while affective valence did not. Our results show that self-incongruence affects memories both at the level of their semantic reports and their phenomenology, and thus contributes to a mechanistic understanding of self-memory integration.

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Self-memory integration – the integration of memories with the self-model – aligns experiences with individual goals and semantic knowledge and allows for their encoding into autobiographical long-term memory (Conway & Pleydell-Pearce, 2000). As a result, experiences may become part of a person's identity, i.e., their self-defining life narrative (McAdams, 1996; McAdams & Pals, 2006). A mechanistic understanding of self-memory integration requires comparing episodes in which integration is easily possible with other episodes where this process is more difficult. Integration is particularly challenging in case of self-incongruent experiences that conflict with aspects of one's self-image (Libby & Eibach, 2002; Singer & Blagov, 2004; Wilson & Ross, 2010). Several theoretical frameworks posited that since the self-model of a person involves various different facets (Newen, 2018) this conflict may take multiple different forms. For example, according to Tory Higgins (1987), different types of self-incongruence may arise for memories that conflict with a person's self-ideal (ideal-conflict) versus those that are inconsistent with someone's assumed social expectations (ought-conflict).

These conflicts lead to profound negative emotions, and in particular, to 'self-conscious' emotions (Brown & Matsuo, 2020; Higgins, 1987; Leary, 2007). In contrast to basic emotions of fear, joy, or anger, the self-conscious emotions of shame and guilt are often categorised as secondary or complex because they develop at a later point in life, depending on a child's cognitive and emotional development (Tangney, 2015; Zinck & Newen, 2008). Together with pride and embarrassment, these emotions are termed 'self-conscious' because of the widely accepted idea that self-reflection is needed to evoke or strengthen them (Robins & Schriber, 2009; Tangney, 2015; Tracy & Robins, 2007). Shame and guilt are complex and multifaceted emotions that can manifest in various situations, ranging from minor social blunders to more significant transgressions (Tracy & Robins, 2004). Previous research suggests that such experiences, although they are not occurring daily, have a relatively high prevalence and can significantly impact emotional well-being (Blum, 2008; Leary, 2007). Therefore, while not regularly occurring on a daily basis, self-conscious experiences are common in individuals' lives. While the criteria that distinguish shame

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and guilt are still disputed (Blum, 2008; Teroni & Deonna, 2008), a commonly applied framework suggests that shame is inherently self-related while guilt is associated with a specific action (Leary, 2007; Tangney, 2015; Tangney et al., 1992, 1996). This proposal may be linked to Higgins' view of the two types of self-conflict: Ideal-conflicts are putatively more inherently self-related since they are inconsistent with personal norms or ideals, and thus elicit shame. By contrast, ought-conflicts may often be triggered by specific actions in which social norms are violated, and thus induce guilt.

If experiences that elicit feelings of shame or guilt conflict with the self, they may be more difficult to integrate and result in altered narrative descriptions and phenomenological characteristics of these memories. Indeed, autobiographical memories can be both characterised by their semantic content (the episode that I remember) and their phenomenological characteristics (how I remember this episode). For memories of self-incongruent episodes, these phenomenological characteristics may reflect attempts of cognitive distancing. Since shame targets more central aspects of the self (Tangney, 2015), one may assume that phenomenological distancing effects are particularly pronounced for shameful memories.

Such distancing effects may be reflected by a shift in the visual perspective of autobiographical memories from a first- to a third-person view. Together with the sense of agency, the sense of ownership etc., visual perspective can be considered a defining aspect of the self (e.g., Metzinger, 2007; Synofzik et al., 2008). While most everyday experiences are encoded from a first-person perspective (1PP), the visual perspective of memories may subsequently change to a third-person perspective (3PP). This change can occur automatically as a function of time (Nigro & Neisser, 1983) or result from deliberate efforts (Robinson & Swanson, 1993; St Jacques et al., 2017). Importantly, a seminal study by Nigro and Neisser (1983) already showed that higher levels of self-awareness during an experience increase its later recall from 3PP, suggesting that 3PP reflects an explicit representation of the self-model in a remembered episode.

Why may episodic memories be recalled from different visual perspectives? The function of 3PP in episodic memory recall has been repeatedly investigated (for reviews, see Libby & Eibach, 2011a; Sutin & Robins, 2008). One study proposed that 3PP is generally related to self-evaluations, be they positive (involving pride) or negative (inducing shame), because both types of episodes were more often remembered from a 3PP than episodes which contained evaluations of others (D'Argembeau & Van der Linden, 2008). Other studies suggested that 3PP relates to a discrepancy between perceived and desired self-models, as 3PP was increased for memories of actions that conflicted with current self-concepts or with subjective traits which participants hoped to change in the future (Libby et al., 2005; Libby & Eibach, 2002). Indeed, some evidence suggests that

remembering an event from a 3PP serves to reduce negative affect: Traumatic events tended to be spontaneously recalled from a 3PP (Berntsen et al., 2003), and non-traumatic experiences that were deliberately recalled from a 3PP elicited less negative affect (Berntsen & Rubin, 2006a; McIsaac & Eich, 2004; Robinson & Swanson, 1993; Sekiguchi & Nonaka, 2014).

Together, these studies suggest that retrieving memories from a 3PP either serves an emotional distancing function for memories that conflict with the self-model (Kenny & Bryant, 2007; Libby & Eibach, 2002; Sanitioso, 2008) or reflects cognitive processes related to self-reflection more generally (D'Argembeau & Van der Linden, 2008; Libby & Eibach, 2011b). Self-incongruent memories that induce feelings of shame or guilt have been proposed to elicit changes in visual perspective (D'Argembeau & Van der Linden, 2008; Sutin & Robins, 2008), possibly allowing one to distance from these self-incongruent experiences. However, whether these effects are specifically related to feelings of shame, guilt, or both has remained unclear thus far.

Distancing from self-incongruent episodes may result in two additional phenomenological effects: First, if successful, distancing should lead to an overall reduction of negative affect. Episodes that elicit negative self-conscious emotions are arguably among the most distressing life events, and negative affect may be reduced for those episodes that can be recalled from a 3PP. However, whether these effects are specific for episodes that induce shame or guilt or whether they occur similarly for other negative episodes (e.g., involving feelings of anger, fear, or sadness) is not clear. Second, distancing should reduce the perceived centrality of memories for one's life. Berntsen and Rubin (2006b) developed the 'Centrality of Events Scale' (CES) to measure the degree to which memories become an anchor point for identity and meaning in a person's life. The CES has been repeatedly used to quantify the relevance of various positive and negative experiences for people's life narratives (Gehrt et al., 2018; Zaragoza Scherman et al., 2015). While it is likely that episodes which are experienced as more central elicit more pronounced self-reflection (and thus possibly higher degrees of 3PP), it is still an open question whether event centrality affects visual perspective – and if so, whether this is related to feelings of shame and guilt.

Presumably, self-incongruence is not only reflected by the self-conscious emotions that are elicited by a self-memory conflict of an episode. The conflict might also present itself in the language we use while describing the experience and therefore through its semantic content. While numerous manual rating schemes have been proposed for this purpose (Hollstein, 2019; Palombo et al., 2013), these are less well suited to analyze large bodies of autobiographical episodes. As an alternative, semantic encoders can be employed which automatically parametrise text based on similarity structures in large-scale corpora (i.e., co-occurrence in texts)

(Cer et al., 2018). Such tools have already been applied in memory research (Lee & Chen, 2022) and they make it possible to examine the semantic similarity between different words and sentences.

Diary methods have emerged as a valuable tool in psychological research, offering unique insights into individuals' experiences in everyday life. By collecting data directly from participants in their natural environments, diary studies provide a means to capture real-time experiences and autobiographical memories that might not be easily accessed through other research methods (Ohly et al., 2010; van Eerde et al., 2011). This methodology allows for a rich and ecologically valid understanding of individuals' daily experiences, including emotional events, cognitive processes, and social interactions (Bolger et al., 2003).

Researchers have utilised diary methods across various psychological domains, including emotion regulation (Mikhail et al., 2022), self-esteem and self-concept (Ayduk et al., 2009; Esposito et al., 2005), and memory processes (Bolger et al., 2003). These studies have shed light on the temporal dynamics, within-person variability, and contextual factors that influence individuals' psychological experiences.

Diary methods offer several advantages over traditional retrospective recall measures. One key advantage of utilising an online diary method is the precise control it provides over the time elapsed since the occurrence of experiences. By collecting data in real-time on a daily basis rather than retrospectively on just one occasion, participants are prompted to document their experiences soon after their occurrence, reducing inaccuracies (Bolger et al., 2003; Mehl & Conner, 2012; Schacter, 1999).

Furthermore, diary methods reduce potential contamination of recalled content by external or self-related factors. By capturing experiences shortly after their occurrence, participants' memories are less affected by subsequent events or cognitive processes that may influence the accuracy or interpretation of the recollections (Schacter, 1999; Symons & Johnson, 1997). This preservation of a relatively 'pure' form of autobiographical memories enhances the ecological validity and reliability of the data (Bolger et al., 2003).

The online diary method also circumvents confounding factors associated with changes in the visual perspective of memories over time. Previous studies have shown that memories tend to shift from a first-person to a third-person perspective as they age (Nigro & Neisser, 1983; Berntsen & Rubin, 2006a). By examining more recent experiences through the online diary method, researchers can better assess causes and implications of visual perspective change beyond time, shedding light on the underlying cognitive processes and potential influences on self-referential processing.

Moreover, using such methods also offers a practical and feasible solution for data collection. Inviting a large number of participants to a lab setting on a daily basis

can pose significant logistical challenges and may introduce additional confounds. By contrast, diary studies allow participants to report their experiences from their own environments and at their convenience, reducing the burden on both participants and researchers. This approach not only enhances compliance but also captures the richness and variability of individuals' daily experiences in a naturalistic setting (Bartlett & Milligan, 2020; Bolger et al., 2003; Nezlek, 2020).

The diary method offers a unique opportunity to capture a broad range of self-conscious events such as shame and guilt experiences that occur in daily life. This comprehensive exploration allows for the examination of various dimensions of shame and guilt, including their intensity, duration, triggers, and contextual factors (Bolger et al., 2003; Tracy et al., 2007). The method thus provides a broad understanding of the phenomenological aspects of self-conscious emotions and their relationship to visual perspective, shedding light on the nuanced dynamics of these complex emotional experiences.

Retrospective methods often focus on participants' most extreme or salient emotional experiences, potentially neglecting the frequency and typicality of everyday events (Berntsen & Rubin, 2004; Robinson & Clore, 2002). By capturing data on a broader spectrum of events that individuals encounter in their daily lives, researchers can gain insights into the frequency, intensity, and contextual factors that shape individuals' experiences.

Diary studies, like any research method, have inherent limitations. They rely on participants' compliance and accurate reporting, which may introduce variations in adherence and data quality (Bolger et al., 2003). By carefully designing the study, providing clear instructions, and ensuring confidentiality, researchers can mitigate this limitation. A second limitation is that autobiographical experiences are inherently less controlled than experimental settings and do not allow for causal interpretations. This limitation is unavoidable and requires complementary studies via experimental interventions (Bolger et al., 2003; Nezlek, 2020).

Our research emphasises the value of investigating memories of self-incongruent experiences as a rich avenue for understanding the intricate interplay between memory and the self-model. Such memories often reflect a conflict between recalled situations and an individual's aspirations for self-enhancement, leading to the emergence of self-conscious emotions, notably shame and guilt.

Investigating self-incongruence in psychology is of high importance as it sheds light on factors that influence the integration of personal experiences with one's self, which we argue forms the basis of autobiographical memory. Self-incongruence – i.e., a misalignment between one's self-concept and previous or ongoing experiences – challenges this integration and can lead to feelings of conflict, discrepancy, and incongruity (Conway, 2005; Higgins, 1987). Dealing with self-incongruence thus has

significant implications for a wide range of psychological processes including emotional responses, memory recall, and identity formation (Barnett et al., 2017; Higgins, 1987; Markus & Wurf, 1987). Investigating self-incongruent experiences that elicit feelings of shame or guilt thus offers a unique window into the cognitive and emotional mechanisms underlying autobiographical memory.

Visual perspective change serves as an indicator of self-incongruence and offers an insight into the cognitive processes involved in the representation and retrieval of autobiographical memories (Libby & Eibach, 2002; D'Argembeau & Van der Linden, 2008; Sutin & Robins, 2008). Understanding the factors that influence visual perspective change provides valuable information about the mechanisms underlying the integration of self-relevant information and the reconstruction of autobiographical memories.

Apart from their phenomenological qualities (e.g., visual perspective), memories are characterised by their semantic content. However, it is unclear whether and how phenomenological and semantic features of memory are related and more specifically, whether they are both influenced by self-incongruence. Semantic similarity analysis can uncover hidden connections, common themes, and shared features among self-incongruent experiences, as well as their relationships to visual perspective change (Abadi et al., 2016; Cer et al., 2018).

Understanding the mechanisms and motivations behind visual perspective change in the context of self-incongruent memories and self-conscious emotions holds significant implications for our comprehension of self-relevant psychological processes and the dynamics of self-identity and self-continuity (Higgins, 1987; Molouki & Bartels, 2017; Sutin & Robins, 2008). It sheds light on the intricate interplay between memory, cognition, and emotion in shaping our sense of self. This knowledge has potential clinical applications in the treatment of psychological disorders associated with shame or guilt, such as post-traumatic stress disorder (PTSD), depression, and other anxiety disorders (Lee et al., 2001; Mills et al., 2015). Unravelling the processes underlying visual perspective change may thus contribute to the development of targeted interventions and therapeutic approaches aimed at promoting self-congruence and facilitating psychological well-being (Gerstenberg et al., 2023).

Here, we investigated the impact of self-incongruence on the phenomenological characteristics and semantic content of real-world autobiographical memories. We collected these memories using an online diary in which we gathered daily experiences from $N = 65$ participants over a period of 9 weeks. This resulted in a large number of shameful and guilt-related memories, which we contrasted to negative self-congruent memories and to neutral memories regarding their impact on several phenomenological variables (visual perspective, expected centrality, and affective valence) and semantic content. Notably, we did not directly assess self-incongruence, but only indirectly

assessed it by collecting memories associated with shame or guilt as compared to other negative or neutral experiences. Future studies should explicitly ask participants to report the self-congruence or self-incongruence of an experience.

We particularly focused on differences in visual perspective, but additionally considered negative affect, centrality and semantic typicality as variables that may mediate or moderate the influence of self-incongruence on visual perspective.

We expected to find a higher degree of 3PP in self-incongruent than in self-congruent memories. We further hypothesised that episodes with high shame/guilt ratings and episodes whose semantic reports resemble the reports of typical shame/guilt experiences show higher degrees of 3PP. A visual perspective change may thus depend both on the self-conscious emotions that these memories elicit and on their semantic content, i.e., their similarity with typical shame or guilt episodes. In addition, we investigated whether shame episodes elicited higher degrees of 3PP than guilt episodes because the need for distancing may be more pronounced for experiences that conflict with central aspects of the self. These types of conflicts might create a substantial tension for self-identity that needs to be relieved, and visual perspective change might be one way of doing so. Finally, we tested whether higher degrees of event centrality and higher negative affect ratings increase 3PP.

Methods

Participants

Participants were recruited via bulletin boards on the campus of Ruhr University Bochum and through an external regional online platform (<https://www.stellenwerk.de/bochum>). Additional participants were recruited by distributing flyers and via social media. To ensure that potential participants met all requirements, a brief telephone screening was carried out.

To our knowledge, no previous studies analyzed similar questions within a multilevel statistical framework, making our study novel and unique in its approach but rendering a formal power analysis unreliable. We thus estimated our sample size based on previous research using similar methods, feasibility, and available resources. Previous diary studies with a specific emphasis on experiences related to self-conscious emotions have employed a similar methodology and sample size (Rispen & Demerouti, 2016; Shahar et al., 2015; Lazarus & Shahar, 2018). These previous studies provide valuable insights into the feasibility and effectiveness of utilising such approaches in exploring emotional experiences. Building upon this foundation, our study aims to expand the existing knowledge by incorporating additional methodological advancements and broadening the scope of investigation. By choosing a sample size of $N = 60$, we aimed to strike a

balance between achieving sufficient statistical power and managing the practical constraints associated with participant recruitment, data collection, and analysis.

Initially a total number of $N=65$ participants were included, and each received a compensation of 100€. Exclusion criteria were current or previous neurological diseases, cardiovascular diseases, age below 18 or above 35 years, and lack of German knowledge. Due to the study design, participants had to own a smartphone. The study was approved by the ethical committee of the Faculty of Psychology of Ruhr University Bochum, and all participants provided written informed consent. An individual code was made available to all participants, allowing them to collect data pseudonymously.

We excluded participants who repeatedly failed to make entries in the online diary or otherwise did not follow the guidelines ($N=17$ participants).

Due to complications related to COVID-19 restrictions, the acquisition phase was subsequently extended by two weeks, amounting to 11 weeks in total. Participants were free to decide whether they wanted to extend their participation. Those who agreed to the extended acquisition period were rewarded with an additional 10 Euros.

Experimental procedure

One week before the start of the study, all participants were invited to a two-hour introductory session. They were invited to ask questions about the study, filled out and signed study documents, and completed a baseline survey including demographic items. During this session, they were also introduced to the online diary platform and familiarised with its use. They were guided through the process of accessing and navigating the diary interface, as well as instructed on how to accurately and effectively record their daily experiences. This step was crucial in ensuring that participants were comfortable and confident in using the online diary for the duration of the study. Participants were asked to describe some example shame and guilt experiences from their past. In addition, they were asked to describe in their own words why they would categorise a given episode into a particular category. However, we explicitly refrained from giving concrete guidelines for categorisations during the introduction in order to ensure that the widest possible range of self-incongruent experiences was collected.

For the next nine or eleven weeks (see above), each participant received a daily online reminder at 7 p.m. with a link to a diary tool based on Google forms (n.d.). (<https://docs.google.com/forms>). Google forms is a survey administration software included as part of the free, web-based Google Docs Editors suite that enables data collection in standardised online questionnaires and assignment to previously generated pseudonyms. Participants had time until 2 a.m. the following day to provide reports. If they did not submit reports within this time window, they could only add missing items with specific justification. As an

additional help throughout the diary period, we offered participants a set of examples from the introductory session to serve as orientation without further elaboration. These examples were intended to provide a general understanding of the types of experiences that could fall within each category. For instance, participants were presented with examples of shame episodes such as:

- 'I was giving a lecture and the response of the group showed me that I did not do a good job'.
- 'A teacher in my drawing class told me that I had no talent for drawing'.

These examples illustrate situations that commonly elicit feelings of shame, involving instances of unexpected bodily reactions or negative evaluation. Similarly, participants were provided with guilt episodes, including:

- 'I drove into a parked car and didn't report the accident'.
- 'I yelled at a teammate while playing football, and he obviously took it to heart'.

These examples describe scenarios where individuals engaged in actions that resulted in negative consequences. Additionally, participants were presented with examples of negative episodes that do not fall under the categories of shame or guilt, such as:

- 'My bike was stolen'.
- 'My cat got hit by a car'.

These examples highlight negative experiences that may evoke emotions other than shame or guilt. Finally, participants were provided with examples of neutral episodes, which we did not expect to elicit substantial emotions such as:

- 'I went shopping today and bought a washing machine'.
- 'I put a poster on my wall'.

These examples represent everyday experiences that (putatively) lack strong emotional implications but are sufficiently unique.

The diary procedure involved a systematic and structured approach to capturing participants' experiences throughout the study period. Each diary entry began with the recording of the current date and time to ensure accurate timestamping of the reports. Participants then entered their unique participant code, which served as an identifier for anonymity and data organisation. Following this, participants selected the appropriate episode type from the provided categories: shame, guilt, negative (neither shame nor guilt), or neutral. They were instructed to provide a concise description of the chosen episode, capturing its essence.

To ensure a sufficient number of reports of self-incongruent experiences, the participants were explicitly

instructed to describe a shameful or guilt-related experience of the current day upon their daily reminder email and to select the associated category (shame or guilt). Only if no episode from one of these two categories could be reported, an episode that elicited a different negative emotion should be chosen (i.e., one that did not elicit feelings of shame or guilt, but e.g., of anger or sadness). In this case, the category 'negative (neither shame nor guilt)' was to be selected. If no negative emotional experience could be reported either, the participant was asked to choose an emotionally neutral experience from the past day and report the category 'neutral'. After selecting the episode category, participants were asked to write down their selected episode of the current day in detail and to assign a clear keyword to their entry.

As described by Miceli and Castelfranchi (2018), self-incongruent experiences can evoke both shame and guilt at the same time, and some of the 'generally negative' or neutral episodes may elicit some amounts of shame and/or guilt as well. For this reason, the subjects were instructed to rate levels of shame and guilt for every experience, regardless of the chosen episode category. A 5-point Likert scale (1 = not at all to 5 = very strongly) was used for this purpose.

The negative affect of each diary entry was determined using a short version of the Positive and Negative Affect Schedule (PANAS-SF) (Thompson, 2007). The five negative items were averaged and formed the 'negative affect' variable.

Studies by St. Jacques et al. (2017; 2018) indicated that the visual perspective often cannot be dichotomised to a 'pure' first or third-person perspective and that a continuous rating scale is more appropriate. A 5-point Likert scale was used to assess the visual perspective of the memory (1 = completely first-person perspective; 5 = completely third-person perspective).

Finally, participants completed a revised version of the Centrality of Events Scale (CES) questionnaire (Berntsen & Rubin, 2006b). In its original form, this questionnaire is used to assess the relevance of autobiographical memory for the participant's self-identity (i.e., their self-model). Since the participants wrote down new experiences, the items of the CES were rephrased such that the participant was asked to assess the expected future relevance of the respective event.

After completing each diary entry, participants were given the opportunity to provide feedback on any issues encountered during the usage of the diary. This feedback allowed for the identification and resolution of possible concerns or difficulties that participants may have faced throughout the study.

Thus, each recorded episode was associated with six ratings: (1) categorical episode type (shame, guilt, negative, or neutral), (2) amount of shame on a 5-point scale, (3) amount of guilt on a 5-point scale, (4) valence (negative affect), (5) visual perspective, and (6) expected centrality.

In addition to variables derived from the questionnaires, we calculated semantic correlations between episodes, using the Google Universal Sentence Encoder (USE; Cer et al., 2018) implemented in tensorflow (Abadi et al., 2016; <https://tfhub.dev/google/universal-sentence-encoder-large/5>) in Python (3.7). Since the USE is trained on English text corpora, we translated the diary entries from German to English using the DeepL translator (<https://www.deepl.com/translator>). The USE takes words and sentences as input and produces a fixed dimensional embedding representation of the text (Cer et al., 2018). For each participant, we computed the embedding of each episode and correlated it to the embedding vectors of all other episodes. This resulted in one episode-by-episode correlation matrix per participant. We then calculated four new variables based on the between-episode similarity scores within each participant: (1) The similarity of all episodes of a given category with all shame episodes ($\text{shame}_{\text{semantic}}$); (2) the similarity of all episodes of a given category with all guilt episodes ($\text{guilt}_{\text{semantic}}$); (3) the similarity of all episodes of a given category with all generally negative episodes ($\text{negative}_{\text{semantic}}$); and (4) the similarity of all episodes of a given category with all neutral episodes ($\text{neutral}_{\text{semantic}}$). Together with the six phenomenological characteristics, this resulted in a total number of ten variables.

Data analysis

In order to assess categorical differences of the 5 phenomenological variables (visual perspective, negative affect, shame, guilt, and expected centrality), we averaged all ratings from a given category for each participant and computed 5 separate repeated measures ANOVAs. The same approach was taken for the 4 semantic variables ($\text{shame}_{\text{semantic}}$, $\text{guilt}_{\text{semantic}}$, $\text{negative}_{\text{semantic}}$ and $\text{neutral}_{\text{semantic}}$), resulting in 4 additional ANOVAs. To correct for possible lack of sphericity, we applied Greenhouse-Geisser correction. In case of significant effects, post-hoc t-tests were conducted using Bonferroni correction for multiple comparisons. This analysis was conducted using SPSS (IBM SPSS Statistics for Mac, Version 28.0, 2020).

Next, we assessed which phenomenological and semantic properties of the different episodes predicted the visual perspective (i.e., amount of 3PP) of a given episode. Since this analysis had to be conducted at the level of individual episodes, we applied hierarchical multi-level analyses with visual perspective as dependent variable and episode-specific ratings of valence, expected centrality, shame, and guilt as well as the semantic variables $\text{shame}_{\text{semantic}}$ and $\text{guilt}_{\text{semantic}}$ as independent variables. Since the overall ratings may differ between participants, we included participant as a nested variable. These analyses were conducted in R Studio (R Core Team, 2019) using the lme4, lmerTest (Kuznetsova et al., 2020), emmeans (Lenth et al., 2019) and sjPlot (Lüdtke, 2023) packages.

Results and discussion

All participants were students at Ruhr University Bochum. The initial sample consisted of 78.46% female participants, with a mean age of $M = 23.25$ years ($SD = 3.99$). In total, we collected 3,181 autobiographical memories from 48 participants (shame: $n = 431$, (entries per participant): ($M = 8.98$, $SD = 5.57$); guilt: $n = 515$, ($M = 10.73$, $SD = 6.56$); generally negative: $n = 779$, ($M = 16.23$, $SD = 7.83$); neutral: $n = 1,456$, ($M = 30.33$, $SD = 11.94$)).

We first analyzed whether shame and guilt episodes differed from each other and from generally negative and neutral episodes in terms of their associated feelings of shame and guilt and in terms of their semantic content.

As expected, ratings of shame differed between episodes (Figure 1A; $F(2.16, 101.55) = 355.013$; $p < .001$). Bonferroni-corrected post-hoc t-tests indicated that shame ratings were significantly higher for shame episodes compared with guilt episodes ($p < .001$), generally negative episodes ($p < .001$) and neutral episodes ($p < .001$). More interestingly, shame ratings were also significantly higher for guilt episodes compared with generally negative episodes or neutral episodes (both $p < .001$). In addition, generally negative episodes elicited higher shame ratings than neutral episodes ($p < .001$).

Corresponding results were found for guilt ratings: They also differed between episodes (Figure 1B; $F(2.05, 96.39) = 281.418$; $p < .001$), and Bonferroni-corrected post-hoc t-tests indicated significantly higher guilt ratings for guilt episodes compared with shame episodes ($p < .001$),

generally negative episodes ($p < .001$) and neutral episodes ($p < .001$). Guilt ratings were significantly higher for shame episodes compared with generally negative episodes and neutral episodes (both $p < .001$). Negative episodes elicited higher guilt ratings than neutral episodes ($p < .001$).

These results show that, as expected, shame and guilt episodes differ from other episodes in terms of their associated self-conscious emotions. In addition, they indicate that episodes could elicit variable amounts of shame or guilt, and that feelings of shame and guilt overlapped substantially.

Next, we analyzed the semantic reports of the episodes. Not surprisingly, we found that semantic similarities with shame episodes differed between categories (Figure 1D; $F(2.39, 105.15) = 44.284$; $p < .001$). Bonferroni-corrected post-hoc t-tests revealed higher similarities with other shame episodes compared with guilt episodes ($p < .001$), generally negative episodes ($p < .001$) and neutral episodes ($p < .001$). Similarities with shame episodes were higher for guilt episodes than for generally negative episodes ($p < .001$) or neutral episodes ($p < .001$), and for generally negative episodes compared with neutral episodes ($p = .012$).

A similar pattern emerged for the semantic similarities to the guilt episodes: They also differed between categories (Figure 1E; $F(1.90, 85.65) = 30.54$, $p < .001$) and post-hoc t-tests showed that they were higher for guilt episodes compared with negative episodes ($p < .001$) and neutral episodes ($p < .001$). Furthermore, semantic

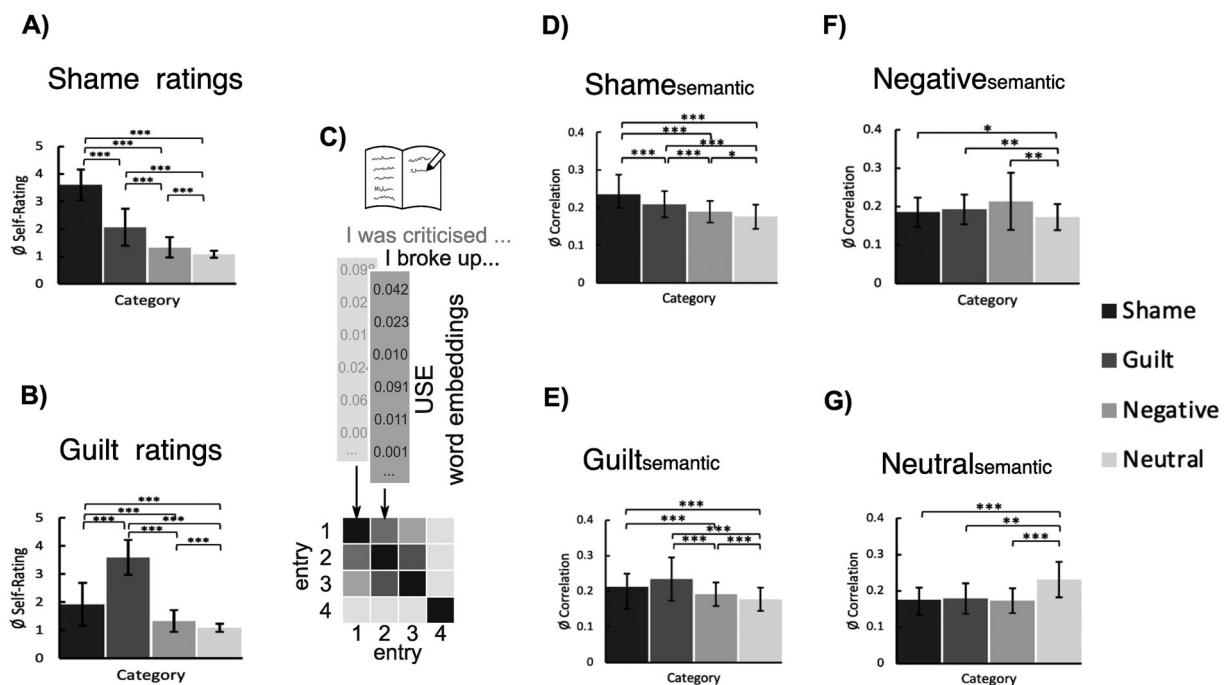


Figure 1. Self-ratings of self-conscious emotions (A and B). Diary entries were processed using Google's universal sentence encoder (USE), resulting in one embedding vector per entry. Embedding vectors were then correlated and visualised in an entry \times entry matrix (C). Semantic similarities to different categories of autobiographical memories (D–G). Bonferroni-corrected post-hoc t-tests (** $p < .001$; * $p < .01$; $p < .05$).

similarity to guilt episodes was higher for shame episodes compared with generally negative episodes ($p < .001$) and neutral episodes ($p < .001$), and for generally negative episodes compared with neutral episodes ($p < .001$).

Similarities with generally negative episodes also differed between categories (Figure 1F; $F(1.39, 65.34) = 7.263$, $p = .004$). When compared with neutral episodes, Post-hoc t-tests revealed that they were higher for shame episodes ($p = .022$), guilt episodes ($p = .002$) and generally negative episodes ($p = .003$).

Finally, semantic similarities with neutral episodes differed between categories (Figure 1G; $F(2.55, 119.71) = 55.234$; $p < .001$). Post-hoc t-tests indicated that similarities were higher for neutral episodes compared with shame episodes ($p < .001$), guilt episodes ($p = .004$) and generally negative episodes ($p < .001$).

Phenomenological characteristics of self-incongruent memories

Next, we assessed the phenomenological characteristics of the autobiographical memories. First, we compared affect ratings between the different types of episodes. As expected, negative affect ratings differed between categories (Figure 2A; $F(2.52, 118.42) = 139.427$, $p < .001$). Bonferroni-corrected post-hoc t-tests indicated that negative affect ratings were significantly higher for shame compared with guilt episodes ($p < .001$), generally negative episodes ($p < .001$) or neutral episodes ($p < .001$). Both guilt episodes and generally negative episodes elicited higher negative affect ratings than neutral episodes (both $p < .001$). Negative affect ratings did not differ between guilt episodes and generally negative episodes. Thus, among the everyday experiences reported by the participants, those that were categorised as shameful were perceived as most negative.

Interestingly, we also found that visual perspective differed significantly between episode categories (Figure 1B $F(2.43, 114.24) = 6.227$; $p < .001$). Post-hoc t-tests

revealed significantly more pronounced 3PP ratings for shame episodes compared to both generally negative episodes ($p = .007$) and neutral episodes ($p = .005$).

We also found that ratings of expected centrality differed between episode categories (Figure 1C; $F(2.72, 127.97) = 13.673$; $p < .001$). Post-hoc t-tests showed that expected centrality ratings were significantly higher for shame episodes ($p = .002$), guilt episodes ($p < .001$) and generally negative episodes ($p < .001$) when compared to neutral episodes.

Phenomenological and semantic predictors of visual perspective

Our analyses presented so far show that memories of shameful episodes exhibit higher 3PP than memories of negative or neutral events, while guilt-inducing episodes did not differ from the other categories. Since shameful episodes also elicited the highest amount of negative affect, the question arises whether these phenomenological characteristics account for the effect of shame on visual perspective. We thus tested whether the negative affect and the centrality of individual episodes predicted their visual perspective, and if so, whether the effect of shame on visual perspective remains after considering possible effects of negative affect and centrality. Further, we investigated whether semantic similarities with shame or guilt episodes predicted visual perspective.

We conducted hierarchical multi-level analyses in which the visual perspective of each episode served as dependent variable. The factor participant was modelled as a nested random intercept variable because the analyzed effects on visual perspective may differ between participants.

In a first approach, we applied six independent multi-level models. Each of these models contained one specific predictor to assess the impact of the phenomenological variables (shame, guilt, expected centrality, negative affect) or the semantic variables (shame_{semantic} and

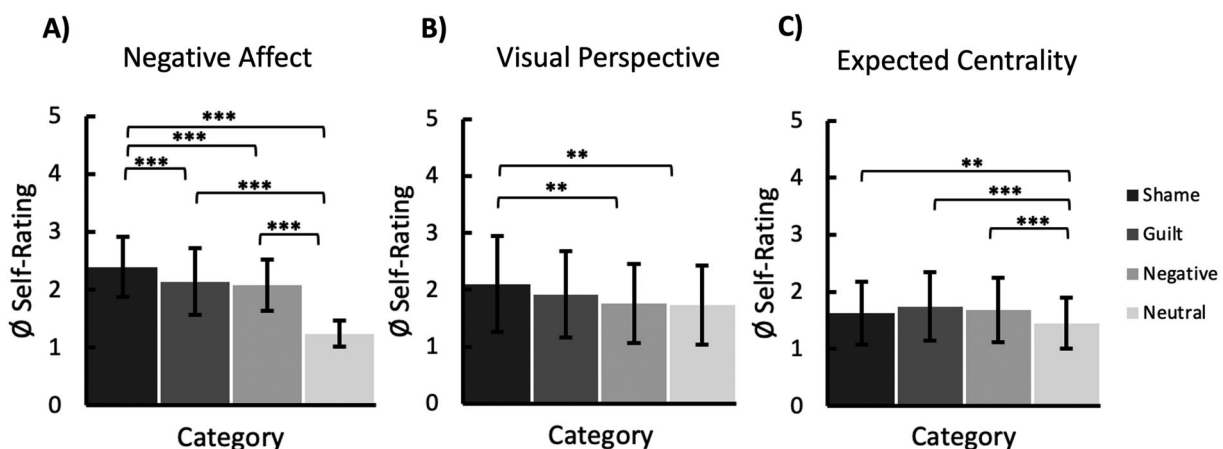


Figure 2. Phenomenological self-ratings for the different types of episodes. Bonferroni-corrected post-hoc t-tests (*** $p < .001$; ** $p < .01$).

Table 1. Phenomenological and semantic predictors of visual perspective (separate models).

	Predictors (separate models)					
	Negative affect	Expected centrality	Shame	Guilt	Shame _{semantic}	Guilt _{semantic}
Visual perspective	0.15***	0.09***	0.14***	0.04**	1.52***	0.84**

Note: *** $p < .001$; ** $p < .01$.

guilt_{semantic}) on visual perspective (Table 1). These semantic variables measure the averaged semantic similarities of a given episode to all other shame episodes (shame_{semantic}) or all other guilt episodes (guilt_{semantic}) and can thus be interpreted as proxies for the similarities to 'typical' shame or guilt episodes. Since the overall ratings may differ between participants, we included 'participant' as random intercept. This analysis showed that all four phenomenological and both semantic variables significantly predicted the amount of 3PP when considered independently.

In a final analysis, we applied a hierarchical (multi-level) multiple linear regression analysis in order to conjointly consider the effects of all variables on visual perspective. We again used visual perspective as dependent variable, but in this case, we added all four phenomenological variables (shame, guilt, expected centrality, negative affect) as well as the two semantic variables (shame_{semantic} and guilt_{semantic}) as fixed effect predictors. We again included 'participant' as random intercept. This model showed that the visual perspective ratings of autobiographical memories were significantly predicted by subjective shame ratings and by the semantic similarity to shame episodes. In addition, we observed a trend for an effect of expected centrality. None of the other predictors reached significance (see Table 2 and Figure 3).

We investigated the influence of self-incongruence on the phenomenological characteristics (negative affect, visual perspective, expected centrality, shame, and guilt) and semantic reports of autobiographical memories.

Based on more than 3,000 real-life autobiographical memories, we could identify phenomenological differences between experiences depending on the emotions that they elicited (shame, guilt, other negative emotions, neutral).

Somewhat trivially, experiences in the shame category received the highest shame ratings, and experiences in the guilt category the highest guilt ratings. More interestingly, we found that experiences from the shame category were rated higher on guilt, and experiences in the guilt category higher on shame, than experiences in the generally negative category. This result shows a substantial overlap between the affective ratings of shame and guilt, even though episodes had been selected as belonging to only one of the specified categories. Similar effects were found in the semantic reports of these episodes: While reports of shame and guilt experiences resembled most those of other reports from their respective category, they were also partially more similar to reports from the respective other self-conscious emotion when compared with reports that were categorised as generally negative or neutral. Our findings are in line with previous studies showing substantial overlap between the self-conscious emotions of shame and guilt (Miceli & Castelfranchi, 2018; Teroni & Deonna, 2008), and show that this overlap occurs both on the phenomenological level (i.e., with regard to emotional ratings) and on the level of semantic reports about these episodes.

Another interesting finding emerged from the comparison of negative affect ratings between the different episode categories: Shame experiences elicited significantly higher negative affect compared to experiences of all other categories, and therefore constitute the most emotionally negative experiences within our data set. These findings can be linked to earlier research in which shameful experiences were classified as particularly emotional and (in more extreme cases than the everyday examples in our sample) were associated with various psychopathologies (Gilbert, 2000; Lee et al., 2001; Mills et al., 2015; Schoenleber & Berenbaum, 2012).

Most importantly, we found significant differences in visual perspective between the different episode categories. Our results show higher 3PP of shame experiences compared to negative and neutral experiences. Such an effect could not be observed when comparing guilt-related experiences and experiences from other categories. The result was corroborated by the more fine-grained and comprehensive multi-level analysis, where subjective ratings of shame and semantic similarity to

Table 2. Phenomenological and semantic predictors of visual perspective (joint model).

Predictors	Effects on visual perspective ratings		
	Estimates	CI	<i>p</i>
(Intercept)	1.35	1.12–1.59	<0.001
Expected centrality	0.05	–0.00 to 0.11	0.057
Negative affect	0.05	–0.01 to 0.11	0.122
Shame rating	0.11	0.07–0.15	<0.001
Guilt rating	–0.02	–0.06 to 0.01	0.174
Shame _{semantic}	0.93	0.21–1.65	0.012
Guilt _{semantic}	–0.05	–0.79 to 0.68	0.889
Random effects			
σ ²	0.84		
τ ₀₀ Participant number	0.40		
ICC	0.32		
N Participant number	48		
Observations	3176		
Marginal R ² /Conditional R ²	0.025/0.337		

Note: Multiple linear regression analysis in a combined model including four phenomenological predictors (expected centrality, negative affect, shame, guilt), two semantic predictors (shame_{semantic} and guilt_{semantic}) and a random intercept for the variable 'participant'.

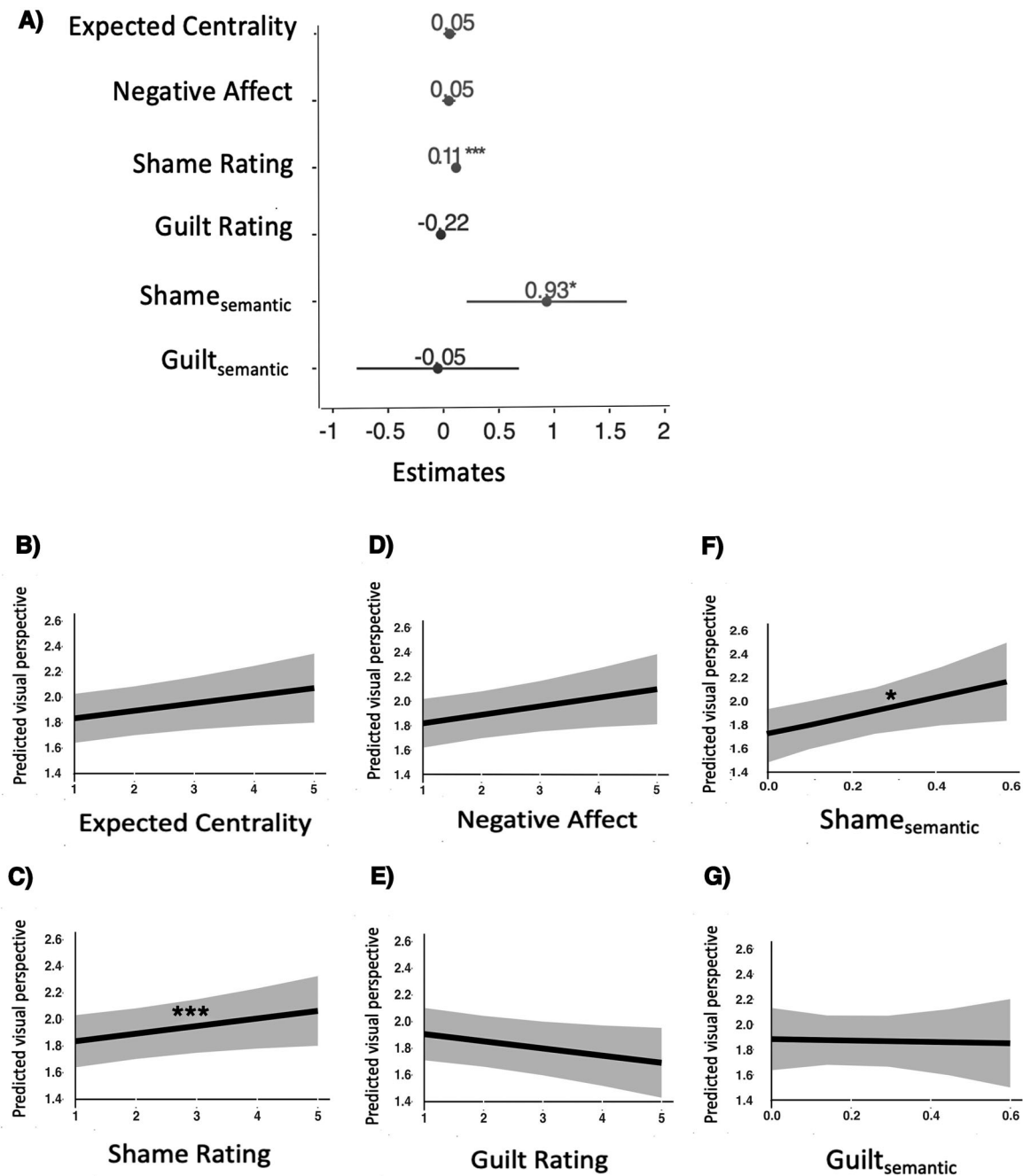


Figure 3. Predictors of visual perspective in combined hierarchical model. Relationships between all phenomenological predictors (negative affect, expected centrality, shame, guilt) and semantic predictors (shame_{semantic} and guilt_{semantic}) on visual perspective within a multilevel model (with subject as random intercept) (A). Linear relationship between individual predictors and visual perspective (shaded areas represent standard error) (B–G). (*** $p < .001$; * $p < .05$).

shame episodes were significant predictors of 3PP for all four types of episodes. As described in the introduction, visual perspective increases with self-awareness (Nigro & Neisser, 1983) and may reflect either emotional distancing or self-reflection in general (Sutin & Robins, 2008). Our results suggest that neither effect alone may be sufficient, but that the combination of both effects in episodes that elicit negative self-conscious emotions – and in

particular, shame – drives changes in visual perspective from 1PP to 3PP.

Our findings also propose that the expected centrality of autobiographical memories may influence their visual perspective. Since episodes that are considered central in the future likely elicit increased levels of self-reflection, this finding would be consistent with the proposal of Libby and Eibach (2011b) that visual change in perspective

can be triggered by a person reflecting upon an experience in relation to other experiences. However, since this result only reached significance at a trend level, it should be considered preliminary and requires further investigation.

On a methodological level, our study shows that daily diary entries can be used to distinguish different kinds of self-incongruent experiences and to better understand how visual perspective differs between autobiographical memories. Combined with a multilevel analysis approach, the naturally differing numbers of various types of autobiographical experiences and differences between participants can be taken into account. Thus, this approach may be a fruitful avenue for further research on the factors that explain the phenomenological characteristics of everyday autobiographical memories. Our study further shows possible future directions in which tools from natural language processing can be employed to scrutinise the semantic content of autobiographical memory reports.

This research further contributes to the differentiation between shame and guilt, two self-conscious emotions with overlapping features but distinct effects on visual perspective change. While both emotions are associated with self-conflict, our findings reveal contrasting patterns in their impact. Shame experiences demonstrated a stronger tendency to be recalled from a third-person perspective (3PP) compared to other negative or neutral experiences. This distinction emphasises the importance of considering the specific emotional context when examining visual perspective change in autobiographical memories (Conway, 2005; Sutin & Robins, 2008; Tangney et al., 1996).

Within the research literature on self-conscious emotions, shame is widely recognised as the most intense and potentially maladaptive emotion (Tangney et al., 1996; Tangney & Dearing, 2002). Our study aligns with this understanding, as shame experiences exhibited significantly higher negative affect ratings than other negative experiences. This suggests that shame has a distinct impact on the emotional valence associated with recalled events, further highlighting its significance within the self-memory integration process.

Previous research has linked self-conflict with a shift from a first-person perspective (1PP) to a third-person perspective (3PP) (Libby et al., 2005; Libby & Eibach, 2002; Sutin & Robins, 2008). Building upon this notion, our study establishes a connection between shame experiences, negative affect ratings, and recall from a 3PP. These findings support the hypothesis that self-conflict, particularly in the form of shame, can influence the way individuals visually recall and represent past events, thereby influencing their autobiographical memory.

The observed findings fit well within the theoretical framework of the self-memory system proposed by Martin Conway (Conway, 2005; Conway & Pleydell-Pearce, 2000). According to Conway's theory, memories undergo adjustments based on the tension between

memory content and the individual's current self-state. In the context of our study, experiences conflicting with a person's self-view, specifically shame-inducing experiences, trigger adjustments of memory that result in changes in their phenomenological properties. The visual perspective change in memory may serve an adaptive cognitive function by facilitating the reduction and (possibly) eventual reconciliation of self-conflict (Conway, 2005; Conway & Pleydell-Pearce, 2000; Libby & Eibach, 2002; Sutin & Robins, 2008).

Our findings have important implications for the research field of self-memory integration and its connection to self-conscious emotions. By demonstrating the association between shame experiences, visual perspective change, and shame-related semantic contents of memories, our study contributes to a deeper understanding of how self-conflict influences the encoding and retrieval of autobiographical memories. These findings extend existing knowledge on the mechanisms underlying self-memory integration and shed light on the cognitive processes involved in the construction and representation of personal experiences (Conway, 2005).

In light of our findings, future research could expand upon our study by implementing a similar approach with clinical populations, such as individuals diagnosed with depression or post-traumatic stress disorder (PTSD). These populations often exhibit heightened levels of self-conflict and emotional distress, making them particularly relevant for investigating the link between shame, self-conflict, and visual perspective change (Gerstenberg et al., 2023; Lee et al., 2001; Mills et al., 2015). By examining how these variables interact in clinical populations, we can test the generalisability of our assumptions and results and at the same time deepen our understanding of the underlying mechanisms involved in these psychopathologies and self-integration.

Follow-up studies should further elucidate the connection between the self and autobiographical memories. For example, categories of self-incongruent experiences could be further refined by creating subcategories. Previous studies have shown that vicarious shame differs greatly from shame in everyday experiences and that when experiencing guilt, the amount of simultaneously experienced shame depends heavily on the situation (Teroni & Deonna, 2008; Welten et al., 2012). In addition, it could be shown that different personality types deal very differently with shame experiences (Fontaine et al., 2006; Schalkwijk et al., 2016), and future studies could examine whether these differences affect the influence of self-incongruence on visual perspective. Furthermore, consideration of additional categories of negative emotional experiences could contribute to a better understanding of the connection between visual perspective and negative affect. For example, episodes that elicit sadness or anger are presumably also related to the self and could provide evidence for the idea that self-involvement is not limited to self-conscious emotions.

We further acknowledge the need for future studies to directly examine the role of self-incongruence in driving visual perspective changes via self-reports and/or experimental designs targeting the self-(in)congruence of an experience. Future research will thus contribute to a deeper understanding of the underlying mechanisms and provide more definitive conclusions regarding the role of self-incongruence in the observed effects.

It would also be interesting to further extend our findings by exploring additional dimensions of visual perspective in memory. While our study focused on the distinction between first-person perspective (1PP) and third-person perspective (3PP), there are other aspects of visual perspective that warrant investigation. Recent research has shed light on the notion that first-person perspective (1PP) and third-person perspective (3PP) in visual perspective are not necessarily opposing ends of a dichotomous scale. Rather, they can coexist and serve different functions in the encoding and retrieval of autobiographical memories (Rice & Rubin, 2009). This raises questions about the qualitative similarity between less 1PP and more 3PP and how the mid-point on a dichotomous scale of perspective is interpreted.

The understanding of visual perspective in autobiographical memory has evolved beyond a simple dichotomy, with researchers recognising the need for a more nuanced and multifaceted approach. One tool that can address this issue is the Memory Experience Questionnaire (MEQ) developed by Sutin and Robins (2007). The MEQ assesses visual perspective along multiple dimensions, allowing for a more comprehensive examination of person perspective in memory. By utilising the MEQ, researchers can investigate the qualitative differences and interpretational nuances between different points on the person perspective scale.

Finally, as the multifaceted nature of selves may lead to ample ways of relating to former selves (Dings & McCarroll, 2022), investigating other modalities, aside from the visual modality, may further enhance our understanding of how self-incongruent episodes modify the phenomenology and semantic contents of autobiographical memories.

Conclusion

The mechanisms underlying self-memory integration are far from being understood. We suggest they can only be unravelled when analyzing the semantic content and phenomenological characteristics of both self-congruent and self-incongruent memories. Our findings that feelings of shame and semantic similarities to reports of shame episodes were the strongest predictors of 3PP suggest that self-incongruence exerts a substantial effect on both the phenomenology and the semantics of autobiographical memories. Thus, understanding the impact of shame on memories is relevant for the fundamental question of how memories are integrated with the self-model in the service of autobiographical memory.

Disclosure statement

The authors report no conflict of interest.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author, [TL]. The data are not publicly available because they contained information that could compromise the privacy of participants.

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