# Ashoka psychology Review

# Our Team: Edition 1, Volume 1

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# A Note by the Editor-in-Chief

As we bring to you the first edition of Ashoka Psychology Review, a question of its purpose comes to mind. First and foremost, it is important to acknowledge that research can often be placed within walls of glass. It can be seen and read, but is not always accessible the way we want it to be. Most high-end journals are exclusive, and rightly so. That's where we come in. Ashoka Psychology Review was made with one main purpose: to make writing, editing and research more accessible. To allow for a space where opinions can flounder, where papers can be refined and the process of review can be understood.

Our aim as a student-led initiative is to be inclusive of as many ideas we can. To take papers written by students with all kinds of motives and refine them into more publishable versions. We do recognise our limitations with regards to empiricism, rigour, and academic standards being a student review. Therefore, the main goal for this inaugural edition is not to compete with high-end academic journals but rather to create a niche of its own through the questions our authors and editors pose.

Before we present to you the papers written by the student body of Ashoka University and our editors, I would like to extend my gratitude to the faculty of the Psychology Department of Ashoka for their feedback on the papers and how to take the initiative forward. I would also like to thank the current president and vice-president of The Psychology Society of Ashoka, Mugdha and Manya alongside the entire core team of the society. Without their support and that of my previous Research H.O.D.s, I would have never been able to bring this idea to life.

Lastly, Review would have been a few pages in an abandoned word document if not for the amazing team of editors and designers. They, alongside the authors who submitted their papers to us, are the reason we can present this edition to you and as we do this, we implore everyone and anyone who reads it to keep asking questions: questions that challenge the norm, the current research, what you read and see and hear.

Asmi Aggarwal
Editor-in-chief
Ashoka Psychology Review: Edition 1, Volume 1

# Contents

## ACADEMIC PAPERS

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Time perception, particularly for durations longer than a second (suprasecond intervals), is crucial for coordinated actions and decision-making. This paper investigates the role of the pre-supplementary motor area (preSMA) in estimating prospective suprasecond time intervals. Traditionally associated with motor planning and initiation, recent evidence suggests the preSMA is also integral to temporal processing, especially in accumulating temporal information and decision-making regarding the timing of actions based on internal cues. But how exactly does an area primarily involved in motor function also be active in time processing? This paper discusses the current evidence, its limitations, and proposes directions for future research to explore whether preSMA activity reflects direct encoding of elapsed time or a decision-making process about time intervals.

## Nudge Theory and the Workplace

Author: Krishnav Sachdev

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Nudge theory suggests that subtle environmental settings can influence decision-making. This is based on the two different ways humans perceive information and make decisions, intuitive or rational. This paper examines the effectiveness of nudge-based interventions in improving employees' positive health behaviours in the workplace in terms of physical activity and dietary choices. Supportive studies show that well-designed nudges, such as easier access, product placement, and price adjustments, can positively influence behaviour. However, opposing research highlights that nudges can be ineffective, or in some cases even be counterproductive, if perceived as patronizing or if the implementation is not contextually well-placed. Factors such as cultural settings, intervention design, and individual differences significantly impact outcomes. The analysis concludes that while nudges have potential, their effectiveness depends on thoughtful implementation tailored to specific workplace environments. Long-term impact requires addressing behavioural trends and established mindsets, minimizing social-desirability bias, and using a combination of nudging strategies. The mixed findings suggest that nudge-based interventions can encourage healthier workplace behaviours but must be carefully designed to align with employees' perceptions and workplace culture for long-term, sustained success.

# Post Traumatic Stress Disorder and the Hippocampus

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Post-Traumatic Stress Disorder is a psychiatric disorder characterized by persistent intrusive recollections, emotional regulation difficulties, and cognitive dysfunction following exposure to traumatic events. Among the key brain regions suggested to be involved in PTSD, the hippocampus is a crucial brain region involved in PTSD, implicated to play a fundamental role in encoding, storing, and retrieving episodic memories. This paper critically examines the extent to which PTSD affects hippocampal volume and its associated cognitive changes by analyzing numerous studies. Evidence suggests that hippocampal atrophy is more pronounced in adults with PTSD, with combat-related PTSD predominantly affecting the right hippocampus and childhood maltreatment-related PTSD affecting the left. Furthermore, functional neuroimaging studies indicate disrupted neural connectivity and reduced hippocampal activity in PTSD patients, correlating with memory impairments. Additional factors such as cortisol dysregulation, white matter atrophy, and alcohol abuse may exacerbate hippocampal volume reduction, influencing PTSD symptom severity. While methodological limitations exist, including sample size constraints and variability in trauma types, the cumulative findings denote the critical role of hippocampal alterations in PTSD pathophysiology. Future research should incorporate longitudinal studies and diverse trauma populations to enhance our understanding of PTSD-related neurobiological changes and improve targeted therapeutic interventions.

## Designed Love: Exploring the Relationship Between The Interface of Dating Apps and User Behavior and Experience

Author: Miti Agrawal

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This study delves into the relationship between the interface of dating apps and user behavior and experience. The study compares the interfaces of two prominent dating apps - Hinge and Bumble to investigate how small nuances like the layouts, messaging features and matching-algorithms influence user perception of self and interaction with others. For the purpose of this paper, a combination of interviews of students from Ashoka University and the researcher's experiences were taken into account. The findings explore the significance of dating apps in shaping romantic approaches and meaningful relationships in the contemporary world.

## An Unsettling Comfort: The Allure of Psychological Horror

Author: Tushar Agarwal

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Despite the general tendency of people to avoid discomfort, many find the disturbing content featured in different forms of media, specifically psychological horror films, to be entertaining. Why is it that something meant to induce stress and fear instead has an entertaining factor? This paper explores the emotional response triggered by such disturbing content and its effect on the behaviours of the audience. Does its continuous exposure make them more prone to otherize? The findings provide insights into the inherent and nurtured psychological dynamics of individuals, as well as the correlation between distress and level of empathy in individuals. Additionally, they allow for an exploration into the effect of the generated entertainment value on an individual's ability to cope.

# How Early Life Trauma Impacts the Neurobiology of the Developing Brain

Author: Madiha Khan

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This review aims to provide a comprehensive overview of how adverse childhood experiences shape and influence the neurobiological development of the growing brain. It explores the different mechanisms through which traumatic experiences in early life can alter brain structure, ultimately affecting emotional regulation, cognitive abilities, and overall mental health in individuals as they mature. It further discusses different areas impacted in response to stress, such as the ventral tegmental area, the limbic circuitry (hippocampus and amygdala) and the prefrontal cortex. It also explores volumetric changes occurring in the brain and the stress response system of the Hypothalamic-Pituitary-Adrenal axis and how these changes can lead to psychopathological disorders.

# LAB REVIEWS

## A Review on 'Enhanced Top-Down Sensorimotor Processing in Somatic Anxiety'

Written by editors Aryan Tiwari and Reva Sawant

Original paper which is reviewed: Ray, D., Bouziane, I., Das, M., Friston, K. J., & Caballero-Gaudes, C. (2022, July 25). Enhanced top-down sensorimotor processing in somatic anxiety. Nature. Retrieved December 19, 2024, from https://www.nature.com/articles/s41398-022-02061-2

## A Review on 'Parent and Peer Messages About Homosexuality: Considering the Role of Gender'

Written by editors Fern (Shirin Raman) and Prajakta Karkhanis

Original paper which is reviewed: Foust, M. D., Ward, L. M., Hagelskamp, C. \& Rowley, S. J. (2021). Parent and Peer Messages About Homosexuality: Considering the Role of Gender. Sexuality \& Culture, 25(2), 597–622. https://doi.org/10.1007/s12119-020-09785-7

# Academic Papers

These papers were written by the student body of Ashoka University, Haryana, India. Any work produced reflects the opinions of the author's and not the Review's.

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Editors: Pratyusha Gupta, Prajakta Karkhanis
Feedback by: Prof. Annie Baxi

ASHOKA PSYCHOLOGY REVIEW

# Selective Memory of the Bengal Partition: Examining Collective and Individual Experience of Trauma

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## Editor's Opinion

Sparshi's paper is a study of how trauma shapes memory- both individually and collectively. By centring her grandfather's experiences, she personalises the history of the Bengal Partition, moving beyond political abstractions to reveal the psychological mechanisms at play in survivors' recollections. The paper explores how trauma alters the way individuals engage with their past, often leading to detachment, dissociation and selective forgetting—coping strategies well-documented in psychological literature. The discussion of detachment as a shared experience rather than an individual pathology lies at the heart of the paper, effectively illustrated with how collective narratives can override or even reconstruct personal memory, a phenomenon linked to the psychological concept of dissociative adaptation. Her discussion of ambiguous loss—the lingering grief of displacement and estrangement—reinforces how psychological wounds can persist even in the absence of explicit physical violence. While the paper makes excellent use of theory, engaging deeply with research on intergenerational trauma and post-memory could have further strengthened its argument. The idea that survivors' silence is often not just an act of forgetting but a protective mechanism to shield later generations from distress is well-documented in trauma studies and allowed for further exploration. Drawing parallels with other mass displacements or partitions (such as that of the Punjab Partition) might have provided a broader framework for understanding the universality of these psychological responses as well. Overall, Sparshi's work captures the minds' negotiation with suffering in the aftermath of collective upheaval and serves as a contribution to both partition studies and trauma psychology.

In the year 1947, Bengal underwent a major geographical and socio political change– referred to as the Second Bengal Partition. This traumatic event divided the nation of Bengal into East and West Bengal by the British government using a border known as the Radcliffe Line. West Bengal, following this event, became a part of India and East Bengal became a part of Pakistan. This is the collective memory of the Bengal partition. When we talk about the Bengal Partition, we remember the sacrifices of the martyrs who we memorialize, the divide of Bengal over the idea of religion and the communal riots that occurred during and after the partition due to conflicts between Hindu and Muslim individuals. No emphasis or attention is placed upon the displacement of the people and their colonies from their homes, their country (Bhattacharya, 2022). The surroundings of the people who relocated during and just before the partition drastically changed overnight. Research has found that traumatic events are more likely to be remembered if they are a socially shared experience and more likely to be forgotten if it's an individual's experience (Brewin, 2018). Thus, this paper will divide the collective and the individual experience of the Bengal partition and argue that individuals attempt to forget their personal experiences of displacement during the Bengal partition and instead recall a collective experience to heal from their trauma. The 'collective experience' mentioned above refers to a simplified, overarching sequence of events that occurred as part of the Bengal partition. This is similar to the idea of a dominant narrative. A dominant narrative is a frequently repeated version of an event that is heard and accepted on some level, whether we are aware of it or not (Morton, 2019). The dominant narrative of the Bengal Partition does not capture the experiences of every individual who suffered as a result of the event. Instead, it focuses on a specific dominant experience and imposes the facts of this experience on every individual part of it as the 'theory' of that event. The theory of the Bengal Partition talks about the divide of Bengal over religion. Essentially, the idea of the two nation theory is popularized with the partition as a whole (Ray, 1977). The two-nation theory is an ideology that advocates for two separate homelands for Indian Hindus and Indian Muslims

in a decolonised India. This theory is used to explain the cause of the partition being the cultural differences between Muslims and Hindus in Bengal, as well as all over India (Engineer, 1996). Why are we, as a nation, more intrigued with discussing the causes of the partition rather than the nuances of its drastic aftermath? The discussion of the aftermath focuses largely on differences of religion and the collective events that the nation endured. There exists very limited literature focusing on the individual experiences of trauma from the Bengal Partition.

## Method

As part of my field work, I chose to conduct a semi-structured interview with my grandfather, Utpal Bhadury, and make him the protagonist of my research. The interview was originally conducted in Bengali and later translated into English. A phone recorder was used to record his answers in a quiet room. Field note observations were transcribed. Anecdotes related to my grandfather's childhood were an important part of my childhood. Hidden within these many memories were also experiences of the Bengal Partition. He never spoke about the partition directly.* I was aware that my grandfather was considered to be the head of the family, regarded as a father figure by his seven sisters, but it was only after this interview that I began to understand how much he sacrificed to maintain his household. His family migrated to India from East Pakistan during the partition. He is currently 94 years of age and resides in Kolkata, the capital of West Bengal.

## Detachment as a Collective Experience

When asked about the image of the Bengal partition, he responded with, "When I think about the partition, I don't merely think about the Bengal partition. It was not just Bengal that was divided, it was the entirety of India. Places like Bengal, Balochistan, Punjab were all divided" (U. Bhadury, personal communication, March 10, 2023). Instead of elaborating on any of his personal experiences, he spoke, at length, on the geography of the partition through oversimplification of the event. He avoided referring to any images or stories that came to his mind. He focused on the theory of partition rather than his experience of it. He saw the partition, not as something that could affect him or his family personally, but as an event that affected the nation as a collective.** Initiating discourse on an event as if one was unaffected by it personally occurs often in situations like these. Individuals often talk about the Bengal partition as if they were not the people affected by it. This is because a potential response to individual trauma is detachment (Weisner, 2020). Thus, emotionally detaching themselves from the details of their experiences may lead to repeating objective facts about the event. This is similar to the phenomenon of persistent derealization, a specific type of dissociation, where an individual feels detached from the situation they are in, resulting in thinking they are observing themselves from outside their body (Spiegel, 2023). However, this is not to claim that all migrants affected by the partition have a mental health disorder. It merely proves that severely traumatic events do tend to cause detachment from personal experiences which translate into a collective experience of dissociation. When this experience is collective it ceases to be categorized as a mental health problem. It is rather a psycho-social problem that requires different attention and intervention (Ganslev et al., 2020). Dissociation causes individuals to tolerate distressing events by fragmenting highly incoherent or overwhelming thoughts, memories, and feelings (Granieri et al., 2018). Thus, using this as a coping mechanism when speaking about the partition is not a rare occurrence in individuals who were severely affected by the event.

## Violence Redefined

Why is there a lack of discussion on individual experience of displacement in the Bengal partition? A reason that contributes to absence of discussion over narratives from the Bengal partition is the conception that the Bengal Partition did not witness as much violence as other states of India such as Punjab. "Stories from Bengal are 'relatively free from violence in its crude form'" (Ghosh & Ali, 2020). The perception of violence in our vocabulary largely includes physical violence such as murder, torture or physical assault. Social injustice or structural violence often does not qualify as violence in used vocabulary (Pontara 20). When talking about violence, we tend to ignore the idea of structural violence and focus on physical violence. Utpal Bhadury, in his interview, spoke about the Great Calcutta Killings of 1946 where his uncle was stabbed to death. He expressed grief over this.*** However, when approached about the topic of adjustment after his family relocated to West Bengal, he was hesitant to spare details. "After my uncle's death, tension spanned the household, the rest of my family migrated from East Pakistan and we rented a room in the Beniapukur area with the attempt to begin our lives in the new Bengal. I had to leave my studies and take up a job to take care of my family. Ar ki bolbo?" (U. Bhadury, personal communication, March 10, 2023). The last sentence, when translated from Bengali, means, "What else do I say?". However, the tone that accompanied the sentence, denoted that there was more to say. However, it also meant that there was nothing else that he wanted to disclose. The findings from this interview shows that Mr. Bhadury's experience of violence was not physical conflict or even direct attack. The violence he experienced was the pain of being denied the right to study, of having to take up the responsibility of supporting a family. His actions signaled that he was more uncomfortable when talking about the structural violence that he was a victim of. Thus, one of the primary reasons for the lack of representation on individual experiences of partition is because any struggle that does not include physical violence is not considered vital enough to mention. Apart from this, it is also the societal construction of the belief of what is worthy of representation.

## Refusal to Remember

Another reason for the selective memory regarding the Bengal partition is the struggle to heal from these experiences. The refugees who were able to survive the traumatic events and provide for their families refuse to revisit these memories. In cities like Kolkata, "an underlying pride prevails in immigrants' successes in consolidating their presence and shaping the city's topography" (Bhattacharya, 2022). Today, the residents of Kolkata, many of whom come from migrant families, invisibilize what their ancestors endured by showcasing their modern multi-storied houses (Bhattacharya, 2022). They also invisibilized their grief of losing, comparing the gains (stability, settlement, regained resources etc) of their effort of recuperating with the trauma. The idea of collective progress and development of West Bengal is characterized by forgetting any trauma associated with migration. "Our family always carries the memories of the different life that we led back home. My great grandfather was a teacher who was respected in his village, they had money, they had a home, and most importantly, they had

stability.Once they came to West Bengal, we changed houses every month and slowly moved up the economic ladder. It was a long journey to get to where we are today. There is so much silence because we feel that we have lost to the 'Outsider'. We feel ashamed that we fell prey to the plans of the British government" (U. Bhadury, personal communication, March 10, 2023)****. As patriots, we associate land with a sense of identity. Immigrants constantly feel a loss and sense of estrangement from the land their homeland or 'desh' (Bhattacharya, 2022). In the context of displacement, an 'ambiguous loss' connects self and belonging to the idea of a homeland— often seen by refugees as a multidimensional concept that ties physical geography of landscapes to their cultural identity (Bunn et al., 2023). Thus, using ambiguous loss theory, refugees' connection to this idea of a familiar multidimensional home often results in an estrangement of their current home, as residue of these losses were still felt. Nevertheless, the guilt and shame of the partition is remembered because this channels the sense of heightened patriotism that a Bengali feels for their homeland today.

## Individual Memory shaped by Collective Memory

What is the relationship between the individual to collective memory of an event? The memory of each individual's experience of the partition is different. The memory of the Bengal partition, like any historical event, is a result of the memories of the millions of people who went through the partition and the memory of the experiences they passed on to their future generations of their families. However, the collective experience and the individual experience, in situations like these, cannot be separated. The memory of an individual is the result of interactions with others in the community (Araújo & Santos, 2009). Therefore, when talking about the experience of trauma and how one remembers this trauma, the collective experience of trauma shapes the individual experience of trauma. Not only do individuals attempt to deflect to the theory of the Bengal partition formed by the collective experience, this collective experience of trauma, with extensive interaction, may actually be able to override and reconstruct the memory of the individual and the trauma associated with their experiences. Thus, after extensive interaction with others in the same community, the individual's suffering due to their displacement from their homes and their families, is converted to this idea of rage, guilt and shame. Often, it has been observed that attempting to recall severely traumatic events that contain disastrous collateral damage or consequences, for example, the Bombing of Hiroshima or the Holocaust, results in a loss of perceived intensity of the event. "In providing an explanation of what has happened, the history that is recounted serves to justify unjustifiable violence and banish it from the collective imagination" (Araújo & Santos, 2009 ). In research conducted by experimenters, it has been found that the action of being told to forget, or active attempts to forget is possible to an extent with people who have the capability to dissociate, under certain circumstances (DePrince & Freyd, 2004). This can be used to substantiate the claim that if an individual who suffered from trauma actively attempts to forget their experiences, this might be possible. Mr Bhadury, in his interview attributed silence about the past being maintained to fear of reliving the pain, guilt and shame that accompanied the individual experiences of displacement. He stated that choosing to forget helped to pretend that the events did not happen. Thus, individual experiences of trauma shape part of the collective experience but the effect of collective memory on individual memory of traumatic events is more evident and significant. This memory of collective experience not only provides a sense of belonging to the community of victims, but also often overwrites the individual's own experience of trauma. In case of the Bengal partition, religious conflict for both Hindu and Muslim survivors, was a more pertinent topic of discussion with other survivors than discussing one's financial and familial struggles to make ends meet.

## Affect and Memory

However, despite our desperate efforts towards erasure from traumatic events, one is only able to dissociate from certain situations or make an attempt to forget. Although research states that individuals attempt to forget their traumatic experiences, such as the loss of their sense of belonging, their identity and their homes, it also states that individuals are more likely to remember memories that are more emotionally significant. "It has long been known that experiences that elicit arousal are more likely to be remembered than experiences that do not evoke an emotional response" (Kensinger, 2009). Thus, a negative memory such as losing a family member, leaving one's home and childhood memories overnight, will cause high emotional arousal. The emotionally salient the memory is, the harder it will be to forget. Research shows that in order to remember a memory, three phases have to occur. The memory must be encoded, consolidated and retrieved. This process occurs more accurately when high arousal eliciting emotions are attached to the memory (Kensinger, 2009). Apart from this, it is not only emotionally salient memories that are recalled better. Recall is most accurate when memories are negative. "Negative affect, in particular, is more likely to lead to focal memory enhancements, whereas positive affect often conveys little benefit to memory accuracy" (Kensinger, 2009). Thus, even though individuals who have suffered through trauma related to financial instability, familial tragedies are more, may be able to forget their experiences in rare situations, but usually, they actively try to forget their experiences and are unable to.

## Conclusion

The relationship between history, trauma and memory is complicated. We are tempted to believe that history of the Bengal partition carries an objective truth and that memories of events are mostly just subjective. However, it is memory that forms almost all of history. Memories of tragedy, loss of shelter, struggle for survival and more. In turn, the collective memory of a historical event also affects how we recall our individual experiences of trauma and what we choose to remember and what we choose to forget. The entire struggle for each individual in the collective is to erase their personal experience and solely remember how an event affected their community. This is so that they can heal and move on from the trauma of their individual experiences.

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## Footnotes

* These were never like the solid, concrete accounts or sit-down stories that he would share while sipping cha (tea) on a random evening. I had an inkling about his experiences during the partition through fleeting moments of vulnerability, here and there, at small family gatherings.

** In the course, Professor Aparna Vaidik spoke about victims of the partition not wanting to talk about their experiences. However, I had believed that my grandfather would not be one of these people. He is a very vocal man, who expresses all of his opinions regarding every political event. I had believed that the partition would be just another political event, and I was mistaken.

*** I wasn't aware of this information prior to the interview and the sudden change of depth in the conversation struck me. I thought about how this was probably one of the first things that he must have thought of when I asked him the first question. I could gauge my grandfather's slight changes in expression. It was very subtle. His eyes turned glossy. I reflected upon this after the interview as I thought about the experiences related to certain events that we try to forget through the course of time. Events that occurred during that Bengal partition were not proud or happy memories for my grandfather. As I continued with the interview, I saw these memories resurface and I noticed his resistance to them. I witnessed him trying to forget as he sat in front of me, trying to curb the topic.

**** My grandfather elaborated that silence about the past was maintained because remembering brought back emotions such as pain, guilt and shame. Choosing to forget helped them pretend that the events did not happen

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ASHOKA PSYCHOLOGY REVIEW

# Role of preSMA in Prospective Suprasecond Time Interval Estimations

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## Editor's Opinion

This paper, through a critical lens elucidates on a problem that stems from science's ever-evolving and dynamic nature. It is not a straight arrow, but rather a complicated diagram, with entangled elements. How does an area associated with planning and execution also play a role in timing, especially our estimation of it? By admitting to the pitfalls in the papers included, this comprehensive analysis has opened doors to exploring this phenomenon further and understanding questions like whether pre-SMA encaptures the decision making process, or simply encodes for the delay caused by it.

Time perception, or our ability to perceive the passage of time, is essential for various aspects of daily life – from coordinating movements like catching a ball to interpreting complex sequences of events. Interestingly, the brain seems to process different time ranges differently. While short intervals are readily perceived, estimating longer durations (suprasecond intervals) is more challenging. Different brain regions contribute to this intricate process. One region of particular interest is the Supplementary Motor Area (SMA). The SMA is known to be involved in planning and executing movements. However, research suggests that it also plays some role in timing. The focus in this paper will be on the pre-supplementary motor area (preSMA), a subregion of the SMA. How does the preSMA contribute to estimating prospective time durations longer than a few seconds (suprasecond time intervals)? Grodin (2010) distinguishes between prospective timing, where we estimate durations yet to happen, and retrospective timing, where we reconstruct durations from the past. My focus in this paper will solely be on prospective timing.

## Past Studies on Time Perception

Let us first understand some major findings in time perception studies that have explored various brain regions involved in our sense of time. Grodin (2010) summarises past literature on timing that uses brain imaging and studies of patients with brain damage and have found several cortical and subcortical regions responsible for time interval estimations: the cerebellum, basal ganglia, parietal cortex, prefrontal cortex, premotor cortex, and the SMA. Additionally, the dorsolateral prefrontal cortex (DLPFC) plays a role in processing longer durations and might be involved in more cognitively demanding timing tasks (Buhusi Meck 2005). It is interesting to note that many of these regions are also known to play a role in movement cognition. For instance, the basal ganglia are involved in motor control, selecting actions, and learning; the cerebellum coordinates and fine-tunes movement by integrating sensory and motor information; and the premotor area and SMA are interconnected with these regions and are involved in planning, voluntary control, and execution of movement. Why might a region like preSMA be involved in time processing?

## Why Motor Areas in Time Cognition?

A popular understanding is that motor behaviors or sequences of movements provide a way to reproduce time intervals (Cassenti, 2011). Also, precise timing of action related movement would be advantageous and desirable in organisms. Hence, any action cognition would involve processing of time in order to coordinate movements across different muscle groups. Macar et al. (2006) found greater activation of the SMA proper in the precise control of time as compared to force. Further, Ivry et al. (2004) suggest that timing might be an emergent phenomenon arising from cognition and coordination of rhythmic movements that do not involve other, external

stimuli. Previously, studies linked the SMA to processing shorter intervals (under a second). However, more recent investigations reveal the SMA's involvement in estimating durations exceeding one second as well. This broader role is supported by brain imaging (fMRI) findings showing SMA activation during both timing tasks and simple counting tasks performed at a rate of one count per second. These findings suggest the SMA might be integrated within a larger network involving the striatum (a subcortical region) and the cortex. This network is called the "striato-cortical pathway" and is thought to play an important role in our sense of timing. However, we need to keep in mind that the review article was published in 2010 and there have been many studies since which have looked at the role of preSMA in timing. For instance, Merchant et al. (2024) studied time encoding strategies in primates and found that preSMA represents a subjective category boundary by reaching peak activity at the moment that separates the set of test intervals into "short" and "long."

## Supplementary Motor Area and Time Perception

The SMA (Supplementary Motor Area) plays a crucial role in both prospective and retrospective timing, especially for durations above milliseconds (Pouthas et al., 2005; Buhusi Meck 2005; Wiener et al., 2010). The SMA can be both anatomically and functionally divided into the pre-supplementary motor area (pre-SMA) and SMA proper. Pre-SMA contributes to action initiation through the utilisation of internally generated temporal representations (Mita et al, 2009). Pre-SMA is particularly involved in initiating actions based on internal timing estimates and shows activity during sensory, non-sequential, and suprasecond temporal processing (Schwartze et al., 2012; Chao et al., 2009). It is also shown to be potentially related to decision-making at the end of an interval (Pfeuty et al., 2019). SMA proper might be more involved in processing non-explicit and subsecond durations (Schwartze et al., 2012).

## Supra-second Time Intervals Processed by preSMA

Let us now have a look at a more recent study by Pfeuty et al. (2019) which examined the role of the pre-supplementary motor area (pre-SMA) in representing durations exceeding a few seconds (supra-second time intervals). They used a unique method called intracerebral electroencephalography (iEEG), which involves implanting electrodes directly into the brain of patients with epilepsy. These patients already had electrodes implanted in the SMA region for clinical reasons. The patients participated in a task where they viewed visual stimuli for various durations (supra-second range) and then tried to reproduce those durations by pressing a button. The study observed increased pre-SMA activity during the presentation of the target supra-second intervals. Interestingly, this activity peaked towards the end of the target interval, suggesting a potential role in the concluding stages of duration estimation. The authors propose two possible interpretations for the pre-SMA activity. Firstly, it could be involved in decision-making as the rising activity could reflect a process of accumulating evidence and deciding when the target duration has elapsed. Secondly, it might be involved in temporal accumulation as the activity might directly represent or be a proxy for the accumulation of time itself. As time progresses during the presentation of the target interval, pre-SMA activity builds up, potentially reflecting the ongoing internal representation of elapsed time. In support of this interpretation, Akkal et al. (2004) had also hypothesised that the progressive firing pattern of preSMA could be representative of some time computation that estimates a fixed time interval.

## Limitations

However, I believe that the study has some limitations. It has a very small sample size (only 4 patients) with epilepsy. Using epilepsy patients with pre-existing brain abnormalities restricts generalising the findings to healthy individuals. Secondly, while iEEG does offer high spatial resolution, it has limited coverage of the entire brain. This then restricts investigating interactions between pre-SMA and other brain regions involved in timing. Lastly, the study focused on reproducing presented durations. Future research could explore if pre-SMA activity shows similar patterns during prospective timing tasks while estimating durations without an external reference. The paper also acknowledges limitations in the iEEG filtering potentially affecting detection of lower frequency activity during encoding and reproduction periods. The authors suggest further investigation using time-frequency analysis of the iEEG data. Additionally, they emphasise the need for future studies with a larger sample size and tasks that manipulate the probability of target interval occurrences.

## Future Avenues

Overall, we saw increased pre-SMA activity during tasks involving suprasecond durations. Pfeuty et al. (2019) directly observed this with iEEG recordings during a reproduction task. The timing of this activity seems crucial. Background information suggests the CNV (contingent negative variation) might be relevant, while Pfeuty et al. (2019) found pre-SMA activity peaked at the offset of the target interval. This suggests pre-SMA might be involved in the later stages of suprasecond timing. Thus, there is evidence that suggests that the pre-Supplementary Motor Area plays a role in preparing for the timing of a future movement that is supposed to take place after an anticipated time suprasecond interval (Pfeuty et al., 2019). It is known that the pre-supplementary motor area (preSMA) was found to have greater activity in individuals with quicker responses (to known time delays) (Chao et al, 2009). Also, in patients with a damaged pre-SMA, Wolpe, et al. (2022) found significantly lower response threshold for initiating an action. Thus, we can infer that the pre-SMA plays a role in mediating response inhibition by evaluating evidence before committing to an action. Moreover, Sánchez-Moncada et al. (2024) found that the pre-SMA and caudate-putamen are involved when we generalise perceptually learnt time interval based responses and apply these responses to actions (motor context). Thus, I think that the pre-SMA is involved in inhibiting a motor response in accordance with a given time estimation. For example, if instructed to move a finger after a certain demonstrated time (say 3 secs), the pre-SMA might ensure (through inhibitory effect) that the signal to move the finger initiates only after that time interval of 3 seconds. However, it is still unclear whether the pre-SMA activity reflects a decision-making process (accumulating evidence about duration) or directly encodes elapsed time itself. Further research is needed to differentiate these possibilities.

## Conclusion

In conclusion, the pre-supplementary motor area (preSMA) emerges to be an important brain region that seems to be involved in processing suprasecond time intervals, particularly within the context of prospective timing. While traditionally preSMA has been linked with motor planning and initiation, evidence increasingly supports its involvement in the temporal processing of durations exceeding one second as well. Studies like Pfeuty et al. (2019) suggest that the preSMA may be particularly important in accumulating temporal information and potentially making decisions about the timing of an action based on internally generated cues. This is further complemented by findings that show its role in response inhibition and action initiation, suggesting a finely tuned mechanism that balances both the perception of time and the preparation for time-based actions.

However, limitations of small sample sizes and reliance on epilepsy patients highlight the need for further studies to determine whether preSMA activity directly encodes elapsed time or reflects merely a decision-making process about duration. Future research with larger samples, diverse methodologies, and tasks that isolate prospective timing without external cues will be essential to deepen our understanding of the role of preSMA in time perception. Thus, while current evidence points toward a significant role for the preSMA in suprasecond timing, ongoing exploration will clarify the precise nature of its involvement in this complex cognitive function.

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ASHOKA PSYCHOLOGY REVIEW

# Nudge Theory's efficacy in influencing positive Health Behaviours in the Workplace

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## Editor's Opinion

The critical lens of the paper ensures that readers gain a realistic perspective on both the promise and pitfalls of such nudge-based strategies. Overall, this is an insightful starting point for leaders, HR professionals, and policymakers aiming to foster healthier workplaces through subtle yet impactful behavioural interventions. The paper is indicative of the growing trends in research to focus on application oriented research with immediate implications in the corporate world. Avenues for future research include exactly how nudges interact with broader systemic factors, such as workplace stress or organizational policies, which also hugely shape employee health behaviours. Additionally, integrating case studies from diverse cultural and industry settings might offer a richer understanding of context-specific success.

Nudge theory, a part of behavioural economics and social psychology, explains that choice-making can be subtly influenced through the deliberate design of the environment in which decisions are made (Thaler Sunstein, 2008). This theory was introduced as a base to derive decision-change tools from and it posits that because humans have limited rationality and often rely on experience, instinct, and "fast thinking", they do not fully consider all decisions, making them susceptible to nudges (Kahneman, 2011). Fast thinking refers to decisions made based on intuition, gut-feelings, and those that do not involve a fleshed out process of thinking. The theory employs dual systems theory, as described by Kanheman as well, to explain how nudges influence behaviour. The theory states that humans rely on two systems to make decisions and influence behaviour: the first is quick, intuitive, and functions on an unconscious level, while the second focuses on deliberation and reasoning. By targeting the first system through subtle cues, nudges can influence decisions toward desirable outcomes (Thaler Sunstein, 2008; Van der Meiden et al, 2019). Nudge theory is used everywhere in today's world, and can be used to encourage healthy behaviour and better decision-making (Thaler and Benartzi, 2004; Karlsen and Andersen, 2019 etc.). Humans often prioritise short-term satisfaction over their long-term goals and this can become a reason that they are more likely to make unhealthier choices in terms of food and physical exercise (Hunter et al., 2018). With the use of nudges, these decisions can be influenced so that healthier choices are made. Certain habitual choices, born out of convenience or necessity, can have long-term negative effects, such as consistently choosing elevators over stairs (University of Missouri-Columbia, 2008) or making unhealthy dietary decisions for short-term satisfaction (Meeusen, Voorn, Berk, 2022). These are examples of health behaviours, which are defined as actions taken by individuals that affect health and mortality (National Library of Medicine, 2015). Throughout this paper, the efficacy of nudges in influencing an increase in positive and, simultaneously, a decrease in negative health behaviors will be studied. Unhealthy food choices (Bremner et al., 2020) and lack of physical activity (Fox Hillsdon, 2007) can have detrimental effects on an office employee's health, directly impacting efficiency, absenteeism, and workplace performance. Therefore, it becomes important from a managerial perspective to improve employee health. Health and organisational psychologists continuously strive to develop methods to encourage healthy behaviours, one of which is the use of nudges (Venema Gestel, 2021). This paper will explore the effectiveness of nudges in improving employee health by evaluating supportive studies and comparing their results and reliability to studies that provide opposing views. After a comparison of both supportive and opposing studies, this paper will attempt to provide an answer to the research question: Can nudges be employed to significantly increase the positive health behaviours, healthier dietary choices and physical movement of employees in the workplace?

## Comparing Studies on Stair Usage

This section will explore studies on the amount of physical activity employees get in the workplace, as this directly influences physical and mental health (Fox Hillsdon, 2007). Office employees often prefer elevators over the healthier option of taking the stairs even for shorter travel distances such as 1-3 floors. Several studies have identified that encouraging stair use can improve employees' physical and mental health, as exercise has a direct link to mental well-being (Fox Hillsdon, 2007). Two studies support the effectiveness of nudge theory in increasing stair usage among office employees. Kwak and colleagues (2005) aimed to see whether using prompts as an intervention would increase stair usage in both white- and blue-collar workers. Using posters with messages about the benefits of stairs, they observed an increase in stair usage from a baseline of 32.6 percent to 37.7 percent after implementing the intervention at both worksites over three weeks. Post-intervention data showed stair usage declined to 33.8 percent. Does this show that nduges are not very effective for long term behaviour change?

Similarly, Van Nieuw-Amerongen, Kremers, Vries, and Kok (2011) assessed whether increasing the attractiveness and accessibility of a stairwell impacted its use among employees and students at Maastricht University. They introduced banners with health messages and made structural changes to improve stairwell visibility and accessibility. Observations over seven weeks showed stair use increased from 51.8 percent to 60.0 percent during the intervention period. Post intervention, this increase remained stable at 8.2 percent for a period of 4 weeks, demonstrating the efficacy of such nudge implementation. Both studies employed field experimental designs as there was manipulation of the independent variables, the nudges, allowing for cause and effect between the interventions and stair usage to be inferred. The large sample size of the 21,786 observations enhanced reliability by reducing the impact of participant differences. A repeated measures design minimises confounding variables. A significant increase in this particular positive health behavior was seen during the intervention phase for both studies which indicates the effective planning put into the implementation. What further highlights the effectiveness of the nudge for the second study was that it had significant lasting impact compared to the first which could be attributed to study design or sample biases, but was most likely seen due to the fact that this study made physical changes to make the stairs more accessible. This goes to show that the differences in nudge implementation can influence long term results significantly. However, generalizability is limited due to cultural factors, as both studies were conducted in the Netherlands since they tend to lead a more active lifestyle meaning that they may be more receptive toward nudges encouraging the same. Demand characteristics may have also affected Kwak et al.'s study, as participants had prior exposure to health interventions. In Nieuw-Amerongen et al.'s study, the absence of human observers, having been replaced by cameras and a computer program, reduced the possibility of such demand characteristics but, due to limitations such as the lack of observation of the second or third floors, and confounding variables such as elevators being out of service, the accuracy of the results may have room for improvement. Regardless, both studies have high ecological validity due to being conducted in real workplace settings. Conversely, two studies revealed contradictory results regarding the effectiveness of nudges in increasing stair usage. Avitsland and colleagues (2017) explored the impact of nudge-based interventions in office buildings. Using footprints leading to stairs and 'stair-riser' banners, they found that stair usage in the experimental building decreased from 89.6 percent to 79 percent during the intervention period. The nudges were perceived as childish, suggesting that negative perceptions can undermine their effectiveness. Similarly, Meiden, Kok, and Velde (2019) aimed to determine if and why nudging interventions stimulate stair use among employees. Over five weeks, they introduced footprints and posters in a Dutch online retailer's headquarters. While footprints had a slight positive impact, posters did not significantly influence employees. Stair use significantly decreased as well after the intervention period, showing no long-term impact. Both studies faced limitations such as potential confounding variables due to different building layouts and lack of random allocation (Avitsland et al., 2017), and possible social desirability bias and the Hawthorne effect, a phenomenon wherein people tend to alter their behaviour when they know they are being observed, from direct observation and questionnaires (Meiden et al., 2019). Despite using field experimental designs with large sample sizes and repeated measures, the nudges were ineffective or even counterproductive in promoting stair usage. These studies highlight that nudges may not always successfully promote health behaviours and can sometimes have the opposite effect if the nudges are perceived to be demeaning or patronizing. They also highlight, in a different sense, that certain nudges can be more effective than others in the short run, but their effectiveness in the long run also matters. Therefore, while some studies support the effectiveness of nudge theory in increasing health behaviours like stair usage in the workplace, others reveal limitations and potential ineffectiveness. The mixed results suggest that the success of nudges may depend on factors such as cultural context, design of interventions, and participants' perceptions. For example, with Kwak et al (2005), posters proved to be effective in the short run, whereas they failed in both Avitsland et al (2017) and Meiden et al (2019), showing the importance of cultural context in terms of perception and design. These studies underscore the need for careful consideration when implementing nudges to bring about desirable changes in workplace health behaviours.

## Comparing Studies on Dietary Choices

Aside from reduced physical activity in the office, employees regularly make unhealthy diet choices that can be detrimental to their health (American Heart Association, 2023). This leads to increased absenteeism and reduced efficiency (Nawata, 2023). The paper will now explore studies on the dietary choices of employees in the workplace. Two studies support the effectiveness of nudges in promoting healthier dietary choices among employees. Velema, Vyth, Hoekstra, and Steenhuis (2018) analysed the effects of nudges on employees' purchase behaviour in workplace cafeterias over 12 weeks. Fifteen cafeterias were randomised into control and intervention groups. The interventions included 14 strategies based on product placement, price levels, and promotion, with healthier food choices made more visible, advertised more, and priced lower during the intervention period. Results showed a positive effect on the purchase of healthier alternatives in three out of seven food groups studied, consistent throughout the 12 weeks. The researchers concluded that product marketing affects employees' purchases and that nudges can promote healthier food choices over a sustained period. Similarly, Meeusen, Voorn, and Berk (2022) studied the effectiveness of nudging strategies in a workplace cafeteria over two months. They implemented nudges such as product placement, changing the ratio of healthy to unhealthy foods, motivational statements, and providing nutritional information. Data collected from 905 photographs of workers' lunch trays showed a 41 percent in-

crease in the purchase of healthier wheat products, such as whole grain over white bread, though not for bread fillings and beverages. The researchers concluded that the combination of the three nudging strategies led to an improvement in healthy dietary choices, albeit in a single dimension of diets. Both studies employed field experimental designs with large sample sizes, enhancing reliability and allowing for cause and effect to be inferred. The repeated measures design controlled for participant differences and potential confounding variables. However, limitations include potential confounding variables such as dietary restrictions and individual differences not being accounted for, which may have affected the data. In Velema et al.'s (2018) study, the lack of negative interventions to decrease unhealthy food choices could have led to more convincing results. In Meeusen et al.'s (2022) study, human error in data calculation from photographs may have reduced reliability. Overall, these studies support the idea that nudge-based interventions can positively influence some food choices and health behaviours of employees in the workplace but also highlight limitations to their effectiveness, primarily affecting certain food groups and special circumstances. Conversely, a study by Wilson, Bogomolova, and Buckley (2015) aimed to identify solutions to encourage healthier dietary behaviours in employees but revealed different results. They monitored milk selection in a university-based research institute's kitchen over 12 weeks to establish a baseline, then placed a nudge encouraging the selection of low-fat milk for another 12 weeks. Results showed that during the baseline, the selection of low-fat milk was already higher than full-cream milk, and this trend continued during the intervention. While there was a temporary increase in the selection of both types of milk in the first two weeks of the intervention, selections returned to baseline levels thereafter. This suggests that the nudge was ineffective in promoting healthier milk choices in the long run. A limitation of the study was its setting in a highly educated environment, where participants were likely more health-conscious, limiting generalizability. The increase in milk selection during the first two weeks may have been due to the Hawthorne effect introducing unreliability. Additionally, the intervention did not include a negative nudge against the unhealthy choice, which might have produced different results. Despite being a field experiment with a large sample size, allowing cause and effect to be inferred, the nudge proved ineffective at influencing the health behaviours of the employees. The duration of the intervention was key; a shorter period might have suggested effectiveness. Overall, this study does not support the effectiveness of nudges in increasing health behaviours of employees in the workplace.

## Conclusion

The studies supporting the effectiveness of Nudges in increasing health behaviours of employees in the workplace show that nudge-based interventions can have positive intended effects on employees' health behaviours. The extent of the effectiveness is also showcased by post-intervention data collections which reveal that some studies have a long-lasting effect, supporting the efficacy of nudge-based interventions. However, the studies that oppose the same outline the conditions and effectiveness of nudge theory for this purpose more precisely. These studies reveal that some nudges lose effectiveness due to workplace mindsets, meaning that an intervention needs to be well-suited for specific workplaces. Nudge theory can be effective in eliciting a positive behaviour change in employees in the workplace to increase health behaviours. However, there are certain limitations to their effectiveness. Interventions need to be well-operationalised to bring out a long-term impact by affecting workplace mindsets. The social-desirability bias can also act against the intended purpose of the intervention if not controlled. Certain nudges can be more effective than others and using a combination during intervention periods may have the best outcomes.

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ASHOKA PSYCHOLOGY REVIEW

# Post Traumatic Stress Disorder and the Hippocampus

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## Editor's Opinion

We've all heard of post traumatic stress disorder, or PTSD. However, despite its popularity, it is misunderstood and sufficiently under researched, especially when it comes to understanding the complex neurological mechanisms that underlie it. This paper highlights such issues and explores emerging areas of PTSD research, focusing on the relationship between hippocampal volume and various types of trauma. The paper's focus on hippocampus and its involvement in instigating PTSD is of great significance, providing readers with a comprehensive review of studies over the past years. While PTSD has been linked with emotional and psychological distress, the review of studies focusing on its neurological impacts provides readers with a novel perspective. Given that the hippocampus plays a vital role in memory formation and recall, better understanding the relationship between the hippocampus and PTSD can be a starting point to further treatment. This paper effectively brings to the forefront how changes in hippocampal volume could be a contributing factor to PTSD symptoms. Quite often we see papers that focus on combat-related trauma; the author has done a fine job of incorporating studies that focus on PTSD from other types of trauma as well. Overall, understanding the neurobiological aspects of PTSD is a crucial step towards developing proper treatments. This paper is a great starting point to bridge that gap, given its depth. It is a significant contribution to the ongoing research and discussion centering PTSD and the brain.

Post-traumatic stress disorder (PTSD) is a psychiatric condition that may occur in people who have experienced or witnessed a traumatic event, series of events, or a set of circumstances Individuals with PTSD tend to have intense, disturbing thoughts and feelings related to their experience that lasts long after a traumatic event (American Psychiatric Association, 2022). PTSD can lead to disparities in mental, physical, and social health, affecting individuals of any age, gender, ethnicity, nationality, or culture. Oftentimes, individuals may relive the trauma through flashbacks and nightmares, igniting feelings of sadness, fear, anger, and a sense of detachment from the people around them. PTSD is relatively common, with approximately 1 in 3 people affected annually, and a lifetime prevalence of 8 percent in adolescents aged 13-18. Women are also twice as likely to develop PTSD compared to men (American Psychiatric Association, 2022). However, research has primarily focused on combat-related PTSD, leaving a gap in understanding the prevalence and impacts of PTSD across different trauma exposures. Developing improved treatments will require a deeper examination of the varied effects of this condition (Atwoli et al., 2015). Therefore, knowledge of PTSD and its effects can make significant contributions to devising effective treatments, informing prevention strategies and reducing the societal burden of trauma-related disorders to improve outcomes for survivors (Lancaster et al., 2016). Symptoms of PTSD can be divided into four main categories, the most prominent for this investigation being intrusion and cognitive alteration. Consistent, distressing dreams and thoughts accompanied by vivid flashbacks and inability to remember significant aspects of the traumatic event may cause discrepancies with memory encoding in the hippocampus (Hayes et al., 2010). Over the course of approximately 40 years, rapid technological advancements in neuroimaging techniques, such as resting-state functional magnetic resonance imaging (rs-fMRI), have enabled scientists to better understand the cognitive and physiological differences in the brain following trauma (Harnett et al., 2021). These advanced neuroimaging methods have provided researchers with novel insights into the variability of resting-state networks and patterns of intrinsic functional connectivity across the brain, which have been linked to the development of post-traumatic stress disorder and other trauma-related psychopathologies. One of the main differences observed was a negative correlation between memory recollection and the scores of the Clinically Administered PTSD Scale (CAPS) (Dickie et al., 2008). Considering the well-documented role of the hippocampus in declarative memory processes and regulation, this essay will further explore the potential involvement of the hippocam-

pus in the development and manifestation of PTSD (Gilbertson et al., 2002). Given the hippocampus' critical function in encoding, storing, and retrieving episodic and autobiographical memories, researchers have investigated how structural or functional alterations in this brain region may contribute to the emergence of PTSD symptoms (Stevens et al., 2017), a primary focus of investigation in this study as well. Therefore, this paper aims to investigate the extent to which PTSD affects the volume of the hippocampus and its associated cognitive changes by critically analysing and evaluating numerous studies from over the years, to further explore the relationship between hippocampal volume, PTSD and additional factors.

## Structure of the Hippocampus

The hippocampus is an extension of the temporal area of the cerebral cortex, distinguished externally by a layer of densely packed neurons, curling into an S-shaped figure known as the limbic lobe (Anand Dhikav, 2012). The hippocampus is divided into three main parts: posterior, middle and anterior. As part of the anterior cerebral cortex, it is proven to be involved with multiple cognitive functions, including pattern recognition and encoding of memories. The hippocampus has a tendency to have higher focal enhancements for negative experiences compared to their positive counterparts (Kensinger, 2019). This potential feature of the hippocampus could factor into understanding the effects of PTSD on the hippocampus. It has been widely debated over the years that the hippocampus is significantly affected in those suffering from the disorder (Stevens et al., 2017). Numerous studies investigating the role of the hippocampus have suggested that combat-related PTSD is specifically associated with structural alterations in the right hippocampal region (Pavić et al., 2007; Shin et al., 2004; Woodward et al., 2006). However, various studies show that childhood maltreatment related PTSD affects the left hippocampal volume, with volume changes differing in children and adult subjects (De Bellis et al., 2001; Tupler et al., 2006; Villarreal et al., 2002). These key studies will be explored in correspondence to PTSD and its possible effect on the hippocampal volume.

## Correlation between hippocampal volume and PTSD

Several studies have been conducted over the years attempting to understand the correlation between hippocampal volume and PTSD (Dossi et al., 2020). A study by Shin et al. (2004) used functional neuroimaging technology and a word stem completion task to measure the amounts of regional cerebral blood flow (rCBF). The experiment was conducted on 16 firefighters: 8 with diagnosed PTSD (experimental group) and 8 without (control group). Participants viewed three-letter words on a computer screen and completed each stem with a word they had either encoded deeply (high recall) or shallowly (low recall). Results showed that the experimental group exhibited significantly lesser amounts of rCBF in the left hippocampus in the high vs low recall condition. However, rCBF increased in the experimental group with the low recall condition. Furthermore, the PTSD group had higher rCBF levels in the bilateral hippocampus; within the experimental group, symptom severity was positively correlated with rCBF in the hippocampus. The PTSD group also had significantly lower levels of right hippocampal volumes. The results suggest an abnormal rCBF response level in individuals with PTSD during explicit recollection of non-emotional material, relative to increased hippocampal rCBF in the comparison group. Furthermore, a meta-analysis of 98 studies conducted by Shin et al. (2006) suggested that the severity of PTSD is positively correlated with diminished volumes, neuronal integrity and functional integrity of the hippocampus, in contrast to heightened amygdala activity (associated with the regulation of emotion, specifically fear), in support of the conclusions derived from the experiment evaluated previously. These findings are further substantiated by the observations reported in the study conducted by Pavić et al. (2007). The hippocampal volumes of 30 individuals, 15 war veterans with combat related PTSD (experimental group) and 15 healthy individuals (control group) were measured using 3D T1- weighted GRE magnetic resonance imaging sequence. Results showed that the volume of the right hippocampus was significantly lower than that of the left hippocampus among the experimental group (7.88 percent), and the volume of the right hippocampus was significantly smaller in the experimental group as compared to the control group (Pavić et al., 2007). The results of the study can be considered to possess high internal validity due to its controlled and experimental nature. The comparatively shorter interval between trauma exposure and neuroimaging assessment, averaging 9 years rather than the 20-year average observed in prior studies. This further strengthens the reliability of the findings. Notably, the researchers highlight that participants were not exposed to any form of treatment or medication, enhancing the accuracy and validity of the study's conclusions by eliminating potential confounding factors. Additionally, a meta-analysis of 39 studies conducted by Woon et al. (2010) discovered that hippocampal volumes were smaller in PTSD groups and trauma-exposed groups without PTSD as compared to the trauma-unexposed groups. In addition, the size of the right hippocampus was lower in the PTSD group, as compared to the trauma-unexposed group. However, right hippocampal volumes were significantly higher in the non-PTSD trauma-exposed groups as compared to the PTSD groups, thereby substantiating that the right hippocampus and anatomical effect are not independent of a PTSD diagnosis. In contrast, a study conducted by Bremner et al. (1997) on adult survivors of childhood abuse reported a 12 percent decrease in the left hippocampus in individuals suffering from PTSD. The study used 17 survivors of childhood abuse and 17 healthy individuals. These findings were significant even after alcohol, age, education and linear regression controls, suggesting a decrease in the left hippocampus is associated with abuse-related PTSD. The impact of technological advancements, such as those in the field of neuroimaging technology, or changes in the diagnostic criteria for PTSD must be taken into consideration; the changes in the DSM-5, which was released in 2013, are substantial as they give a more conceptual understanding of post-traumatic stress disorder (Pai et al., 2017), thus critiquing the method of sample collection in the study taken. Regardless, these findings do suggest that PTSD affects may be lateralized, thus establishing scope for research in the area, which will be discussed further.

## PTSD, Hippocampus and Memory

Certain studies surrounding the hippocampus, memory and PTSD have also shown contrasting results, essentially claiming that PTSD does not impose adverse effects on memory recollection. One such study was an experiment conducted by Lindauer et al. (2006) on 12 police officers with PTSD, and 12 officers who experienced trauma but did not develop PTSD. Significantly smaller hippocampal levels and high early morning cortisol levels were found in the PTSD group.

Subjects with PTSD also performed worse in the visual memory recall task, and a positive correlation was found between early morning cortisol and right hippocampal volume. However, hippocampal volume did not correlate with memory and it was concluded that memory impairment was not a direct result of the hippocampal volume. While the study had a robust sample size focused on combat-related trauma, its scope was limited to evaluating visual and verbal memory recall tasks, precluding a more comprehensive assessment of cognitive functions. Specifically, focal enhancements in memory encoding tend to occur more for negative memories than for positive ones (Kensinger, 2009). This has important implications for understanding how emotional valences can influence the encoding and retrieval of traumatic memories in PTSD. Furthermore, previous studies suggest that the symptoms of PTSD are associated with the effects and impairment of long-term traumatic memories, which could potentially explain the vivid flashbacks experienced. Research indicates that the symptoms are linked to the disruption of long-term traumatic memories, which may account for the flashbacks. Therefore, the study does not necessarily conclude the irrelevance of the right hippocampus in terms of long-term spatial memory, but only of its potentially insignificant effect on short-term memory. This distinction aligns with research on the lateralisation of memory, which suggests that verbal episodic memory is primarily associated with the left hippocampus, while spatial memory relies on the right hippocampus (Ezzati et al., 2016).

## Cortisol and PTSD

Cortisol plays a significant role in the relationship between stress and memory, which implies the potential role stress and alcoholism could play in the regulation of PTSD symptoms pertaining to memory. Improper mediation of cortisol, the hormone responsible for stress response, can have adverse effects on hippocampus anatomy, resulting in higher tendency of false recognition of memory and critical lures (Bremner et al. 2000; Sapolsky, 2000;). Considering that symptoms rely heavily on improper regulation of emotions and issues with spatial memory regulations, a diminished right hippocampus in such individuals seems justifiable (Mathew et al., 2022). It can therefore be suggested that spatial memory plays a significant role in PTSD, and can result in improper regulation of long-term spatial memory, thus leading to a smaller right hippocampus compared to the left in combat related PTSD (Abed et al., 2020).

## Alcohol and the Hippocampus

Research suggests a relationship between alcoholism and PTSD, where its consumption and abuse may act as a coping mechanism and a factor influencing the memory-related symptoms of the disorder (Dell'Aquila Berle, 2023). Alcohol dependence is characterised by repetitive or compulsive alcohol consumption despite significant problems, and may involve cravings, tolerance and withdrawal symptoms (Smith et al. 2018). As previously mentioned, the study by Lindauer et al. (2006) did not consider the impact of alcoholism and its potential effects on cortisol levels, which can overlap with PTSD symptoms influencing memory and hippocampal volumes. This oversight raises questions about the role of alcohol dependence in PTSD, as evidenced by Smith et al. 's (2018) review, which exhibited higher prevalence of alcohol use disorder in individuals with PTSD. As stress can adversely impact the hippocampus, cortisol interacts with the brain's reward system and cognitive processes (Stephens Wand, 2012). The potential influence of alcohol use and its impact on glucocorticoids on PTSD symptoms warrants consideration when investigating the role of the hippocampus in PTSD. Woodward et al. 's (2006) study on combat veterans found a strong association between PTSD and comorbid depression, but no significant link between PTSD and increased alcohol abuse. Adjusting for cranial volume revealed a 9 percent reduction in hippocampal volume in PTSD individuals, suggesting an indirect influence of alcohol on hippocampal volume. The results of this study indicate that the exclusion of alcohol abuse history from previously mentioned studies does not weaken the relationship between a diminished right hippocampus and combat PTSD. Furthermore, the indifference in results between the alcohol abuse PTSD groups, as acknowledged by the researchers, may hint at the notion that hippocampal volume is a potential predispositional factor, and that lower hippocampal volume may affect the development of PTSD.

## Differences observed in hippocampal volume in combat and childhood maltreatment related PTSD

Numerous studies mentioned in this paper have been conducted on adults with PTSD, specifically combat-related. However, studies conducted on children with paediatric maltreatment-related PTSD have failed to replicate the results which report decreased hippocampal volumes. A study conducted by De Bellis et al. (2001) did not support hippocampal changes in paediatric maltreatment related PTSD. The study used magnetic resonance imaging to measure the hippocampal volume in 9 prepubertal subjects with maltreatment-related PTSD and 9 healthy individuals. Results showed that hippocampal volumes did not differ between groups at base-line, follow up or across time, while average hippocampal levels increased in individuals with PTSD. The pilot longitudinal study allowed researchers to identify developmental changes in the hippocampus, helping to determine whether reduced hippocampal volume is a cause or consequence of PTSD. Subjects were matched at a sociodemographic level, thus minimising confounding variables and increasing the internal validity of the study. Another study conducted by Tupler et al. (2006) investigated hippocampal volume and whole-brain atrophy in relation to PTSD. The study used 61 subjects with maltreatment related PTSD and 122 healthy control subjects adjusted for age and gender, followed by a magnetic resonance imaging scan. Apart from increased white matter volume, results reflected a larger average hippocampal size in young PTSD subjects, while there were no differences in its effect on gender and age. These results further establish a significant difference in childhood maltreatment and combat related PTSD, and also imply the role of white matter atrophy. Contrastingly, a pilot longitudinal study conducted by Carrion et al. (2007) showed that stress associated with PTSD results in hippocampal reduction over a period ensuing 12-18 months. Data from adult subjects in a meta-analysis conducted by Woon et al. (2008) has suggested that hippocampal reductions are associated with PTSD. However, studies conducted on children and adolescents have failed to replicate these results. In summary, this meta-analysis found reduced bilateral hippocampal volumes in adults with childhood-maltreatment related PTSD, but not in children with the same form of PTSD, thereby suggesting hippocampal reduction may not be apparent in PTSD subjects until adulthood. Consistent with a study conducted by Bremner et al. (1997), the study showed a decreased left hippocampal volume in adults with PTSD. These findings suggest that abnormal volumetric

development in otherwise healthy individuals occurs after exposure to trauma.

## Potential role of White Matter (WM) atrophy

White matter atrophy also plays a crucial role in PTSD. It connects brain regions, impacts cognitive abilities, and has been targeted by various medications. A study by Villarreal et al. (2002) found that individuals with abuse-related PTSD had lower white matter to intracranial volume ratios, supporting previous findings suggesting abuse-related PTSD may be attributed to generalised white matter atrophy (Villarreal et al. 2002). Additionally, findings from Zhao et al. (2021) imply that genetic differences in white matter atrophy, particularly in areas responsible for hippocampal connectivity, may be affected by PTSD, leading to structural changes in the hippocampus and potentially explaining inconsistent hippocampal volume patterns (Zhao et al., 2021). Dennis et al. (2019) also reported associations between PTSD and reduced white matter function in the tapetum region, which connects the hippocampi (Dennis et al., 2019).Changes in white matter atrophy disrupt neural pathways, affecting the regulation of associated cognitive abilities, such as long-term spatial memory. These findings collectively suggest that white matter atrophy is a key underlying neurobiological mechanism in the development and maintenance of PTSD.

## Discussion and Conclusion

Relevant literature has demonstrated valuable insights into the relationship between PTSD and hippocampal volume, though several limitations may affect their generalisability and scope. While experimental studies, such as Shin et al. (2004), exhibit strong internal validity, allowing for a robust causal relationship between hippocampal volume and PTSD symptoms, small sample sizes and potential sampling biases, such as a lack of cultural diversity, reduce the generalizability of these findings (Bremner et al., 1997; Shin et al., 2004). Furthermore, while meta-analyses highlight the reliability of cumulative data, some studies, such as Lindauer et al. (2006) overlook comparisons, namely control groups for non-traumatised individuals, limiting their scope and accuracy. Similarly, studies such as De Bellis et al. (2001) face challenges pertaining to short-follow-up periods; the pilot-study nature, combined with a follow-up period shorter than the average of twelve years, may challenge the reliability of such studies (De Bellis et al., 2001). Despite these limitations, the collective results significantly contribute to understanding the localisation of hippocampal effects in PTSD and underscore the need for further research with more diverse and longitudinally robust methodologies.

Critical evaluation of the studies suggests that PTSD has a significant effect on hippocampal volume. Reduced hippocampal volume is not a predispositional factor, but occurs after trauma exposure; the reduction of hippocampal volume in individuals with PTSD is more likely to occur in adulthood, potentially due to differences in emotional processing across age groups. The affected hippocampal region varies by PTSD type, with combat-related PTSD reducing the right hippocampus and abuse-related PTSD reducing the left (Bremner et al. 1997; Pavić et al., 2007). Differential volume reductions in PTSD subtypes may underpin their distinct symptom profiles, primarily including intrusive memories and exaggerated startle. Right hippocampal reduction, typically observed in combat PTSD, decreases contextual memory function, which could potentially explain reduced intrusive memories yet heightened exaggerated startle responses. Subsequently, left hippocampal reduction in childhood abuse PTSD, associated with enhanced spatial memory regulation, likely contributes to an increase in intrusive memories. This lateralisation suggests that combat PTSD may be more influenced by spatial triggers, such as environments resembling the trauma, while childhood abuse PTSD may primarily respond to verbal triggers, such as emotionally charged words. These findings align with the distinct nature of trauma between these populations, warranting further investigations. The right hippocampal volume reduction in combat PTSD decreases its function, which could potentially explain lower intrusive memories and exaggerated startle, while left reduction in abuse PTSD elevates spatial memory regulation, increasing intrusive memories. This suggests combat PTSD has more verbal triggers, while abuse PTSD has more spatial triggers. Further longitudinal research will aid in understanding how genetics affecting white matter may predispose individuals to PTSD. Additionally, studies should compare long-term memory, coupled with spatial, environmental, and verbal triggers between groups with combat- and abuse-related PTSD. Direct comparisons of the effects of combat- and childhood maltreatment-related PTSD on hippocampal volumes are also necessary to gain a deeper understanding of the specific localisation of hippocampal changes and the associated neurophysiological mechanisms that contribute to the development and manifestation of the disorder. Existing treatments for this disorder include the provision of medicines akin to SSRIs and glucocorticoids which target the cortisol dysregulation in the hypothalamic-pituitary-adrenal (HPA) axis, a major system involved in stress responses, while hippocampus-specific techniques include memory reconsolidation techniques and neurofeedback therapies (Florido et al., 2022). Developing improved treatments for PTSD, such as targeted therapies based on the identified impacts on the hippocampus, will require a deeper understanding of the varied effects of this condition. Identifying hippocampal changes associated with different trauma exposures can enable clinicians to tailor personalised interventions, leading to better outcomes. Additionally, elucidating the hippocampal mechanisms underlying PTSD symptoms can inform preventive strategies to reduce the broader societal burden of trauma-related disorders. Overall, these insights enhance our understanding of the underlying biological mechanisms of PTSD and the hippocampus, offering a comprehensive perspective on their interplay and implications.

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ASHOKA PSYCHOLOGY REVIEW

# Designed Love: Exploring the Relationship Between The Interface of Dating Apps and User Behavior and Experience

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## Editor's Opinion

Considering the contemporary world's dependency on technological modes of dating, this paper's focus on user behaviour can make fascinating links to the domain of socio-cultural psychology. Although this research deduced how one dating app can be more capable of forming genuine connections than the other, it is integral to examine the broader picture and understand what this system shows about human functioning in a new, virtual setting. In such a setting, technological boundaries can significantly influence various psychological aspects like self-esteem, self-image, and its portrayal to others. Although certain individuals strive to make genuine bonds through online dating, it is becoming more arduous to do so because of purposeful identity creation. Due to additional barriers in online dating, people have the liberty to carefully craft their personas through enhanced pictures or personal facts. Research conducted by Catalina Toma and Jeffrey Hancock on the role of physical attractiveness in online dating self-presentation revealed volumes about how less attractive people have the tendency to edit their photographs more than people who appeared more physically attractive. Environmental influences and societal beauty standards can primarily impact one's self-image to such an extent that they might resort to visual deception to seem more appealing to potential matches. Furthermore, the Uses and Gratification Theory suggests that people have started relying on media to satisfy their emotional and social needs. It also expands upon how social media, including dating apps, can fulfil our socially integrative desires by fuelling our self-worth and providing a temporary escape from the real world. This explains why individuals incline towards online dating to feel validated and increase their self-esteem. Unfortunately, multiple studies have implied that perpetual cycles of such behaviour are linked to adverse issues with body image and mental well-being. It is undeniable that various nuances must be considered while investigating these claims, as a non-trivial percentage of people have actually benefitted from online dating and the ease in socialising that comes with it. Therefore, learning about the sociopsychological basis of dating apps can help individuals navigate those systems and gain cognisance about human behaviour from an intriguing point of view.

We use digital media to traverse the everyday rhythms of life as well as to carry out mundane tasks (Pink, 2013). It is ingrained so deeply in our daily lives that the distinction between our real and reel selves is almost negligible. The virtual world serves as an extension of our real identities and a dynamic environment for building human contact, with its own set of socio-political and cultural norms (Boellstorff, 2009). In lieu of this, there have been several changes in the human concepts and mode of communication including their approach towards romance (Chan, 2022). Dating apps are digital platforms that act as "modern cupid". They introduce users to a roster of potential matches on their finger tips which makes it convenient to navigate through their romantic life in today's fast-paced world. After creating customized profiles, users get a chance to find people within and beyond their common interests and social circles (Pashikar, 2024). The advent of dating sites traces back to the late 90s with the launch of Match.com which allowed the users to streamline their online dating experiences by choosing their preferred gender, age range, and lifestyle habits. Much later, in 2012, Hinge and Tinder introduced the consumers to the 'detailed/extensive' profiles and 'swipe' system, respectively. In 2014, taking inspiration from Tinder, Bumble was introduced in the digital market, adopting a feminist approach (Matthews,

2017). On the Hinge screen, each profile has a heart beside every picture and prompt on which one can click to match or select the 'x' button to reject the profile. On the other hand, Bumble adopts the 'swipe' method but unlike Tinder, Bumble has a more feminist approach where women need to text first within 24 hours of matching. Unlike Hinge, all users need is a clear picture to create a profile on Bumble, this encourages rapid decision making (Garda Karhulahti, 2019). Moreover, this gives a gamified effect to the app, making the process feel superficial yet exciting (Dobhal, 2022). Lastly, Hinge's "Designed to be Deleted" strategy seems to foster more meaningful connections through customized profile features (Weingus, 2024). The ease of access to these apps has made the experience of online dating "fun", altering the conventional dating practices (Bryant and Sheldon, 2017). Another paper supports this view by talking about the efficiency of the algorithms of these dating apps which mediate the social engagement of the users, reshaping the traditional dating norms and culture (Bandinelli and Gandini, 2022). An important aspect of dating apps is how the user represents their 'real-selves' on these virtual platforms. These online dating spaces are an extension of the user's real identity. Users tend to show their "real selves" on their profiles through carefully chosen pictures and tailored prompts, using a combination of self-presentation and purposeful identity creation (Boellstorff, 2009). This further ties into Walther's theory of hyper-personal communication which states why computer mediated communication could seem better than face-to-face interactions. This helps them get validation through building connections and societal relations (Walther, 2007). It has repeatedly been observed through pre-existing studies that consumer's reliance on digital media like dating apps has constantly been increasing. In such a case, it is crucial to investigate the interplay between the affordances of these apps and user attitudes/behavior and experience. Therefore, this paper examines the importance of designing user-friendly apps with respect to online dating and consumer experience.

## Methodology

While these apps have subtly different interfaces/affordances, they make a huge difference in the user experience, interaction, perception and behavior on these apps. Hinge and Bumble were chosen specifically because they are currently the most popular among the students of Ashoka University for the convenience of study. The paper adopts a qualitative, digital ethnographic approach. It gathers data through conducting semi-structured interviews based on the subjectivity and personal experiences of the participants who were chosen through convenience sampling. The sample consisted of four participants/interviewees: three males and one female, aged between 19 and 21. Two participants were chosen through matches on Hinge and Bumble, while two were friends who also used these platforms. For this study, first hand exploration of the interface and features was done. This incorporated matching with users and disclosing the purpose of the study to them. A detailed consent form ensuring confidentiality was sent to the matches and other participants who seemed interested in being a part of and contributing to the ethnography. The relevance of comparing Hinge and Bumble is set by the precedent that most of the users within the sample population are on both platforms. The interviews were conducted in three rounds, with each round lasting around 25 minutes. The first two rounds addressed broad questions on the participants' dating app history, preferences, and overall experiences. The third round of interviews focused on how particular features of the Hinge and Bumble interfaces influenced their online dating perceptions and behaviors.

## Significant findings

Through the study, we found that most of the participants joined the dating apps out of curiosity, boredom and fascination for the easy accessibility of the virtual dating world, hoping to find like-minded people beyond their social circle between the age of 18-19. "I joined Hinge and Bumble during COVID because I was curious and bored. My usage was amplified because I was chronically online during that time." (P4, Personal Communication, April 15, 2024). Through more interviews, the study found that online dating apps drew the attention of individuals within this age bracket because it is appealing to have access to a wide range of potential matches while having the convenience of taking things at one's own pace in academically and socially rigorous places like a University. Moreover, the participants preferred Hinge to Bumble because Hinge gives them the opportunity to build intimate connections, allowing people to express their true personalities and creative sides through detailed and personalized profiles. An interviewee stated that he liked using the app because he could showcase his talents like playing the piano which is not the case with Bumble because of the rapid swipe system. This ties into the concept of self presentation - social comparison and self esteem play a huge role when it comes to curating a dating app profile. While people want to "keep it real", there is an urge to fit into the online dating setting and instant gratification/validation through matches (Faelens et al., 2021). "Using Bumble feels like playing Subway Surfers, you go on using it for the constant feeling of reward and validation." (P3, Personal Communication, April 15, 2024). Some people genuinely want to engage with the potential match's profile before sending a like and present themselves as they are on the dating apps. Information such as prompts, audio, and video, which not only allows for a more expressive and accurate portrayal of oneself but also stimulates meaningful responses from possible matches. This connects back to Boellstorff's argument about the virtual world being an extension of our real identity. The inclusion of intricate details improves the quality of encounters by encouraging conversations that go beyond superficiality, focusing on shared interests and personality traits. Furthermore, Hinge gives consumers agency over their dating experience by allowing them to set deal breakers and filter options, which contribute to more targeted and customized potential matches. The participants revealed that Hinge enables users to like or 'heart' specific elements of another person's profile (such as a photo, video, or response to a prompt) and send a message with that like or heart. This encourages thoughtful interaction and enables users to pinpoint what piqued their attention. Hinge's user interface encourages slower, more deliberate attention and engagement, which can lead to more meaningful matches as the users are looking at extensive profiles instead of constant rewards. Moreover, Hinge double-checks with you if you want to match with a person and presents you with the options of either sending a like, rose, comment or cancel. This makes the user more mindful. Its interface is clean and engaging, enabling users to spend their time creating profiles and responses. The app's motto, "Designed to be deleted," is consistent with its features, which urge users to take their matches beyond the app, into real life. Hinge also has features like "We Met" that provide input on real-life meetings, which helps to improve future matches. Furthermore, according to the data gathered in the interviews, Hinge seems to be more inclusive

of relationship types and user preferences.

On the other hand, participants observed that Bumble's swiping method produces a fast-paced, shallow user experience akin to playing a game. They criticized the platform for focusing too much on physical appearance and lacking features that encourage deeper engagement, such as filling out comprehensive prompts or uploading audio and video. This results in users swiping mindlessly for validation rather than truly wanting to connect or meet someone. It can be further said that dating apps can keep the users hooked because users constantly experience a dopamine boost either through getting a match or just exploring various profiles can feel like a rewarding experience (Liu, 2024). Taking this into consideration, the study assumes that it is easier to make superficial connections through the swiping system to gain instant rewards. One of the participants also stated that they perceived Bumble as more of a 'hook-up' app because of its swiping mechanism and rapid decision making. "Bumble feels too convenient for anything real to happen there." (P2, Personal Communication, May 2, 2024). Moreover, Bumble's norm for women to message first was interpreted as both positive and negative. While it can eliminate unsolicited texts, it complicates interactions for certain users who prefer a more balanced approach. They found the interface of Bumble too cluttered, filled with pictures. It felt as if the app was constantly urging them to make a decision and move to the next profile. Moreover, constant notifications and gamification of features such as "superswipe" might keep users engaged with the app for longer periods of time, potentially prioritizing quantity above quality of matches. Some participants stated that the "super swipe" feature on Bumble made them feel objectified because it is a premium feature and they know that someone has paid money to match with them based on their physical features. Besides the influence of variations in the interface of the apps, the interviews revealed important insights about user behavior, preferences, and the impact of dating app features on user experiences. First, the dynamics of initiating conversations differs dramatically across the apps; many users critiqued Bumble's requirement for women to make the first move, preferring Hinge's more balanced communication style. This raises a bigger concern about gender relations in dating apps. Moreover, they criticized Bumble as a feminist app because the women's approach first feature does not prevent their encounter with unsolicited and vulgar messages from men. Additionally, the female participant mentioned that she preferred men texting first because it helps her gauge the kind of person they are from their texting style. Furthermore, there has been a shift in dating attitudes among users, who reported being more selective and cautious. The ease of discovering matches on these platforms has resulted in higher standards and a faster dismissal of prospective connections, in contrast to the more thoughtful involvement encouraged by the conventional norms of dating. This shift in behavior reflects a broader cultural and psychological shift in dating, in which the plethora of options available through apps can create a paradox of choice, making it easier for people to find more options and not invest or commit too fast. Lastly, features that maintain user privacy and preferences, such as Hinge's ability to filter out undesirable words and customize visibility settings, were highly regarded, indicating an increasing concern for safety and personalized experiences in online dating. These findings indicate a complex interaction of technological and social elements, influencing the modern dating landscape. The interviewees' preference for Hinge over Bumble underscores a major shift in online dating: individuals are increasingly looking for true, meaningful connections rather than superficial interactions. This shift from viewing potential matches as options in a rapid, game-like context highlights an increasing demand for dating platforms that value authenticity, respect individual preferences, and promote safe and inclusive environments. Essentially, people want apps that help them create genuine relationships, with a focus on personal engagement and deeper understanding of one another beyond the stereotypical pictures and profiles.

## Limitations

There are several limitations to the study. It only takes into account the students of Ashoka which is representative of a certain class and culture. The gender distribution is not equal. For selecting the four participants of the study, convenient sampling was adopted which means that the study does not consider the wider range of population, out there on dating apps. Moreover, social desirability could have influenced the experiences shared by the participants. Additionally, it was not possible to delve into depth of the participant's experiences or overtime usage of dating apps because the study was conducted over a period of two weeks. Furthermore, the findings of the study cannot be generalized to the population outside Ashoka. Lastly, the formulation of the questions could have been influenced by the reserachercher's biases towards dating apps and their interfaces.

## Conclusion

This paper examines the relationship between Hinge and Bumble interface designs and their impact on user behavior and experiences at Ashoka University. The study's interviews and personal observations reveal a strong preference among participants for Hinge over Bumble, driven by a desire for more meaningful relationships. Hinge's rich profile options and tailored engagement features encourage deeper connections and represent a shift towards more meaningful relationship-building in the digital age. The study also reveals important insights into how interface design influences user behavior, demonstrating how minor variations in-app functionalities can have a huge impact on user experiences. However, future studies could look at a greater population across different apps and how new technological advancements like AI play a role in forming relationships on digital media.

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ASHOKA PSYCHOLOGY REVIEW

# An Unsettling Comfort: The Allure of Psychological Horror

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## Editor's Opinion

This review gives an in-depth of analysis of why we are so attracted to the horror genre and the cathartic effect it can supposedly have, or how watching it can be a 'coping mechanism' of sorts. It explores the deep intricacies of human emotions, and how movies play a major role in eliciting them. Through the paper, the author nudges readers towards new directions. One of particular interest to me was how certain horror–only disturbing but seemingly non-cathartic–elicits pleasure and joy? Studies delving into these conflciting valences will be particularly enthralling to look at.

In 2023, running among the top 5 produced film genres in North America, the horror genre grossed more than 900 million dollars with 55 movies in the domestic theatrical market. (The Numbers, 2023) Despite the general tendency of people to avoid distress, the industry sold over 80 million movie tickets displaying a high demand for horror movies, and the potential stress they induce. What is it about ourselves that makes us challenge our intrinsic aversion to stress and indulge in activities that give rise to it? Why do we find disturbing content, specifically those featured in psychological horror, to be entertaining despite the discomfort they elicit? Is the momentary pleasure gained after watching one such movie worth the two hours of anguish? What happens if one is continuously exposed to such disturbing content? This paper is an attempt to answer some of the many such questions. By analysing the emotions and behaviours that psychological horror evokes in people, the paper aims to understand why disturbing content holds such an allure. The examination of the entertainment value of horror movies is then expected to provide insights into people's level of empathy and their tendency to otherize.

## Is it just Entertainment or More?

The need to distract oneself from the overwhelming demands of everyday life sends an individual into a search for a means of coping. While, for some, it can manifest in taking a vacation or hanging out with friends and families, for others it is the engagement with several forms of media that acts as a distraction. The disconnection from people and things around them that such an immersion offers might allow them to momentarily escape the discomfort in life and experience pleasure. Such a feeling of transcendence and enjoyment is what is expected out of the various forms of media that provide entertainment. Peter Vorderer, a professor of Media and Communication Studies at the University of Mannheim, defines entertainment as "an experience that helps media users to cope with their everyday life." Entertainment acts as a refreshment by providing psychological relaxation and offering variety in what might be a monotonous life. It stimulates and amuses by creating an atmosphere of comfort and fantasy (Vorderer, 2001). But what if a means of entertainment rather than providing comfort only elicits discomfort and distress? How can distress be entertaining? How can it help one cope? Psychological horror is one such popular subgenre that, as opposed to the familiar atmosphere of the general horror genre, creates an atmosphere of confusion, unsettlement, and anguish, despite which people claim to have enjoyed the distress, to have felt relieved, and to have wanted to relive the experiences. Zillmann's Excitation Transfer theory suggests how the more empathic stress is felt during an experience, the more relief it gives afterwards. (Zillmann, 2008) The excitation felt from the emotions of distress transfers into those of euphoria and relief. These intense positive feelings make the cost of having experienced distress and discomfort to be worth it. Similarily, the Affective Disposition Theory, suggests how the fear and hope that audiences feel come together with the relief experienced at the end of the

narrative to complete an experience of entertainment (Vorderer, 2001). Therefore, while the idea of entertainment might give a general perception of experiencing positive emotions, they need not necessarily be a result of positive experiences. For some, the feelings of adrenaline rush that the elements of fear and uneasiness in psychological horror give might be all they look for when seeking distraction in forms of entertainment (Park, 2018).

## A Coping Mechanism

The allure of psychological horror starts with a desire to cope with life. The desire makes an individual want to seek distraction, often in the form of mass media where they look for something "fun" that may immerse them and make them feel escaped. Such an escape leads to immersion into the experiences of the characters, where one feels involved in their decision-making and absorbed into the plot. This leads to a vicarious pleasure, one that transforms distress into euphoria and helps meet the desire to cope. For many, watching disturbing content is a way of feeling better about oneself. By doing what is out of one's comfort zone, they get to challenge their abilities. (Vorderer, 2006) When done as a group activity, it allows them to strive for competition and achievement. And when they realise that they made it through the experience, they feel a sense of accomplishment (Vorderer, 2006). This resulting sense of achievement, however, transcends mere bragging rights. Continuous exposure to psychological horror can build resilience against the stress an individual might feel in real life. The knowledge of having been through a similar experience before can enable them to be less psychologically distressed in times of adversity. Moreover, the controlled dose of negative emotion elicited may help cope with anxiety (Scrivner, 2021). This might function as an "enjoyable exposure therapy" and improve one's coping skills (Clasen, 2021). The nature of the disturbing content one exposes oneself to is crucial though. It is important to distinguish between the carefully crafted disturbing content found in fictional psychological horror films and real-life violence. When shown the content of cows being butchered, a monkey's skull being cracked open, and a child's facial skin being turned inside out for surgery as part of a study by Haidt, McCauley, and Rozin (1994), 90 percent of the participants only found the content disturbing and could not get through it till the end. Such pieces of content do not help cope. Fictional content, however, with the assurance they bring — that of a sense of control and a psychological distance between them and the experiences despite the immersion — sufficiently helps cope regardless of the level of discomfort they elicit (Park, 2018). But further research and review are required to understand how the lack of a satisfying ending in a fictional content affects the euphoric emotions felt after watching it or how a disturbing but non-violent content that lacks any resolution or catharsis — like This is a Special Time commercial by Little Baby's Ice Cream — elicits pleasure for some people.

## Otherization

Although prolonged exposure to the kinds of disturbing content can build resilience, it can also have significant effects on the level of empathy an individual experiences. When an individual seeks distraction to cope with the negative experiences in their life and encounters someone less fortunate, it allows for a comparison that improves the subjective well-being of the individual (Wills, 1981). Having been immersed in the experiences of a character in a psychological horror content, the individual feels a vicarious pleasure when the character undergoes positive feelings. However, when the character faces an extreme challenge, the viewer's initial distress shifts to relief when they feel disconnected from the character's plight. This disconnection can manifest as either pity for the character's misfortune or a sense of cynicism. The downward comparison can also manifest in the feeling of superiority complex. When the Danish movie "Speak No Evil" (2022) aired, many audiences criticised the characters, calling them "stupid" for making decisions that the audience would never have had they been in their places, making them feel better about themselves and even "smarter" in certain cases. Although viewers often feel immersed in the decision-making process of the characters, when those decisions lead to an eventual suffering, there is a feeling of detachment from the characters. It leads to a general tendency to look at the decisions not as shared anymore but as theirs alone. The significance of the effects on empathy gets exaggerated when the content specifically features violent scenes. A study by Krahe and Moller (2010) found a positive association between an increased usage of media violence and a decreased level of empathy in children. As the exposure to such content increases, so does the tendency to otherise. Moreover, a study by Kamalesh et al. (2019) suggests that people with a preference for the horror genre upon being exposed to a lot of violence were desensitised to such content, leading them to score less on empathy.

## Conclusion

Psychological horror, with its unsettling content and ability to evoke discomfort, thrives on its ability to provide a form of entertainment that can manifest itself into a feeling of catharsis. The desire to cope with life emerges as a key motivator and drives an individual through the cycle of distress, distraction, escape, and euphoria. The intense emotions elicited, particularly stress, fear, and relief, by psychological horror can help improve one's ability to cope. While exposure to psychological horror can build resilience, it can also equip viewers with a sense of achievement and a feeling of downward comparison. In extreme cases, it can lead to reduced empathy and an increased tendency to otherize. Ultimately, the allure of psychological horror emerges out of its ability to help us find pleasure in discomfort. While it can provide entertainment, a means of coping, and resilience building, the potential for decreased empathy calls for a careful approach toward its consumption.

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ASHOKA PSYCHOLOGY REVIEW

# How Early Life Trauma Impacts the Neurobiology of the Developing Brain

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## Editor's Opinion

This paper effectively synthesises insights from diverse studies, coherently linking adverse childhood experiences (ACEs) to structural and functional changes in key brain regions, including the ventral tegmental area, amygdala, hippocampus, and prefrontal cortex. An area for further exploration could include a more explicit discussion on the broader implications of these neurobiological changes for public health, intervention strategies, and potential therapeutic advancements. Additionally, reading insights from contemporary research on neuroplasticity and resilience could further enrich the reader's knowledge base by showcasing potential avenues for recovery and intervention. Overall, the paper not only highlights the severity of early life trauma but also underscores its long-term consequences, paving the way for future exploration and application. We urge the reader to further look into emerging research trends in Traumatology, wherein reading this paper can serve to build a foundation in child trauma studies.

Emotional trauma can have lasting and detrimental effects on individuals, often continuing throughout their lives. It can give rise to psychologically maladaptive behaviours that may endure if timely and appropriate interventions are not implemented. This is especially concerning when the trauma occurs during the formative years of childhood, as it not only triggers profound psychological shifts but also induces significant neurobiological changes within the body. This paper will explore the major physiological alterations in the brain as a result of early-life stress and how that impacts a person's overall well-being and functioning. Park et al (2021) identified several neurobiological changes in the Ventral Tegmental Area (VTA), a part of the dopaminergic brain system, as a response to early-life stress. This system is mainly responsible for delivering dopamine, a neurotransmitter aiding the reinforcement or pleasure processing and motivation behaviours, to other parts of the brain, such as the nucleus accumbens, the anterior hippocampus, and the medial prefrontal cortex. Repeated overstimulation caused by early-life trauma also impacts the amygdala and the hypothalamic-pituitary-adrenal (HPA) axis by altering its structure (Campbell, 2022). In addition, volumetric changes in the brain areas have also been reported as a result of adverse childhood experiences (Bick Nelson, 2015). The implications of these changes can also be a precursor to certain psychopathological disorders such as depression and post-traumatic stress disorder (PTSD).

## Neurobiological Impacts

Past studies have shown that the structure of the brain does not develop in a linear fashion. The areas necessary for survival, such as the sensation and motor areas, mature earlier, while neural substrates, such as cognition and emotional regulation, take longer to mature. (Campbell, 2022) This period can leave these developing areas more vulnerable to adverse stressors. Park et al., 2021 argue that early childhood stress can affect the brain and found changes in the VTA and other connected regions such as the nucleus accumbens (NAcc), anterior hippocampus (aHipp), and the prefrontal cortex (mPFC) collectively called the mesocorticolimbic pathway. The study primarily focused on the resting state functional connectivity, which showed various patterns with age based on the stress exposure of 4-9-year-old children. Children exposed to less adverse childhood experiences (ACEs) exhibited age-related increases in VTA functional connectivity with the dorsomedial prefrontal cortex (dmPFC). The research implied that changes in the VTA due to stress may arise during childhood. The study also observed age x ACEs interactions on VTA connectivity in the dorsal anterior cingulate cortex (dACC) region of the mPFC. The dACC evaluates the environmental states and integrates internal and external motivation components to guide behaviour through top-down modulation of the ventral tegmental area. Variations in the effectual

dACC top-down regulation could be explained by the blunted age-related changes in the VTA-mPFC functional coupling in children. Chronic early-life stress impacts the dopaminergic neurons in the VTA, reducing the number of these neurons and altering dopamine activities. Adverse childhood experiences also brought differences in the connections between the aHipp and the left inferior frontal gyrus (LIFG). Compared to the children with lower exposure to adverse childhood experiences, those with higher exposure exhibited a stronger negative correlation between age and aHipp-LIFG connection. Observations also suggested reductions in the connectivity between two brain regions, namely the rostral anterior cingulate cortex and nucleus accumbens, with the parahippocampal gyrus (PHG) as individuals age. The PHG plays a vital role in spatial processing and memory. The findings of this study suggest that adverse childhood experiences significantly contribute to impaired development of functional connectivity within the ventral tegmental area (VTA). The research highlights how early traumatic events can hinder the development of neural pathways associated with reward processing and motivation, ultimately leading to long-term effects on emotional and cognitive functioning. Early life stress in the form of emotional trauma can have cascading effects in later life. Campbell, 2022 states that in addition to chronic pain, early life stress could also lead to inflammation. Children who have experienced maltreatment by the age of 12 happen to have higher levels of inflammation than children who have not experienced maltreatment. As noted by Campbell, 2022, this heightened maltreatment may subsequently elevate the risk of developing psychopathological disorders such as depression, bipolar disorder, schizophrenia, and PTSD later in life. A potential explanation for this phenomenon is the cross-sensitisation effect, where exposure to one stimulus increases the sensitivity or responsiveness to another seemingly unrelated stimulus over time. This could be linked to an altered neuroendocrine response to stress resulting from immune activation in early life. Similar to psychosocial stress exposure, the activation of the hypothalamic-pituitary-adrenal (HPA) axis and central catecholamines can be induced by the administration of specific immunological molecules such as interleukin-1 (IL-1), and a minor degree of IL-6 and TNF-. (Campbell, 2022). The cross-sensitisation of the neuroendocrine response to stress and immune activation may explain why early life stress has such long-lasting effects on an individual's health. Campbell, 2022 further claims that research conducted on grown patients reveals that early-life trauma can also predict increased sensitivity to pressure pain and the prevalence of low back pain. In addition to that, increased temporal summation of pain and intense touch sensitivity are also related to traumas such as emotional and sexual abuse. These occurrences suggest heightened responsiveness or increased sensitivity to somatosensory stimuli (hyperalgesia), potentially stemming from heightened alertness and anxiety associated with childhood maltreatment. Childhood trauma, however, may also result in decreased sensitivity to pain or hypoalgesia. Disorders such as schizophrenia, borderline personality disorder, and PTSD commonly have these responses. It could be a result of avoidance or deficits in response to childhood trauma, particularly neglect (Campbell, 2022). Stress also triggers the HPA axis, leading to the release of glucocorticoids throughout the body and brain. Regions with high glucocorticoid receptors, like the prefrontal cortex and hippocampus, are vulnerable to disruption, impairing neural plasticity (Campbell, 2022). This impairment may result in irregularities in the cognitive and emotional development of a child. The development of essential brain structures during the adolescent years can be vastly affected by early life stress and trauma, leading to significant structural and functional changes. Trauma further can lead to age-specific impacts in the hippocampus and prefrontal cortex, accentuating its lasting influence on neurodevelopment. Inhibitory control structures, such as the caudate nuclei and the striatum, including the frontal lobe, continue to develop and exhibit greater connectivity in late adolescence (Campbell, 2022). Abuse can disrupt this process by negatively impacting these structures, leading to reduced volume in areas like the caudate nucleus and putamen, correlating with general anxiety (Campbell, 2022). Decreases in brain volume have also been noted in children who have experienced maltreatment, affecting the temporal, frontal, parietal, and occipital areas (Bick Nelson, 2015). Early Life Stress is associated with increased bilateral amygdala reactivity to sad faces, according to recent functional MRI research, and behavioural investigations demonstrate quicker reaction times to angry and sad faces (Campbell, 2022). Exposure to adversity before age 3 correlates with lower accuracy in identifying fearful and happy faces (Campbell, 2022). Compared to the control group, institutionalized adopted children show a larger right amygdala volume (Campbell, 2022). Adults exposed to childhood trauma showed a dose-response relationship in a 30-year longitudinal study; higher severity at 10-11 years was linked to a larger right amygdala volume in adulthood (Campbell, 2022). Sexual trauma in females aged 3-5 is associated with reduced hippocampal volume, whilst impairments in the prefrontal cortex and corpus callosum link to sexual abuse at ages 9-10 and 11-14 (Campbell, 2022). According to Bick Nelson, 2015, children who experience maltreatment while growing up have been shown to display several structural and functional changes in the brain. Maltreatment in the form of physical abuse and emotional neglect has been associated with reductions in amygdala volume which further increases the risk for behavioral problems. Bick Nelson, 2015, further report reduced volumes of the hippocampus in late childhood and adolescence among young individuals with PTSD and depression related to maltreatment, as well as in maltreated youth who do not have psychiatric disorders. PTSD that results from maltreatment has also been linked to alterations in the white matter content of the hippocampus, resulting in a relative increase in that area. In addition, limited growth of the left hippocampus has been observed in youth who retrospectively reported childhood maltreatment and psychiatric symptoms. Studies have likewise discovered structural changes in the cerebellum concerning childhood maltreatment. There is an overall decrease in the cerebellar volume especially in the vermis, a subregion of the cerebellum (Bick Nelson, 2015).

## Conlcusion

In conclusion, early life trauma has profound implications on an individual's overall well-being, extending beyond mere emotional disturbances. It can trigger significant neuro-biological alterations within the brain, fundamentally reshaping the way individuals process experiences and respond to stress. These alterations may help explain why certain people are more susceptible to developing psychological disorders as they age. Understanding these mechanisms not only sheds light on the complexities of mental health but also opens avenues for potential therapeutic improvements. Furthermore, recognizing these changes highlights the importance of timely and targeted interventions, which could foster resilience and enhance recovery prospects for those affected.

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# Lab Reviews

Through Lab Reviews, we hope to critically analyze papers that were synthesized in University labs: within or outside Ashoka.

Lab Review

ASHOKA PSYCHOLOGY REVIEW

# A Review on 'Enhanced Top-Down Sensorimotor Processing in Somatic Anxiety'

Aryan Tiwari & Reva Sawant

**Original Paper: Ray, D., Bouziane, I., Das, M., Friston, K. J., Caballero-Gaudes, C. (2022, July 25). Enhanced top-down sensorimotor processing in somatic anxiety. Nature. Retrieved December 19, 2024, from https://www.nature.com/articles/s41398-022-02061-2**

The human brain is capable of processing various forms of sensory information and creating links with sets of corresponding motor functions. This highlights the psychophysical phenomenon of sensorimotor processing, which revolves around receiving sensory inputs and producing motor outputs as a response to a particular stimulus. The processing of sensorimotor signals can occur in a top-down manner, where such impulses can be transmitted from hierarchically, or functionally higher to lower regions in the brain. These types of impulse transmission can be studied in the context of somatic anxiety as they utilize sensorimotor functions like exteroception (perception of external stimuli), interoception (perception of internal signals from within the body), and proprioception (perception of body balance and movement). Through the neural circuits discovered to be responsible for the given functions, the manifestation of somatic anxiety-inducing sensory information occurs in the form of motor-oriented physiological symptoms such as increased heart rate, sweating, hyperventilation, etc. This stress response can be initiated by cognitive anxiety, a psychological disorder that is a mental manifestation of negative thoughts and emotions. It differs from its somatic counterpart solely based on the area of impact, but if combined, they provide a broader experience of the disorder. If so, through what methods did researchers deduce this path of impulse transmission that dictates the operation of our sensorimotor system? What was the logic that was utilized to establish the possibility of this neural circuit, and how can one envision the working of this pathway in real-life situations? To answer these questions, this review paper aims to concisely recapitulate Dr. Dipanjan Ray's research on enhanced top-down sensorimotor processing in somatic anxiety, and discuss some of the potential real-life applications and scopes that may connect to this hypothesis (Ray et al., 2022).

## Methodology

To investigate the neural pathways involved in top-down sensorimotor processing and their association with somatic anxiety, Dr. Dipanjan Ray and his team employed a rigorous computational neuroimaging approach. They utilized resting-state functional MRI (rs-fMRI) data from the Human Connectome Project: which is a comprehensive dataset of detailed structural and functional brain imaging. The aim was to isolate and evaluate effective connectivity among specific brain regions associated with exteroception, interoception, and motor functions, providing a detailed understanding of the hierarchical flow of sensorimotor information in individuals experiencing varying levels of somatic anxiety. Effective connectivity refers to the directional influence that one brain region exerts over another. For this, the study utilized Dynamic Causal Modeling (DCM): a computational technique that estimates effective connectivity by quantifying the directional influence of one neural region over another which can help uncover the causal relationships within a hierarchical framework. In particular, the team employed Spectral DCM, an optimized variant of the method that translates neuronal activity into spectral frequencies in order to enhance computational efficiency and precision. To establish the relationship between somatic anxiety and top-down processing, the researchers incorporated psychometric scores, such as the Fear-Somatic Arousal (FSA) scale, which quantifies anxiety's physiological manifestations. Participants with high sadness scores, indicative of depression, were excluded to control for confounding effects. This ensured that the observed connectivity patterns were primarily related to somatic anxiety. The Fear-Somatic Arousal (FSA) scores were used as the primary measure of somatic anxiety, while Fear-Affect (FA) scores were included to differentiate and account for cognitive anxiety effects as well. Key regions of interest (ROIs) were identified to represent hierarchical nodes within

each domain: the primary sensory cortices (visual, auditory, somatosensory) and lateral frontal pole for exteroception; anterior and posterior insula for interoception; and the primary motor cortex and supplementary motor area for motor processing. These regions were carefully chosen based on their established roles in sensorimotor hierarchies. The neuronal signals from these ROIs were extracted as time-series data and preprocessed to remove noise and ensure data consistency, enabling the creation of precise connectivity models.

**Table 1.** Brain regions and their functions

| |
|---|
| **Primary Visual Cortex (V1)** Processes visual sensory input and forms the foundational level of visual perception by perceiving local features such as edges and bars. (Lee et al., 1998) |
| **Primary Auditory Cortex (A1)** Processes initial auditory sensory input and is involved in adaptation through learning-associated plasticity to store specific memory traces. (Weinberger, 2004) |
| **Primary Somatosensory Cortex (SSC)** Interprets tactile sensory input, such as touch, pressure, and pain. It is important for sensory-motor signal integration. (Borich et al., 2015) |
| **Lateral Frontal Pole (FP1)** Acts as a higher-level node for exteroceptive information, integrating sensory inputs from multiple modalities. It is also involved in processing higher-order relations, regardless of the nature of the information. FP1 helps to control emotional approach–avoidance actions. (Hartogsveld, 2018; Bramson, 2020) |
| **Anterior Insula (AI)** Processes internal bodily signals, such as emotions and interoceptive awareness. It is involved in processing quality and intensity of taste, alongside the texture and temperature of food. It might be involved in all subjective feelings, with implications for consciousness. (Rolls, 2016; Craig, 2009) |
| **Posterior Insula (PI)** Plays a primary role in interoceptive processing and the perception of internal bodily states. Neural activity accumulation here might encode the passage of time. (Wittmann et al., 2010) |
| **Primary Motor Cortex (MC)** Executes voluntary motor movements, serving as the final output node for motor commands. It is heavily involved in motor execution and might also participate in higher cognitive processes such as attention, motor learning, motor consolidation, movement inhibition, somatomotor response, and movement imagery. (Bhattacharjee, 2020) |
| **Supplementary Motor Area (SMA)** Involved in executing intentions, learning and performing sequential actions, switching between tasks, and inhibition of undesired actions. (Nachev et al., 2008) |

Parametric Empirical Bayes (PEB), a Bayesian statistical method, was applied to examine group-level variations in effective connectivity and FSA scores. Finally, a leave-one-out cross-validation analysis was performed to assess the predictive power of the identified connectivity patterns for somatic anxiety. This unconventional validation technique demonstrated the ability of specific top-down connections to predict somatic anxiety levels, providing a potential biomarker for the condition.

## Results

The study identified distinct patterns of effective connectivity in sensorimotor networks that correlated with somatic anxiety. Firstly, backward (top-down) connections in the exteroceptive network were predominantly inhibitory. In contrast, the interoceptive and motor networks displayed excitatory backward connections, suggesting heightened precision and gain modulation within these systems. These patterns were consistent across participants, indicating a systematic difference in the way somatic and cognitive anxiety manifest in neural connectivity. Secondly, key connectivity pathways emerged as predictive markers of somatic anxiety through leave-one-out cross-validation. Among these, connections from the lateral frontal pole to the primary somatosensory cortex, anterior insula to posterior insula, and self-connections in the primary motor cortex demonstrated significant correlations with FSA scores, suggesting their utility as a neurobiological marker for somatic anxiety. Lastly, a strong positive association was found between FSA scores and enhanced backward effective connectivity across all three networks. However, the FA scores measuring cognitive anxiety did not show consistent changes in top-down connectivity.

## Discussion

The studies supporting the effectiveness of Nudges in increasing health behaviours of employees in the workplace show that nudge-based interventions can have positive intended effects on employees' health behaviours. The extent of the effectiveness is also showcased by post-intervention data collections which reveal that some studies have a long-lasting effect, supporting the efficacy of nudge-based interventions. However, the studies that oppose the same outline the conditions and effectiveness of nudge theory for this purpose more precisely. These studies reveal that some nudges lose effectiveness due to workplace mindsets, meaning that an intervention needs to be well-suited for specific workplaces. Nudge theory can be effective in eliciting a positive behaviour change in employees in the workplace to increase health behaviours. However, there are certain limitations to their effectiveness. Interventions need to be well-operationalised to bring out a long-term impact by affecting workplace mindsets. The social-desirability bias can also act against the intended purpose of the intervention if not controlled. Certain nudges can be more effective than others and using a combination during intervention periods may have the best outcomes. Upon examination of the resting state fMRIs and anxiety scores, researchers were able to procure significant results for both cerebral hemispheres. Firstly, the top-down exteroceptive network was found to be composed of inhibitory neural connections i.e, neurons that inhibit the firing of an action potential across a particular network (Collins Dictionary, n.d.). The prevalence of such a network was justified with the help of the predictive coding framework, which explains how the brain continuously generates models based on previous experiences to predict reactions to a sensory input (Gilbert et al., 2022). However, if a prediction error (when the predicted reaction to sensory input does not match the actual reaction) occurs in the exteroceptive network, the inhibitory neurons in superficial and deep cortical layers are targeted to reduce passing of neuronal messages. This filtering is done to potentially suppress prediction errors in lower levels of cortical hierarchy, prioritise more unexpected stimuli, and reduce sensory overload. On the other hand, an excitatory nature of interoceptive and motor networks was observed, which suggested the presence of excitatory

neurons that promote the passing of action potentials. Interoceptive connections may utilize them to enhance the brain's attention towards bodily signals like perception of heartbeat and breathing difficulties. These symptoms, through the enhancement of the interoceptive network, were positively correlated with the intensity of somatic anxiety in participants. Similarly in motor networks, excitatory connections can enhance impulse transmission from hierarchically higher (SMA) to lower motor regions (MC), which will regulate motor responses that are manifested in somatic anxiety, such as muscle tension and fidgeting of hands. All of the aforementioned observations significantly aligned with the FSA scale results.
In the exteroceptive network, higher somatic anxiety scores were associated with increased inhibition, reflecting heightened sensory sensitivity to external stimuli.
In the interoceptive network, excitatory backward connections intensified with higher scores, mirroring increased internal bodily awareness and physiological symptoms such as increased heart rate and respiratory changes.
In the motor network, enhanced excitatory backward connectivity corresponded with increased muscle tension and motor restlessness which are hallmark symptoms of somatic anxiety.
The misalignment of observations with FA scores indicates a clear difference between cognitive and somatic anxiety and their connectivity with sensorimotor circuits. The paper proceeds to support the existence of two separate components of anxiety and their intricate interaction with one another. Although the type of enhanced processing in cognitive anxiety was not highlighted, the collected evidence clearly implies a backward connection, or a top-down processing approach in the somatic counterpart.In addition to this, the empirical Bayesian scheme was conducted to validate effect size and the neural routes chosen for the study. Specific participants were withheld and asked if they can estimate FSA scores of someone else by looking at their neural connectivity estimates. Results suggested that five individual pathways under the three aforementioned networks showed a strong correlation with the respective FSA scores, and three of those pathways being of top-down nature further justifies the overall claim. This research's strengths revolved around large sample size and cross-validation to ensure generalizability. However, its primary limitation was the absence of participants who were actually diagnosed with somatic anxiety. Considering this, testing effective connectivity in sensorimotor circuits of somatic anxiety patients can perhaps garner varying observations that can enrich and expand this area of specificity. Lastly, it is undeniable that the current findings opened avenues for further exploration of therapeutic interventions such as neurofeedback and relaxation techniques involving Transcranial Magnetic Stimulation (TMS).

## Implications

The findings of the study shed light on how the hierarchical transmission of impulses from upper cortical regions to lower sensorimotor areas drives somatic symptoms of anxiety, such as increased heart rate, hyperventilation, and muscle tension (Washington, 2024). This process, mediated by the sympathetic nervous system, provides a mechanistic basis for understanding the physiological manifestations of anxiety, including those triggered by stress or panic-inducing stimuli. In a real-life scenario, such as an individual participating in bungee jumping, the factor of height can be a stress-inducing stimulus that triggers their sensorimotor system for an anxiety attack. This external stimulus will be received by the exteroceptive network's primary visual cortex for basic visual processing, which will pass that information to the lateral frontal pole. This high-level region will utilize the predictive coding framework to make predictions about the outcome, and share this information downwards back to the visual cortex for enhanced exteroception. After this, cognitive anxiety can generate negative thoughts that can trigger physiological symptoms of somatic anxiety through the interoceptive and motor pathways. Once internal symptoms like increase in heartbeat are evident, they are processed with the help of anterior insula, which passes down the impulse to the posterior insula for internal perception. Simultaneously or as an aftermath, certain motor-regulated symptoms such as muscle tension will occur once descending impulse transmission from the supplementary to primary motor cortices affects the target muscles. Although this is an oversimplified understanding which does not spotlight other ongoing processes, this can potentially explain the essence of descending sensorimotor processing and the responsible brain regions deduced by this study. In the context of stroke surgery, these insights could hypothetically explain the onset of panic attacks in post-operative patients, where disruptions in sensorimotor pathways may amplify anxiety-related physiological responses. From a biomedical perspective, the identification of specific neural connectivity patterns as biomarkers of somatic anxiety opens avenues for the development of targeted drugs. Such treatments could aim to modulate the overactive top-down connections in sensorimotor circuits, offering more precise management of somatic anxiety symptoms and potentially improving patient outcomes in clinical and therapeutic settings. These are life-changing implications for people with severe somatic anxiety. The implications of this study extend beyond theoretical insights, offering practical applications in healthcare and therapeutic interventions. From identifying potential biomarkers for somatic anxiety to informing the development of targeted pharmacological and non-invasive treatments, the research paves the way for precision medicine approaches to managing anxiety disorders.

## Conclusion

This study advances our understanding of somatic anxiety and its manifestation in humans by identifying enhanced top-down connectivity in sensorimotor networks as a key neural mechanism. It provides valuable insights into the neural basis of the physiological symptoms of anxiety. Furthermore, these findings have practical implications, from identifying biomarkers to developing targeted treatments, offering new directions for precision medicine and therapeutic interventions in managing anxiety disorders. We leave you with further questions to ponder over:

1. Can cognitive anxiety initiate its somatic counterpart, and is this relationship bidirectional?
2. Could similar neural patterns emerge in high-performance settings, such as athletes experiencing somatic anxiety during competitions?
3. How might cultural differences shape patterns of top-down connectivity in sensorimotor networks?
4. Could non-invasive treatments, such as neurofeedback or transcranial magnetic stimulation, effectively target these connectivity changes?
5. To what extent do age, gender, or genetic factors influence the manifestation of somatic anxiety through sensorimotor pathways?
6. How can long-term treatments for anxiety, such as C.B.T. or medication, alter the neural connectivity patterns?

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Lab Review

ASHOKA PSYCHOLOGY REVIEW

# A Review on Parent and Peer Messages About Homosexuality: Considering the Role of Gender

Fern (Shirin Raman) & Prajakta Karkhanis

Original Paper: Foust, M. D., Ward, L. M., Hagelskamp, C. & Rowley, S. J. (2021). Parent and Peer Messages About Homosexuality: Considering the Role of Gender. Sexuality & Culture, 25(2), 597–622. https://doi.org/10.1007/s12119-020-09785-7

In the past few decades, there has been an increased acceptance of homosexuality, which has been linked to a general shift to liberalism and increased exposure to queer people either in person or through media, with notable differences across country, gender, age, education, marital status and religion (Adamczyk & Liao, 2019). Thus, a huge factor influencing the views one holds would be the social context one belongs to and the kind of messages one receives from it — specifically, gendered sexual socialization, the gendered process through which individuals come to understand and form their beliefs about their sexual roles, behaviors and sexuality (Gansen, 2017). Despite this, there have been few studies looking at the role sexual socialization plays in the messages one receives on homosexuality. Foust et al. (2021) aim to tackle this in their paper, where they look at the messages about homosexuality that college students had received in their formative years (between ages 5 and 18) from their parents and their peers, conducting analysis that looked both at the gender of the source (whether the parents and peers were men or women) and the gender of the recipient. In this paper, we will summarize and discuss Foust et al.'s study, implications of their findings, its relevance in the Indian context and further questions that they raise.

## Framing the Hypothesis

This study uses the theory of sexual scripting — that there exist cultural messages about sexuality, which become part of an individual's schemas of how they perceive themselves as sexual beings and how they perceive the sexual world around them. They say that this is a gendered process, as the messages one receives are defined by what their gender is, and what gender these messages come from, as there exist sociocultural differences in the stereotypical expectations of how women and men should behave in sexual situations. After examining these differences in detail, they came to the following three hypotheses:

H1: Messages about homosexuality would differ across the type and gender of source, such that peers would provide more positive messages than parents, and female sources would provide positive messages than male sources. Conversely, parents would provide more negative messages than peers, and male sources would provide more negative messages than female sources.

H2: Messages about homosexuality would differ across the gender of the recipient, such that women would report receiving more positive messages than men, and men would report receiving more negative messages than women.

H3: The gender of the recipient and source would interact, such that women would report receiving more positive messages from female sources, and men would report receiving more negative messages from male sources.

## Methodology

The sample consisted of 429 undergraduate students aged 18-24, who were enrolled in introductory psychology courses and received credit for their participation. Women consisted of 55 percent of of the sample. The sample was predominantly White, heterosexual and raised in the United States. A majority of the participants had married parents who had completed some form of higher education, and were acquainted with someone who was lesbian, gay or bisexual. A pen-and-paper survey was administered in a lab on campus in groups of 2-10 participants. A 9-item scale developed by Dr. Monica D Foust, as part of a 50-item measure based on the Sex-

ual Socialization Discourses measure developed by Caruthers and Ward, was used to examine the messages participants had received about homosexuality. Six items were to assess positive messages while three were to assess negative messages. Participants were asked how strongly each message was conveyed to them on a 4-point scale, with separate responses for each of the four sources. The responses were first analyzed using separate exploratory factor analyses for each source, using Maximum Likelihood extraction. As the factors for positive messages and negative messages were moderately yet significantly correlated with each other for each source, they were treated as two separate independent variables. The hypotheses were then tested with a multi-level regression model with random effects, level 1 accounting for the variation between message sources and level 2 for the variation between recipients. Separate regressions were run for positive and negative messages with demographic information as controls.

## Results

Most participants reported receiving low to moderate positive messages from each source, and few negative messages. The differences between the strength of these messages were statistically significant. Mothers indicated more positive messages than fathers, and women received more positive messages from peers across genders. Conversely, men received more negative messages from their peers. All positive and all negative messages were positively correlated with each other. Exposure to more positive messages from parents was correlated with fewer negative messages from peers, having an LGB friend or family member was correlated with more positive messages, and higher parental education was correlated with more positive messages.

H1: While peers provided more positive messages than parents, female sources provided more positive messages than male sources and male sources were reported to provide more negative messages compared to female sources, peers, rather than parents, also provided more negative messages.

H2: No statistically significant result was found to indicate that women received more positive and less negative messages than men.

H3: There was a significant interaction between the gender of the recipient and the source for positive messages, i.e. women reported receiving more positive messages from female sources, but there was only a marginal significance for this interaction on negative messages (that is, men reported receiving more negative messages from male sources). Men reported receiving more negative messages from their peers, not their parents.

## Discussion

The authors suggest that their finding that participants may have received fewer negative messages may be due to the current sociocultural climate or the parental education of the participants. Their research also finds that peers provide more negative messages than parents, and they suggest that this could be because parental messages are often about sexual safety (abstinence and preventing pregnancy) while peer messages could be about policing one's identity and expression. Peers also provide more positive messages than parents, perhaps attributed to this or the fact that youth may pay more attention to their peer's messages than that of their parents. The finding that female sources provide more positive messages than male sources is consistent with previous literature on gendered attitudes towards homosexuality. The authors find that men seem to distance themselves from homosexuality, which could be a result of masculinity being culturally heterosexual. They suggest that the positive messages women receive may indicate a minimal stigma around homosexuality. Despite their study showing the different sexual scripts offered by parents and peers across gender, they note that their study sample is homogeneous. Moreover, the study has the limitation of having collected retrospective information from their participants and groups messaging about lesbians and gays, so the accuracy of the data can be questioned. As aforementioned, the paper groups homosexuality as one category, but literature has shown that messages differ based on distinct categories within the queer community — not just lesbians and gays, as the study notes, but also bisexuals, asexuals and transgender people, nuances that are further complicated by gender (Feinstein et al., 2022) which are not properly reflected. This also makes it unclear what messages are being conveyed — are they about gay men, lesbians, bisexuals and so on? Moreover, one's own opinions on these categories would influence the way one perceives sexual scripting. For example, what seems homophobic to one person may not be homophobic to another. This holds especially true when the sample is majorly heterosexual, as a cis-heterosexual person is privileged compared to trans and queer people, and these populations would perceive social situations very differently. Likewise, positive messaging may not indicate the absence of homophobia, as people may hold certain beliefs that they do not express, which would complicate the results and the explanations provided. Parental education may also be a bigger confound than anticipated, as education strongly influences one's views, and thus the findings cannot be generalized to non-American and non-White populations as well as populations without higher education. The research has not accounted for the demand characteristics and the respondent's biases that could make them answer the questions inaccurately. The study has also not taken into account the way having a single parent, a turbulent relationship between parents or between parent(s) and children, or same-sex or queer parents may influence the kind of messaging one receives. While this offers up a potential area for future research, it also complicates the question of gender even for a cis-heterosexual respondent. Further, in discussions about sexual scripting and sexual messaging, topics such as sexual assault, sexual aggression, normalisation of sexism, toxic masculinity, and homophobia and transphobia were not taken into consideration (or shown in any of the discussions or results). These topics may provide alternative explanations — for instance, parents providing more cautionary sexual messages to female children may be because if they experience sexual harassment, they are more likely to be blamed for it due to victim-blaming (Weiss, 2009). It is also unclear whether the negative messages men receive are about policing masculinity or rejecting femininity, which are widely different and this clarity would be needed to develop an intervention model. One of our biggest criticisms of the paper would be that it assumes a binary view of gender that seems to be tied to sex and not gender identity; its gendered categories are male and female, and as the study looks at the role of gender in sexual messaging and looking at this through a non-binary lens would add to the study, as there are further insights that could be offered by comparisons not only along the male/female dichotomy, but also along trans- and cis-gendered lines. Similarly, differences between sources and recipients of different sexualities was left unexplored. While we

understand it would be difficult for this demographic to be found in the university, it is a major limitation of the study as that would reflect the way in which sexual scripting occurs in the real world.

## Implications and Further Questions

The study was the first of its kind, and despite its limitations, it opens the field to many related questions on how one's sexual identity is influenced by the messaging they receive from their parents and peers, as well as their gender.

Can these results be applied to the Indian context? Indian attitudes on homosexuality are not well-defined as there are no major statistics (unlike in the United States, where this study took place). The Indian context also has more conservative attitudes towards sexuality. Moreover, many sociopolitical structures continue to harbor unfavorable attitudes towards queer people through homophobia, transphobia and conversion therapy, and cultural norms are still predominantly heterosexual (Chatterjee & Mukherjee, 2021; Sheikh, 2008). As studies are still emerging in this area, it might be helpful to culturally validate this study to understand Indian norms and sexual scripting, and compare these with the Western world. The limitations of this study can be looked at as avenues for further research. Some suggestions are — replicating the study in different populations, looking at intersections of queer identity and different family structures with social scripting, looking at the interactions of culturally present toxic masculinity, sexual harassment and homophobia with the messages one infers, and attempting a longitudinal study that focuses on the messages provided to participants in their formative years or a cross-sectional study with children and not college students. These would serve to make the study more internally and/or externally valid, and the findings would lead to stronger claims. There are also practical implications of this study. Understanding the ways in which sexual scripting works could lead to developing programs for sexual health and wellness among youth, and understanding how and what messages about homosexuality are conveyed would help with developing interventions to reduce discrimination and create more inclusive environments for trans and queer folk.

## Conclusion

Foust et. al.'s study aims to bridge a gap in the literature on sexual socialization — what role does gender play, and how do sexual scripts differ between parents and peers? It comes up with innovative hypotheses and develops a new survey to assess the same. Despite the study's limitations, its findings propose ways in which gendered messaging about sexuality, specifically homosexuality, can work and a solid base for future research to be built upon.

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