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Using shame to extend Martin Conway's self-memory system

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ABSTRACT

We extend Conway's self-memory system by adding theory and data from shame, an emotion that disrupts the internalised ideals of society needed for a positive self-concept. The event that caused 273 undergraduates their greatest amount of shame was analyzed; 66% were not very negative except for producing shame. Ratings of post-event effects, including two measure of self (self-perceived weakness, and centrality to identity) and four clinical symptoms (intrusions, avoidance, anxiety, and depression), were attributed separately to the remembered event, behaviour during the event, and shame from the event. The effects of shame were generally as large as the those of the event and larger than those of the behaviour, demonstrating the importance of shame's effects. The Tonic Immobility Scale (TIS), which measures tonic immobility (i.e., freezing), was obtained for the event that produced the most tonic immobility but that was not the event that caused the most shame. The post-event symptoms measured on the event that caused the most shame and the TIS correlated highly, suggesting that shame and tonic immobility may belong to a cluster of phylogenetically conserved submissive defensive mechanisms that could account for effects currently attributed to goals in self-memory systems.

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Martin Conway's self-memory system (SMS) theory of autobiographical memory (Conway, 2005; Conway et al., 2004; Conway & Jobson, 2012; Conway & Pleydell-Pearce, 2000; Conway & Rubin, 1993) took form about 25 years ago. Since then, what is known about autobiographical memory has grown dramatically in ways that have not become part of the theory's principles. Based on our research, we examine five main limitations in the current SMS theory that could be overcome by integrating what is known about the effects of the emotion of shame.

First, the SMS theory, from its earliest formulations to its current form, uses goals as the main mechanism in the construction and retrieval of autobiographical memories. It largely ignores the parallel role played by emotions. *Second*, shame is a social emotion, which occurs when society's goals, or internalised concepts of society's goals, are violated. This puts the goals outside of the self of the SMS theory. A broader definition is therefore needed to extend the self in a continuous way from the individual to society and to include various groups and roles with which the individual identifies. SMS theory already considers such groups and roles for other purposes. Thus, the change is to integrate them directly into the concept of the self. *Third*, shame is an indication of disruption of a remembered event in relation to a

positive conceptual self, which is the basic condition for producing autobiographical memories in the SMS theory, giving shame a central role to play (Conway et al., 2004). *Fourth*, shame is an evolutionarily-conserved, submissive defence mechanism which produces automatic and obligatory reactions (Gilbert & McGuire, 1998; Landers & Szyner, 2022; Pinto-Gouveia et al., 2014; Piretti et al., 2023). Much is known about its evolutionary history and underlying biology, which increases our understanding of such defence mechanisms and provides a model for integrating them into any extension of the SMS. *Fifth*, tonic immobility (TI) is another evolutionarily-conserved, submissive defence mechanism which produces automatic and obligatory reactions. In trying to understand how TI impacts memory of negative events (Rubin & Bell, 2023), it became clear that experiencing TI often leads to shame. We therefore examine whether shame and TI covary across individuals when they arise from different events. This could provide a model for integrating other evolutionarily conserved processes into the SMS.

To examine these five extensions of the SMS, we use a novel design and set of measures to compare the effects of shame to the effects of the remembered event causing the shame and behaviour during the event, both by themselves and in relation to individual-differences measures

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of shame and TI. Moreover, we compare the effects of the evolutionarily conserved biological and behavioural processes of shame and TI.

Information supporting these five extensions is considered in the remainder of the introduction, the study done here, and the general discussion. We start by briefly reviewing the literature on shame, the concept of the self, and TI.

Shame

In the 1990s Allan, Gilbert, McGuire, and colleagues proposed and studied shame as a phylogenetically conserved defence mechanism, distinguishing it from guilt, though noting the similarities (e.g., Allan & Gilbert, 1997; Gilbert, 1998; Gilbert et al., 1994; Gilbert & McGuire, 1998). Under this view, shame is intended to indicate remorse or submission to other people when an individual does not follow their own or society's rules or expectations. For a more recent expansion of these views see Sznycer et al. (2018) and Landers and Sznycer (2022).

Shame can be accompanied by a loss of status, acceptance, feeling attractive, and feeling valued. In particular, "The psychobiological mediators of human shame evolved from phylogenetically older mechanisms that originally evolved to regulate social rank and status behavior, in particular submissive behavior" (Gilbert & McGuire, 1998, p. 99). The submissive behaviour is involuntary and passive, occurring without the need for conscious control, when flight and fight are not viable or successful options. It includes blushing (Darwin, 1872), putting one's head down, gaze avoidance, and hiding, which are "appeasement displays, designed to de-escalate and/or escape from conflicts" (Gilbert & McGuire, 1998, p. 102). In addition, shame produces biological changes that are consistent with the interpretation that the neural networks involved in shame adapted from a shared evolutionary mechanism to inhibit aggressive responses and passively defend the self from social and interpersonal threats, which also may be sufficient to induce TI (Corrigan & Elkin-Cleary, 2018; Gruenewald et al., 2004). Further supporting this view, the biological and neural systems involved in shame hold across diverse groups (Michl et al., 2014; Piretti et al., 2023).

Given this biologically-based functional view of shame and the negative emotional aspect of shame, several post-event reactions and clinical symptoms occur. Intrusive memories remind people of the cause of the shame. People avoid cues that remind them of the shame and thus possible new situations that would cause shame. They become anxious and show symptoms of depression. Events that cause shame often become a central part of people's life narrative and identity (Gehrt et al., 2018; Matos et al., 2012; Matos & Pinto-Gouveia, 2014; Møhl, 2019) and the ones people would most like to erase from their memory (Rasmussen et al., 2022). Moreover, basic phylogenetically conserved biological processes

with serious health outcomes have been shown to occur in human, non-human primate, and rodent studies. A coordinated psychobiological response to events producing shame results in proinflammatory cytokine activity, and cortisol production. Chronic activation of this response can lead to serious disorders as well as disengagement and withdrawal from social activities (Kemeny et al., 2004).

As a defence mechanism, shame depends both on specific types of situations and on stable dispositions that can be measured by individual-differences tests (e.g., Andrews et al., 2002). Both factors can be related to gender, ethnicity, social status, and income. Including shame in the SMS theory would provide a way to explore the degree to which autobiographical memories are determined by stable dispositions versus event specific factors (Rubin, 2021). The relative importance and interaction of the specific situations and stable disposition in the SMS theory for shame, and in general, is an open question, as is how specific repeated situations and stable social status can create such stable dispositions. Though understudied, both questions are important to understanding individual behaviour, social interactions (Crozier, 1990), and social policy.

In the SMS theory, autobiographical memory emerges from self-coherence, which is "the need to maintain a coherent and stable record of the self's interaction with the world that extends beyond the present moment", when combined with "the need to encode an experience-near record of ongoing goal activity" (Conway et al., 2004, p. 492). However, events that cause shame challenge a positive stable record of the self because they lead to a loss of status, acceptance, feeling attractive, and feeling valued. Tracy and Robins's (2004) process model of self-conscious emotions, which provides a detailed account of how this occurs, was developed at about the same time as the SMS theory. If a remembered event includes survival goal-relevance, it leads directly to appraisal and basic emotions, which might include fear associated with TI. If it does not, it leads to attentional focus on self-activation of self-representations. This leads to identity-goal relevance, which can produce shame, rather than ongoing goal activity (see their Figure 1, p.110 and surrounding text for details). In simpler terms, just experiencing the emotion of shame brought on by evolutionarily conserved mechanisms can disrupt positive self-coherence. We support this claim in our results, noting that two thirds of the memories that produced the most shame were not rated negative enough to cause a major interruption of ongoing goal activity independent of shame.

Who is the self?

In the SMS theory "The representations of the conceptual self are socially constructed schema and categories that define the self, other people, and typical interactions with others and the surrounding world" (Conway, 2005, p. 597). Thus, the conceptual self in the SMS theory is

broader and more sophisticated than many other conceptions of the self. However, for shame the standards or ideals, whether internalised or not, are those of others perceived as judgmental of the self.

In Tulving's definition of episodic memory (Tulving, 1972, 1983, 2002), the self is the person recalling the autobiographical or episodic memory. This aspect of the self is retained in the SMS theory, even though in the SMS theory the self is using all it has absorbed in developing the conceptual self and self-knowledge. "Thus, both goals and conceptual self-knowledge act as control processes or as the source for such processes in the everyday regulation of memory" (Conway, 2005, p. 597) and "may act to edit memory content or generate false memories to resist change and, ultimately, to maintain goal coherence" (Conway, 2005, p. 599). Because of this, it is the goals of the person recalling the memories that matter in the SMS theory, whereas in shame it is the goals of others, the norms of the society and culture, internationalised to various extents by the self.

Here we wish to extend the boundaries of the self from the person who is remembering to a continuum extending from the person remembering, to people who are very close to that person, to those with a common social group or ethnic, racial, or national identity, to those with minimal perceived relevance, and to society in general (Rubin, 2022). Shame introduces a challenge to both the dichotomy of self versus other and the continuous dimension because it is the violation of the goals of other people, or groups with whom the individual identifies to varying degrees, that causes shame in the self. Thus, consideration of shame causes a novel evaluation of the concept of the self and its relation to the groups to which the self belongs. For instance, it allows one to ask whether the distance on the continuum from the self to the relevant group whose goals are being violated influences the nature of the shame and its effects.

Tonic immobility (TI)

TI is engaged in response to situations in which a person is at risk of harm. It is an obligatory response, not consciously controlled by the self, and since it prevents the person from moving, it is typically counter to the immediately perceived instrumental goals of the self, such as to escape, fight or vocalising to attract help. Like shame-inducing events, it potentially challenges a sense of positive self-coherence. It produces submissive behaviours in which an animal becomes rigid and offers no resistance to a threat. TI first became widely known in the human literature as rape-induced paralysis (Burgess & Holmstrom, 1976; Suarez & Gallup, 1979) and then was extended to other forms of violent assaults (Kalaf et al., 2017; Möller et al., 2017). For TI, the enabling condition is a physical situation in which voluntary escape and resistance fail or are unavailable, or to social threat cues to such harm (Roelofs et al., 2010). Given the enabling condition and

physiological reactions, fear is the emotion most commonly associated with TI and is included in the scale most commonly used to measure it. The underlying biological mechanisms of TI have been extensively studied and are well understood both because TI has a distinctive neurobehavioural phenotype that can be used to decide if it is occurring in people and animals and because TI is commonly used as a behavioural measure of fear in animal laboratory studies (Carli & Farabollini, 2022; Kozłowska et al., 2015; Marx et al., 2008; Maser & Gallup, 1977; Wang et al., 2014).

Based on observations in people, Rubin and Bell (2023) suggested that some of the negative effects of TI could be attributed to shame. However, to our knowledge, the biological and behavioural processes of shame and TI have not been measured together in the same study in humans. Here we wish to examine empirically the possibility that these two defence mechanisms, which result in different forms of submissive behaviour, co-occur across individuals. Consistent with this speculation, mice that experience defeats in interaction with other mice, which in humans might be likely to cause shame, had more TI when later stressed in other ways (Kudryavtseva & Bakshtanovskaya, 1989). Corrigan and Elkin-Cleary (2018) suggest that the inescapable pain of acute shame could engage TI at the level of the periaqueductal gray and cerebellum, even though the stimulus is social rather than predatory. If shame and TI happen more often in the same people, measures of their co-occurrence could be used to probe issues related to an underlying submissive disposition and its relation to situational status measures. In addition, shame and TI are transdiagnostic processes, and as such lack the specific, targeted treatments that diagnoses including depression, anxiety disorders, and PTSD have.

Overview of the study

The study is intended to increase what is known about remembered events that cause shame and the later effects of that shame. Undergraduates chose the event that has caused them the most shame. They were then asked to attribute post-event effects to each of five potential reasons, thereby allowing direct quantitative comparisons among perceived sources of effects. Three reasons are causes for feeling shame; they are shame from doing the wrong thing, shame from not acting, and shame from one's appearance. Two reasons provided comparisons to the causes of the shame: the remembered event itself and one's behaviour during the event. For each of the five reasons, attributions were made to seven post-event measures. Five were measures of clinical symptoms including symptoms of general anxiety disorder, depression, and the intrusive memory and avoidance symptoms of PTSD as well as the average of the items of these symptoms. The remaining two measures addressed aspects of identity: how central the shame event became

to self and identity and the perceived weakness or inadequacy caused by the shame associated event.

Following this, we had participants choose and rate the event that caused them the most TI. Finally, participants rated scales from individual-differences measures of shame that allowed the general tendency to feel shame to be correlated with the effects attributed to it in a single event. To our knowledge, this study is the first comparison of long-term effects of shame to differences in causes of shame and the first to measure individual differences in both shame and TI.

Method

Design issues

All undergraduates in the psychology subject pool were invited to participate. We wanted precise measures to describe our findings and a sample size suitable for individual-differences testing. Therefore, the stopping rule was simply the end of the semester in which the study was run.

Participants

The 273 Duke Undergraduates (166 female, 106 male, 1 chose not to answer; mean age 19.30, range 18–23) who completed our study during one semester were included.

Materials

Post-event reactions

In order to measure reactions to the remembered event that caused the most shame, 14 post-event reaction items were constructed to have a similar format and were intermixed to distribute them across the task and have each be considered as a separate post-event effect, rather than part of a series of items about related aspects of the same effect. All items began with “Please rate the degree to which following the event you”. In the order rated, the items were as follows: 1. Experienced repeated, disturbing memories, thoughts, images, or dreams; 2. Avoided thinking about or talking about the event or avoided having feelings related to it; 3. Felt nervous, anxious or on edge; 4. Felt depressed; 5. Felt like a weak person; 6. Felt that this event has become part of your identity; 7. Suddenly acted or felt as though the event were happening again (as if you were reliving it); 8. Avoided activities or situations because they reminded you of the event; 9. Felt unable to stop or control worrying; 10. Thought your life had been a failure; 11. Felt inadequate; 12. Felt this event was making your life different from the life of most other people; 13. Felt very upset or had physical reactions (e.g., heart pounding, trouble breathing, or sweating) when something reminded you of the event; and 14. Felt you could not rely on yourself. All scales had seven points

with the following labels: 1 strongly disagree, 3 disagree, 5 agree, 7 strongly agree.

For each item there was one option for the event, one for behaviour and three for shame. The three for shame were shame from: not acting, from acting poorly, and appearance. The first analyses are based on the reason for shame that caused the largest post-event effect for each participant for each of the post-event attributions instead of an average, because having one reason for shame would often minimise the effects of other reasons of shame. The three reasons for shame are discussed and analyzed separately later in the paper.

The 14 items were grouped to form three separate scales based on whether they were rated for the post-event attributions to the remembered event, to behaviour during the event, or to the reason for shame that caused the largest post-event effect for each participant. The three scales for *intrusions* were based on items related to intrusive memory symptoms of PTSD (1, 7, 13). The three scales for *avoidance* scales were based on items related to the avoidance symptoms of PTSD (2, 8). The three scales for *anxiety* on items related to symptoms of general anxiety disorder (3, 9). The three scales for *depression* on items related to depression (4, 10). The three scales for *weakness* based on items related to cognitive reactions to shame (5, 11, 14). The three scales for *centrality* items related to the centrality of event scale (6, 12). See Rubin and Bell (2023) for scale references. In addition, the three scales for *symptoms*, were formed by averaging the nine items from *intrusions*, *avoidance*, *anxiety*, and *depression* to provide a measure of the post-event attributions to the remembered event, to behaviour, and to shame that was relevant to clinical symptoms. The alphas for the *symptoms* scales for the remembered event, behaviour, and shame are .85, .83, and .67, respectively.

Internal shame and external shame

These 4-item scales are the two subscales of the external and internal shame scale (Ferreira et al., 2022). Internal shame is based on self-focused negative evaluations and feelings; it includes items about feeling isolated, inferior and unworthy ($\alpha = .80$). External shame is focused on the experience of the self as seen negatively by others; it includes items about not being up to other people's standards ($\alpha = .75$). All items are rated on a 0 – never to 4 – always scale.

Behavioural shame and bodily shame

These scales are subscales of the experience of shame scale (Andrews et al., 2002). The 9-item behaviour shame subscale has three items each about doing something wrong, saying something stupid or failing competitively ($\alpha = .88$). The 4-item bodily shame subscale included items about being ashamed of your body, worried about your appearance, and avoiding looking in the mirror (α

= .87). All items are rated on a 1–4 scale of not at all, a little, moderately, and very much.

Tonic immobility scale (TIS)

The TIS (Fusé et al., 2007) sums 10 items rated on a not at all (0) to as much as I could imagine (6) scale. The items were froze or felt paralysed, felt cold, were unable to move even though not restrained, felt fear or panic, trembled or shook, felt as though you were going to die, were unable to call out or scream, felt detached from yourself, felt numb or no pain, and felt detached from what was going on around you. The scale was initially derived from studies in the animal literature and adapted for use in sexual assault, with various 7-item subsets of the initial 10 items being considered for a range of traumatic events (Covers et al., 2022; Fusé et al., 2007; Reichenheim et al., 2014). The 7-item scales have commonly used cutoffs for scores of moderate and extreme TI of 21 and 28 (e.g., Fusé et al., 2007; Heidt et al., 2005; Möller et al., 2017; TeBockhorst et al., 2015). ($\alpha = .89$). Participants were asked to indicate the degree to which you (or someone close to you) experienced each of the following at any point during the event. We included “someone close to you” to avoid undergraduates having to indicate it happened to them. It also guards against potential safety and privacy issues (Campbell et al., 2019), and helps to avoid the Title XI mandatory reporting requirements of research faculty in the U.S.A. (Holland et al., 2018).

Severity scale for the TI event

For the severity scale (Rubin & Feeling, 2013), participants were asked to please think back upon the event on which they answered the TIS and complete the following questions in an honest and sincere way. The severity scale summed the following 5 items rated on a not at all (1) to as much as any event I could imagine (7) scale: how much physical damage did the event do to you or others very close to you, how much emotional damage did the event do to you or others very close to you, how much financial damage did the event do to you or others very close to you, overall, how much does this event affect your future, and overall, I believe that if the event happened to most people, they would consider the severity of the event as ___. ($\alpha = .80$).

Procedure

The procedure had four main parts. First, the event that causes the most amount of shame was nominated, categorised, and dated. Second, the scales of the sequelae of that event were rated on five possible causes. These assessed how much they were due to: the remembered event itself, their behaviour during the event, their shame from freezing or not acting, their shame from thinking or doing the wrong thing, and shame from their appearance. Third, an event that caused the participant to freeze, but not the event

already chosen for shame, was nominated, categorised, and rated on the TIS and on the severity scale for the TI event. Fourth, individual-differences measures of shame were obtained.

Because shame has a range of meanings, we include here our full description of shame given to the participants.

Events that cause shame have at least one aspect that leads them to be evaluated negatively. For example, that aspect can be things that you said, or did, or your appearance. They can be a poor performance or failure. They can even be the fact that you froze or did not act or speak when action was, or later seemed to be, more appropriate. In objective terms, the event itself could be something you viewed as a test of your ability, character, or social status, or it could be a violent or unexpected event for which you did not react quickly enough to be effective. Anything that you or others might judge as inappropriate, unintelligent, foolish, or less than ideal can lead to shame. Please think of an event, that you are comfortable rating in this survey, that now causes you the most amount of shame.

Thus, we focus on the current intensity and effects of shame, not shame at the time of the event or the time course of its development.

Participants were asked to select one of following four broad categories that best fits the remembered event that resulted in shame. (1) A violent intentional harm event involving a frightening or life-threatening event that is due to another person or persons committing deliberate violent intentional harm against you. Examples include physical or sexual assaults, hate crimes, and muggings. (2) A traumatic unintentional harm event that does not involve another person trying to harm you but could lead to your death or that of a loved one. Examples include a serious accident fire, natural disaster, or having a loved one die unexpectedly. (3) A negative non-traumatic event does not generally result in death. Examples include the divorce of your parents, a major negative change in your financial or social situation, a difficult romantic break up, a decision that caused you to lose a friend or friends, or a change in your physical ability for the worse. (4) An event negative mostly because of shame that would not have been especially negative except for causing shame. Examples include doing something stupid or unkind, performing poorly, or dressing inappropriately.

Time since the event was assessed on a roughly logarithmic scale rated from 1 to 7 asking “How recently did this event occur: within the last week, within the last month, 1–6, 6 months to 1 year ago, 1–3 years ago, 3–10 years ago, more than 10 years ago”.

The central part of the study asked participants to

judge whether various thoughts, feelings, and behaviors that you experienced following the event were primarily due to the event itself or to your reaction to the event. There will be five rating scales to measure how things that happened during the event affect things that occurred after the event.

The five rating scales were: 1 due to the event itself, 2 due to my behaviour (during the event) in general, 3 due to shame from freezing or not acting, 4 due to shame from thinking, saying, or doing the wrong thing, 5 due to shame for the way I looked.

Following the section on shame, we switched to measuring TI. We asked participants to

“Think of times when you wanted to move or speak but could not, that is, when something caused you to freeze. This might have happened from a relatively mild event, such as when you were surprised or startled by something, or something very severe, such as when you were extremely afraid or experiencing a threat to your life or person. From among these specific occurrences, please choose the event that produced the most freezing. ... categorize the event as: 1 an intentional violent event that happened to you, such as a physical or sexual assault, 2 an unintentional event that happened to you, such as an accident or a natural disaster, 3 something else surprising or shocking that happened to you.

The most severe of these categories correspond to those used for shame, but for a different kind of event.

The ten-item TIS and the five-item severity scale included in the materials section were then rated for the event that produced the most freezing. We included a measure of TI because we claimed that shame was often a sequela to experiencing TI due to a person being unable to respond during an event but could find no empirical behavioural measure of the relation between shame and TI (Rubin & Bell, 2023).

We then switched to measures of individual differences rather than measures of events, informing the participants with the transition “the remaining items are about you in general, not the specific events you have been rating until now”. The four individual-differences measures of shame, internal shame, external shame, behavioural shame, and bodily shame are described in the materials section above.

Results

Shame

The results for the event with the most shame are presented first followed by the results about the event with the most TI. We then return to the results of the individual-differences measures, which combine measures from the shame and TI event.

General properties of the shame event

The mean (and standard deviation) of the time since the remembered event using roughly logarithmic categories was 4.02 (1.66), which was about 6 months prior to completion of the survey. Of the 273 participants, 66% reported an event that was negative primarily due to shame, 18% for negative non-traumatic events such as a major change in your financial, social situation, or physical abilities, 8% for traumatic events involving unintentional harm, and 8% for traumatic events involving intentional

harm. Thus, when asking for the event that caused the most shame in a sample of college undergraduates, two thirds reported events they considered negative due to shame, independent of other major causes.

Attributions of post-event shame effects

Each of the rows of Table 1 contains a post-event effect, which is labelled in the first column. In order, they are the clinical symptoms of *intrusions*, *avoidance*, *anxiety*, and *depression* followed by *symptoms*, which is the average of the items in these four symptoms, *weakness* based on cognitive reactions to shame, and *centrality* to the self and identity based on the centrality of event scale. The second, third, and fourth columns present the attribution of these post-event effects to shame, to the remembered event itself, and to behaviour during the event. There were three reasons for shame: shame from doing the wrong thing, shame from not acting, and shame from one’s appearance. In all the analyses except for Figure 1, the reason for shame that caused the largest post-event effect for each participant for each of the post-event attributions was chosen instead of an average, because having one reason for shame would often minimise the effects of other reasons for shame. In Figure 1, the percentage of participants who had each of the three reasons for shame for their maximum attribution are presented.

We expected the post-event effects of shame listed in the first column of Table 1 to be substantial in events that caused extreme levels of shame. However, we had no specific hypotheses about how large the attributions to shame would be compared to those of the remembered event or behaviour during the event. Moreover, we had no specific hypotheses about differences among the post-event effects. Examining the three columns of attributions suggests post-event effects attributed to shame are roughly equivalent to those of the remembered event itself and larger than those of their behaviour during the event. To quantify this post hoc observation, repeated-measure ANOVAs were conducted and reported in the last two columns of Table 1. There were minimal effects between shame and the remembered event. However, there were highly significant effects between shame and behaviour, with shame being larger for many, but not all, post-event effects. The exceptions were *depression*, *weakness*, and *centrality*.

Gender differences

There were no significant gender differences in the post-event effects of shame and only one for behaviour, with females having a higher value: *intrusions* (3.24 vs. 3.64, $t(270) = 2.32$, $p = .0208$). For the remembered event, the four measures with significant differences all had higher values for females: *intrusions* (4.01 vs. 3.42, $t(270) = 3.08$, $p = .0023$), *avoidance* (4.65 vs. 3.99, $t(270) = 3.35$, $p = .0009$), *anxiety* (4.83 vs. 4.16, $t(270) = 3.40$, $p = .0008$), and *symptoms* (4.23 vs. 3.65, $t(270) = 3.60$, $p = .0004$). Table 1 in the

Table 1. Basic statistics for the remembered event that caused the most shame.

| Post-event effects | Attributions to. | | | Shame Versus | | | |
|--------------------|--------------------------|------------------------|------------------------------|--------------|-------|-----------------|--------|
| | Their shame Mean (SD) | The event mean (SD) | Their behaviour mean (SD) | The event | | Their behaviour | |
| | | | | F(1, 272) | p | F(1, 272) | p |
| <i>Intrusions</i> | 3.95 (1.52) | 3.77 (1.56) | 3.49 (1.41) | 4.66 | .0318 | 52.67 | <.0001 |
| <i>Avoidance</i> | 4.29 (1.60) | 4.38 (1.64) | 3.88 (1.50) | 0.76 | .3843 | 23.61 | <.0001 |
| <i>Anxiety</i> | 4.45 (1.67) | 4.56 (1.64) | 4.14 (1.61) | 1.18 | .2778 | 13.43 | .0003 |
| <i>Depression</i> | 3.47 (1.77) | 3.39 (1.80) | 3.31 (1.77) | 0.56 | .4543 | 4.59 | .0331 |
| <i>Symptoms</i> | 3.98 (1.35) | 4.00 (1.34) | 3.68 (1.24) | 0.03 | .8549 | 26.42 | <.0001 |
| <i>Weakness</i> | 4.04 (1.70) | 3.87 (1.65) | 3.89 (1.69) | 3.19 | .0752 | 4.35 | .0380 |
| <i>Centrality</i> | 3.15 (1.67) | 3.27 (1.87) | 3.17 (1.68) | 1.40 | .2377 | 0.05 | .8259 |

Note. *Symptoms* is the mean of all the items in the *intrusions*, *avoidance*, *anxiety*, and *depression* scales. $N = 273$.

supplementary materials contains the full set of means and t -tests for gender for all post-event effects.

Analyses of the reasons for shame

Three common reasons for shame were measured: doing something wrong, not doing something that should have been done, and appearance. In analyses, except for those in Figure 1, only data from the reason for shame that produced the largest effect for each attribute of each participant was used. Here the relative frequencies of three reasons are compared.

First, within each attribution there is variability over the three reasons. The minimum $\chi^2(2)$ is 29.16, $p < .0001$. Second, not acting, which was of interest to the relation of shame with TI, had the lowest numerical value for all seven attributions, with values between 16 and 22%. Because there are many reasons not to act besides TI, this is an upper limit for the effects of TI, indicating that TI could not have been the cause of the shame for most participants' remembered shame event.

Third, did wrong was generally the most frequent cause of shame, though the exceptions are interesting. To make this comparison in terms of the χ^2 statistic used for the other observations, the not acting cause, which was always the least frequent category, was removed from the analysis. The five $\chi^2(1)$ for which did wrong was higher than appearance, in the order shown in Figure 1, were *intrusions* 23.45, $p < .0001$; *avoidance* 5.84, $p = .0157$; *anxiety* 10.77, $p = .0010$; *weakness* 12.10, $p = .0005$; and

symptoms 88.51, $p < .0001$. For *depression*, there was no significant difference $\chi^2(1) = .07$, $p = .7893$, and for *centrality*, there was a difference with shame attributed to appearance being higher, $\chi^2(1) = 5.35$, $p < .0207$. Fourth, there were no significant gender differences in the frequencies shown in Figure 1. The maximum $\chi^2(2)$ was 3.80, $p = .15$ and five of the other χ^2 s were below 1.00. This lack of a gender difference was surprising given conventional wisdom about gender biases in the role of appearance. Although negative effects are often easy to dismiss, here they are made on the same data with many significant effects using the same measures.

Tonic immobility

The norms for TI are based on seven of the ten items of the TIS. The choice of the seven items varies from study to study, so we chose the conservative option of multiplying the sum of the ten items by .7 in our reporting of the mean values. By these values, the TIS had a mean (SD) of 16.17 (9.51) with a range of 0–38.50 out of a maximum possible of 42. Using standard cutoffs, 69% of the participants had low TI, 14% moderate TI and 17% extreme TI. The event that caused the most TI was categorised as something surprising or shocking by 63% of the participants, unintentional harm by 22% of the participants, and intentional harm by 15% of the participants. The mean TIS scores for these three groups were 14.01 (SD = 9.02), 19.00 (SD = 8.30), and 21.35 (SD = 10.32). The TIS correlated with the severity scale for the event causing it .55, $p < .0001$.

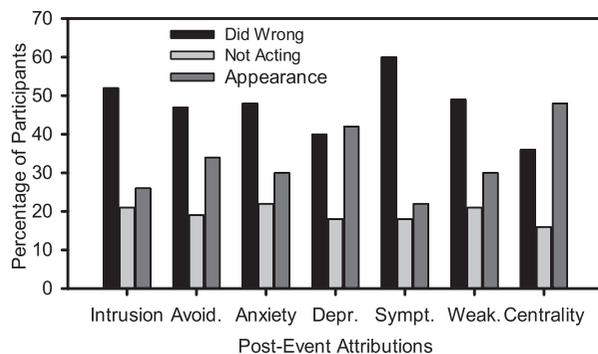


Figure 1. Percentage of participants who reported their reason for shame as doing wrong, not acting, or their appearance. Avoid., depr., sympt., and weak. Are abbreviations for *avoidance*, *depression*, *symptoms*, and *weakness*.

Individual differences

Table 2 presents the correlations among the attributions to the *symptoms* variable and all measures considered here as individual differences. The *symptoms* variable is the average of the items in the four clinical symptoms of *intrusions*, *avoidance*, *anxiety*, and *depression*. It provides as a statistically reliable, conceptually coherent, clinically and practically relevant measure of the attributions of effects to the participants remembered event, to their behaviour during the event, and to their shame. The individual-differences variables are behavioural shame, bodily shame, internal shame, external shame, and the TIS. The

Table 2. Correlations among the attributions of symptoms and the individual-differences measures.

| | Attributions to <i>Symptoms</i> | | Measures of shame and TI | | | | | |
|-------------------|---------------------------------|-----------|--------------------------|---------|---------|----------|----------|--------|
| | Event | Behaviour | Shame | Behav | Bodily | Internal | External | TIS |
| Event | | | | | | | | |
| Behaviour | .64**** | | | | | | | |
| Shame | .49**** | .72**** | | | | | | |
| Behavioural shame | .23**** | .37**** | .40**** | | | | | |
| Bodily shame | .24**** | .24**** | .22*** | .49**** | | | | |
| Internal shame | .30**** | .39**** | .39**** | .52**** | .43**** | | | |
| External shame | .25**** | .37**** | .37**** | .49**** | .38**** | .78**** | | |
| TIS | .40**** | .39**** | .41**** | .34**** | .33**** | .44**** | .37**** | |
| Gender | .21*** | .12 | .08 | .17** | .32**** | .02 | .08 | .19*** |

Note. $N = 273$, except gender (male = 0, female = 1, $n = 272$),

Event, behaviour, and shame are the attribution to the *symptoms* measure of these categories.

** = $p < .01$, *** = $p < .001$, **** = $p < .0001$. The exact probabilities for the gender correlation row are: .0004, .0553, .1731, .0058, < .0001, .7464, .2164, and .0020.

individual-differences measures of shame are stable differences of the participant rather than measures of a single event. The TIS measure is for a single TI event, but not the event that the attributions to the *symptoms* measure were made. Thus, none of the correlations of the *symptoms* measure with the individual-differences measures and the TIS refer to the event on which the *symptoms* measures were made. The alphas for all measures were between .75 and .94. All correlations, except those with gender, were significant at the $p < .001$ level and all but one at the $p < .0001$ level.

The 6 correlations among the shame measures in the lower right corner were between .38 and .78. The 4 correlations of the TIS with these shame measures were between .33 and .44. Although somewhat lower, the correlations overlap those among shame. The correlations among the shame measures, which all measure different aspects of shame, is not surprising. The correlations of the TIS, measured on the event that caused the most TI, with the shame measures suggests a relation at the level of the individual participant. For gender, women had higher correlations with attributions to *symptoms* for the remembered event, for behavioural and bodily shame, and for the TIS.

A similar pattern of results occurred for the correlations among the attributions to the event, behaviour, and shame *symptoms* measure. The three correlations among the three attributions to *symptoms* in the upper left corner of the triangular matrix were between .49 and .72. The 12 correlations of the 4 shame individual-differences measures with the 3 attributions to *symptoms* had a median of .33 and a range of .22 to .40. The 3 correlations among the TIS and the attributions to *symptoms* overlapped with those of the shame measures but were higher with a median of .40 and a range of .39 to .41.

The correlations of the TIS measured on the event that caused the most TI correlated with the attributions to *symptoms* similarly to the standard individual-differences measures of shame. Thus, for both the correlations among the individual-differences measures and for the attributions to *symptoms* for the event that caused the most shame, the TIS measure for the event that caused

the most TI has correlations similar to measures of shame, which is strong evidence for a relation at the level of the individual participants rather than events.

To more directly investigate this similarity, we used the TIS and the four measures of shame in multiple regression analyses as predictors of the attributions of *symptoms* to the event, behaviour, and shame, with the restriction that each predictor in the final equations contribute at a $p < .05$ level. Because internal shame and external shame correlated .78, it was unlikely that both could enter. Standardised regression coefficients for measures are reported in the order they appear in the correlation tables. Event = .15 Internal Shame + .34 TIS, $R^2 = .18$. Behaviour = .19 Behavioural Shame + .19 Internal Shame + .24 TIS, $R^2 = .24$. Shame = .23 Behavioural Shame + .15 External Shame + .28 TIS, $R^2 = .26$. The TIS entered for all three regressions with the largest numerical standardised regression coefficient. Either internal or external shame entered for all three regressions. Behavioural shame entered for behaviour and shame. If just the TIS is entered the R^2 for the TIS for Event, Behaviour, and Shame are .16, .15, and .17, respectively.

The TIS was measured on an event not chosen because it caused shame. Even with the review of the literature in the introduction, the finding that the TIS correlated as highly as the individual-differences measures of shame and the finding that the TIS accounts for at least half of the variance of the four predictors of the multiple regression analyses were unexpected. They strongly support the idea that TI and shame covary across individuals.

Discussion

Summary

We conducted a study to extend Conway's SMS theory (e.g., Conway, 2005; Conway et al., 2004; Conway & Jobson, 2012; Conway & Pleydell-Pearce, 2000; Conway & Rubin, 1993). Although, we concentrated on shame and TI, other emotions and evolutionarily conserved defence mechanism, especially those that produce submissive

behaviour, might also provide evidence for the following extensions of the SMS theory and to any theory that intends to understand autobiographical memory. In terms of shame specifically, shame is an indication of an event challenging a stable, positive conceptual self, which leads to the production of autobiographical memories in the SMS theory. Moreover, shame is a social, self-reflexive emotion which occurs when society's goals, or internalised concepts of these goals, are violated. Thus, goals outside of the SMS theory's private sphere of the self need to be included in the SMS theory.

Our study measured participants' ratings of the remembered event that caused them the most shame on seven post-event effects, which consisted of two measures of the self, self-perceived *weakness*, *centrality* to identity and the four clinical symptoms of *intrusions*, *avoidance*, *anxiety*, and *depression*, as well as a combined *symptoms* measure which was the mean of the four clinical symptoms. These post-event effects were rated separately for their attribution to the participant's shame, to the remembered event, and to the participant's behaviour during the event. As shown in [Table 1](#), in what we believe is the first comparison of the post-event effects of shame to more commonly used baselines for negative events, there were minimal differences between shame and the event, but shame generally had greater effects than behaviour. Thus, for remembered events chosen because they produced high levels of shame, the long-term effects of their shame are at least as large as, and often larger than, the remembered event and behaviour during the event. This is consistent with two thirds of the participants choosing an event that "would not have been especially negative except for causing shame".

As shown in [Table 2](#), the 12 correlations of the four individual-differences measures of shame with the three attributions of the *symptoms* measure to event, behaviour, and shame had a median of .33 and a range of .22 to .40. This is large enough to be of practical importance for the attributions of post-event effects to shame, to the event, and to the participant's behaviour during the event. The correlations between the TIS measured on an event that produced the most TI and the attributions of *symptoms* to event, behaviour, and shame from an event that produced the most shame were .40, .39, and .41, which overlaps but is generally higher than correlations with the measures of shame. This unexpected result suggests an overlap in the sequelae of shame and TI within an individual following different events. Multiple regression analyzed attributions to *symptoms* for the event, behaviour, and shame using the TIS and four individual-differences measures of shame as independent variables. The TIS had the largest numerical standardised regression coefficient in all equations, supporting the observations noted with the correlations. These analyses based on individual differences strongly suggest that both shame and TI may be part of a cluster of phylogenetically conserved submissive

defensive mechanisms and could be the mechanisms used in negative events to accomplish tasks that the SMS theory has previously attributed to more cognitive and explicit goals driven behaviour.

Clinical implications

Shame and TI are transdiagnostic mechanisms, which contribute to PTSD, depression, anxiety, and other disorders (Allan & Gilbert, 1997; Gilbert, 1998; Möller et al., 2017). However, unlike clinical disorders, they lack a diagnosis and are not usually the focus of treatment. More speculatively, although the nature of the phylogenetically conserved defensive mechanisms that are engaged in events involving shame and TI differ, submissive behaviours caused by similar phylogenetically conserved mechanisms, such as fear, may also be part of this cluster.

Gender

Although, we had no hypotheses about gender differences in shame, we note their limited occurrences. As described earlier, there were few gender effects in the post-event effects of the participants' shame and behaviour during the remembered event, though women did show larger effects of the event itself. Specifically, there were no significant gender differences in the seven possible post-event effects due to shame, one due to behaviour, and four due to the event, with females having higher values in all cases. There were also no significant gender differences in the 21 frequencies in [Figure 1](#) for the number of participants who reported their reason for shame as doing wrong, not acting, or their appearance for *intrusions*, *avoidance*, *anxiety*, *depression*, *symptoms*, *weakness*, or *centrality*. Women did not have more attributions to *symptoms* due to shame or due to their behaviour in [Table 2](#), though they did to the event itself. They also did not have more internal or external shame, though they did for behavioural shame, bodily shame, and the TIS.

Thus, there were minimal gender differences for shame. This is consistent with the Matos and Pinto-Gouveia (2010) study, reviewed in the introduction, that demonstrated the lifetime relation of a significant early shame experience on two shame scales and measures of post-event effects on depression, anxiety stress, intrusions, avoidance, and hyperarousal scales, effects in which there were no significant gender differences.

Support and extension of Conway's SMS theory and theories autobiographical memory in general

The SMS theory is, above all else, a theory of the role of the self in autobiographical memory. One important way the self is explored in autobiographical memory is through finding stable individual differences that measure aspects of the self, such as the centrality of event and severity scales used in this paper (Berntsen & Rubin, 2006; Rubin &

Feeling, 2013). This literature has not become a central part of the SMS theory. However, such stable dispositions are needed for the key SMS mechanism of self-coherence in order to maintain a stable self while processing challenges to it that occur in ongoing activity. Which individual differences are most central to the construction of autobiographical memories would therefore benefit from more systematic study. Here, we have demonstrated that stable individual differences in shame and TI account for substantial variance in the way people experience individual memories and evaluate and react to individual events. Extending the SMS with these measures, and other individual-differences measures not considered here, would extend the empirical basis for the conception of self-coherence.

A second way the present findings support and extend Conway's SMS theory is by showing the strength of the self-reflexive emotion, shame. Shame arises when a person remembers an event in which they did not live up to internalised norms (Tracy & Robins, 2004). We show that the self-reflexive emotion of shame has post-event reactions that are as large as effects of the event itself and larger than effects of their remembered behaviour. This indicates the importance of the self in memory-based reactions, consistent with Conway's model, and supports a more systematic extension of the model to the role of self-reflexive emotions to supplement its current focus on instrumental goals.

A third way we support and extend Conway's SMS theory is by considering the ways in which shame creates the long-lasting consciously accessible autobiographical memories that are reported in our data only because the events remembered caused shame rather than interrupting ongoing goal-directed experiences. In the SMS theory, autobiographical memory emerges from the need to maintain self-coherence in the face of challenges from encoding ongoing experiences that cause self-incoherence (Conway et al., 2004). Because we find such memories can be created without interrupting ongoing goal-directed experiences, our results require extending the model beyond its reliance of goals for memories of shame and open exploration of a more complete range of self-incoherence and other mechanisms that can encourage the formation and recall of autobiographical memories.

Finally, by including shame and TI in our study, we were able to explore evolutionarily conserved mechanisms. Much is known about such mechanisms' behavioural and biological processes that could provide an additional perspective to the conscious cognitive level that is the current focus of autobiographical memory and the SMS theory.

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Ethics approval

The study was approved by the Duke University Campus Institutional Review Board.

Data availability

Data are available from the first author.

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