Cognitive Proxemics: An Extension of Proxemic Theory via Internal Mental Representations

Daniel Greeves[1]
[1]*Researcher, School of Behavioural Science, Evidentia University, Kissimmee, United States*
Corresponding Author: danny_physio@live.co.uk

***Abstract*: Proxemics is a core dimension of nonverbal behaviour, capturing how humans use physical space during interpersonal interactions. However, despite recent advances in cognitive neuroscience, the underlying cognitive processes that shape these nonverbal behaviours remain underrepresented in the nonverbal behaviour literature. This article introduces the conceptual construct of Cognitive Proxemics, which integrates research on how mental representations influence psychophysiological arousal and, in turn, guide the regulation of external interpersonal space. Drawing on findings from spatial cognition, peripersonal space research, and mental imagery studies, the article illustrates how incorporating these cognitive antecedent processes into proxemic theory broadens and deepens our understanding of nonverbal behaviour. By providing a conceptual label for the dynamic interplay between internal representational states and observable spatial behaviour, Cognitive Proxemics helps to broaden proxemic analysis within nonverbal behaviour to incorporate relevant cognitive and psychophysiological processes.**

***Keywords*: Proxemics, nonverbal behaviour, Cspatial cognition, peripersonal space, mental imagery.**

1. Introduction

Since Edward Hall first introduced the term proxemics in the 1960s (Hall, 1966), the regulation of interpersonal distance has been regarded as a core dimension of nonverbal behaviour. Proxemic choices—how close we stand, how we approach, how we withdraw—are deeply connected to safety, social comfort, power, and emotional regulation (Argyle and Dean, 1965; Burgoon et al., 2023). Decades of research have demonstrated that proximity preferences vary across cultures, personality traits, and clinical presentations (Hayduk, 1981; Sorokowska et al., 2017). Although the original conceptualisation focused on overt spatial behaviours, the underlying principle—that distance management is intrinsically linked to emotional and physiological regulation—has been demonstrated across many empirical studies (Candini et al., 2021; Cartaud et al., 2018). This article proposes 'Cognitive Proxemics' (CP) as a distinct sub-branch of traditional proxemics, integrating research on the mental construction, representation, and modulation of spatial relationships into the broader domain of nonverbal behaviour.

2. Cognitive Proxemics as a Conceptual Construct

The literature on nonverbal communication offers rich descriptions of spatial behaviour and the observable features of interpersonal distance. For example, Hall's (1966, 2005) intimate zone—spanning approximately 0 to 18 inches and typically reserved for lovers, close friends, and parent–child interactions—details how people use space, yet provides limited insight into the cognitive antecedents that shape these proxemic choices. Advances in spatial cognition, peripersonal space (PPS) research, and mental imagery studies indicate that the brain encodes imagined or remembered spatial relationships using mechanisms similar to those used for real space (Burgess, 2008; Pearson et al., 2015). Moreover, internal simulations of spatial or threat-related scenarios have been shown to modulate arousal, attentional allocation, and threat appraisal in ways functionally comparable to real-world proximity (Lang, 1979; Schaefer et al., 2003; Grèzes et al., 2013). These findings align with embodied cognition frameworks, which hold that spatial reasoning is scaffolded by sensorimotor systems (Barsalou, 2008; Glenberg, 1997; Wilson, 2002). Yet, the extent to which such internally generated spatial representations inform physical proxemic behaviours has not been systematically integrated into contemporary models, leaving a translational gap between internal spatial simulation and observable interpersonal distance regulation in nonverbal behaviour. While the phrase "cognitive proxemics" has appeared sporadically in the literature—most notably in Bagnara and Vidari's (2003) exploration of workplace knowledge design—it has not been formally defined as a theoretical construct in behavioral science. CP is proposed to encompass research on the neural and representational mechanisms through which proximity information—both spatial and social—is encoded, stored, and used to modulate interpersonal behaviour via nonverbal communication. It extends the scope of nonverbal behaviour literature by incorporating the intrinsic distance-regulation processes that operate within mental representations before they manifest as measurable interpersonal distance and spatial behaviour.

Within this framework, CP incorporates research that discusses how these mental representations and spatial distances influence arousal, cognition and emotional processing—therefore directly influencing how external interpersonal physical spaces are regulated. Through synthesising advances across diverse research domains, this article invites scholarly debate on whether expanding our understanding of the cognitive antecedents of proxemic behaviour would help elucidate the mechanisms governing physical spatial regulation and, in doing so, add depth and nuance to the nonverbal behaviour literature.

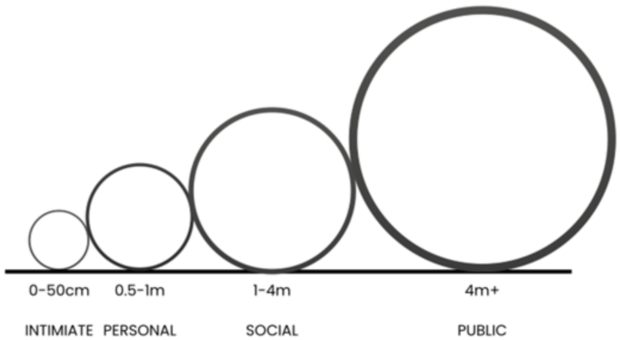

Fig. 1. Hall's (1966) 'Proxemic zones' (adapted from Marquardt and greenberg, 2012)

The approach of exploring the mechanisms that underpin various nonverbal behaviour channels is well-established. For example, the domain of facial expressions includes examining the theoretical and physiological research on emotion in order to more fully understand the mechanisms that affect facial expression. Moreover, facial expression research explores the neurological pathways that create such expressions (Rinn, 1984). Oculesics—the nonverbal channel concerned with visual behaviour—encompasses the sensory facets of vision along with the underlying anatomy, physiology, and neurology of the visual system to explain the mechanisms that shape gaze and eye contact. This author argues adopting the CP conceptual label facilitates the inclusion of research that examines how we cognitively map space, thus broadening the nonverbal behaviour literature. In short, CP is not proposed as a new branch of study, it simply offers a nomenclature that expands the scope of proxemics to incorporate spatial cognition, PPS and mental imagery research within the study of nonverbal behaviour.

3. Proxemics and Emotional Regulation: Contemporary Evidence

Proxemics has long been recognised as closely linked to affective regulation—individuals routinely adjust interpersonal distance to modulate discomfort, reduce threat anticipation, or facilitate intimacy (Burgoon and Hale, 1988). Bird et al. (2012) demonstrated that the hippocampus provides an allocentric (environment-centred) spatial scaffold that is translated into egocentric (self-centred) imagery via retrosplenial and parietal regions. This transformation allows individuals to simulate themselves within imagined environments and anticipate spatial interactions. Importantly, these neural systems do not differentiate strictly between real and imagined input. They construct spatial coherence whether the scene is perceived, remembered, or invented. Recent findings provide more precise evidence of the impact of these mechanisms in real-word contexts. Kroczek et al. (2020) showed that individuals with high social anxiety rated close interpersonal distances (approximately one metre) as significantly less pleasant and more arousing than greater distances, while also demonstrating increased skin conductance responses and measurable backward movement to avoid proximity. These patterns highlight the psychological sensitivity embedded within proxemic behaviour. Kroczek et al.'s (2020) study utilised Virtual Reality (VR) agents to conduct brief social interactions with participants, and therefore more research involving naturalistic settings and more elaborate VR interactions is required to more fully understand the real-world implications. However, evidence that psychological differences can modify proxemic behaviour strengthens the argument that cognitive neuroscience should play a greater role in traditional proxemic theory. This indicates that greater integration of antecedent cognitive processes could contribute meaningfully to the advancement of proxemic theory.

Research indicates that individuals with high social anxiety maintain substantially larger interpersonal distances and often disengage attention when others approach. This attentional avoidance of close-range social stimuli suggests a defensive strategy that mirrors behavioural withdrawal (Leroy et al., 2019), reinforcing the central premise that distance regulation is a central component of emotional self-management. While it is widely agreed these behavioural responses primarily relate to threat anticipation and self-protection (Veranic et al., 2025), more research on the cognitive processes driving these responses is required. Givon-Benjio et al. (2020) provided the first evidence that individuals with Social Anxiety Disorder (SAD) demonstrate an 'estimation bias', whereby they perceive unfamiliar others to be closer than they actually are, highlighting the importance of mentally simulated distance. Givon-Benjio et al.'s (2020) findings are particularly interesting given previous authors have found that SAD should theoretically improve distance-accuracy judgements due to enhanced working memory of feared stimuli (Amir and Bomyea, 2011; Yoon et al., 2017). While further research is needed to replicate these findings, the idea that distortions in mental simulations can directly shape how individuals perceive the physical location of others carries important implications for proxemics and for mental health conditions such as SAD. Furthermore, if distorted mental simulations influence an individual's physiological and behavioural responses, this has important ramifications for real-world conflict situations in which two people must share a confined physical space (e.g. the office).

Mental imagery is increasingly understood as a depictive, quasi-perceptual process in which internal representations activate neural mechanisms similar to those engaged during real perception (Pearson et al., 2015). Spatial cognition, on the other hand, refers to the processes through which individuals organise and transform information about spatial relationships (Waller and Nadel, 2013). Taken together, this lends mental imagery a spatial structure: imagined objects possess size, distance, position, and movement that are encoded in the visual cortex (Senden et al., 2019). Trope and Liberman's (2010) 'Construal-level theory of psychological distance' posits distant mental objects are construed more abstractly, while close mental objects are construed more concretely. Nanay (2019) endorses the notion that mental representations be considered as real entities, whereas Hudson and Johnson (2021:7) expand this idea and report certain mental images (Emotional Memory Images) be considered as 'real, fixed entities that can be manipulated'.

Evidence indicates that the spatial features of mental imagery—especially distance and movement—modulate emotional intensity. Davis, Gross, and Ochsner (2011) showed that imagining negative scenes moving toward the self increased emotional intensity and psychophysiological arousal, whereas imagining them shrinking or moving away significantly reduced these responses. This has many pertinent real-world implications. For example, an individual who repeatedly replays a 'zoomed in' mental simulation of a past conflict with a colleague may experience greater psychological distress, which may in turn make conflict resolution more challenging. Moreover, the distress from the mental simulations may contribute to observable changes in physical distancing, and potentially impact the overall workplace. Beyond specific proxemic examples, these findings may have wider consequences. For example, an individual ruminating on a previously failed driving test by repeatedly replaying a 'close-up' mental representation of the prior event may experience increased psychophysiological arousal that impairs optimal concentration, while their cognitive processes may also distort their perception of spatial relationships and hinder subsequent attempts. Incorporating this research into the domain of proxemics via CP terminology could expand our understanding of how the manipulation of mental imagery affects nonverbal behaviour.

Peripersonal space (PPS) is the multisensory, action-oriented space immediately surrounding the body (Zanini et al., 2021). It is encoded by fronto-parietal networks and integrates visual, tactile, and auditory information to guide defensive responses and goal-directed action (Graziano and Cooke, 2006). PPS has been observed to be highly plastic; it can expand when individuals perceive threat and contracts in secure contexts (de Vignemont and Iannetti, 2015). Critically, PPS can be reshaped by mental imagery alone (Davoli, Bloesch and Abrams, 2012), indicating that the action-orientated space around the body is sensitive to internal spatial simulations. These cognitive processes suggest that an individual's internal spatial mapping influences the body's defensive and attentional systems, and are capable of triggering physiological and behavioural adjustments that may be a key determinant of externally observed proxemic choices.

Hudson and Johnson (2022) expand this perspective and propose nonconscious mental imagery from past adverse or traumatic experiences can repeatedly trigger an individual's Hypothalamic-Pituitary-Adrenal axis and contribute to psychological distress. The notion that nonconscious mental imagery can influence our choices while outside our awareness, as well as be interacted with and manipulated by others (Hudson and Johnson, 2021), adds greater importance to the inclusion of more cognitive processes being explored in the proxemic literature.

Fig. 2. A visual representation of Peripersonal space (adapted from Serino, 2019)

To expand upon how the inclusion of CP within proxemics could be beneficial to the study of nonverbal behaviour, we can consider the components of power and dominance. Burgoon et al. (2021) suggest the physical control of space is a key factor in successfully exerting power and dominance. Schubert (2005) argued the perception of power involves the mental simulation of space, demonstrating an association between power and verticality in cognitive architecture. Rieger et al. (2023) showed how power concepts automatically recruit greater use of vertical spatial dimensions when mentally visualised, and Bertoni et al. (2023) reported that social power affects the multisensory representation of PPS. In conjunction with this, Galinsky et al. (2006) demonstrated how individuals primed with high power are less likely to spontaneously adopt another person's visual perspective in an imagery task. While Hong et al.'s (2019) research concluded that mental simulations involving power goes beyond metaphor, showing power activates automatic, implicit mental representations in higher spatial positions. In practical terms, if power-related contexts activate non-conscious perceptual–cognitive schemas, and mental imagery itself can influence physiological responses (Hudson and Johnson, 2022), then interpretations of nonverbal behaviour may need to be analysed across internal and external physical spatial domains to comprehensively account for the observed behaviour. Collectively, these research findings underscore the pivotal role that antecedent cognitive processes play in the nonverbal expression of proxemic behaviour—an influence that remains underrepresented in the current literature.

The CP terminology therefore serves as the conceptual bridge that links the vast literature of cognitive neuroscience, spatial cognition, PPS and mental imagery to the expression of nonverbal behaviour through physical space management. It aims to extend the study of proxemic theory beyond observable, physical behaviours to the cognitive systems that represent spatial proximity, even in the absence of external stimuli.

4. Cognitive Proxemics: A Conceptual Extension

CP captures four key principles:

First, internal spatial representations are encoded using similar neural systems that represent physical space (Burgess, 2008; Davoli et al., 2012). Second, individuals vary in their organisation of their mental imagery in relation to its perceived distance, size, movement, and perspective, which modulates emotional intensity (Davis et al., 2011; Grol et al., 2017). Third, the cognitive distance of mental images engages spatial mechanisms that influence arousal, attention, and change meaning-making (Gu and Tse, 2016; Trope and Liberman, 2010). Fourth, the cognitive mapping and spatial relationship of mental imagery directly influences the perception of physical entities, thus shaping observable proxemic behaviours. Considered together, these principles position CP as a conceptual label that extends traditional proxemic theory by accounting for the continuous regulation of the internal proximity of images, imagined events, and social stimuli, while also supporting their inclusion within nonverbal behaviour training and education.

5. Implications and Future Directions

CP offers conceptual and applied implications for research, nonverbal behaviour training and clinical practice. Furthermore, it suggests that therapeutic techniques involving imagery—such as cognitive distancing, imagery rescripting or prospective imagery interventions—operate partly through internal proxemic regulation. It also opens possibilities for assessing how individuals with anxiety, trauma or attachment disturbances organise internal spatial representations, and how these may contribute to maladaptive patterns of emotional responding.

6. Conclusion

Proxemics has long provided a powerful framework for understanding how humans negotiate interpersonal space. However, developments in spatial cognition, PPS research and mental imagery show that the brain constructs and responds to internal spatial representations with functional consequences comparable to real proximity. CP offers a theoretical extension that unites these domains, proposing that humans also regulate internal distances to manage arousal, emotional intensity, and cognitive load. By integrating cognitive spatial dynamics with classical nonverbal behaviour theory, CP provides a richer and more comprehensive account of how proximity—both real and imagined—shapes human experience.

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