

INVITED COMMENTARY, *BEHAVIORAL AND BRAIN SCIENCES* (PRE-REVIEW, PRE-COPYEDIT). PLEASE DO NOT CITE THIS VERSION.

**Target Article Author.** Duncan Stibbard-Hawkes

**Word Counts.** Abstract: 60, Main text: 998, References: 734, Total: 1881

**Commentary Title.** Shared Intentionality May Have Been Favored by Persistence Hunting in *Homo erectus*

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**Abstract.** Shared intentionality is the derived hominin motivation and skills to align mental states. Research on the role of interdependence in the phylogeny of shared intentionality has only considered the archeological record of *Homo heidelbergensis*. But ethnographic and fossil data must be considered, too. Doing so suggests that shared intentionality may have been favored in *Homo erectus* to support persistence hunting.

**Main Text.** The Target Article necessitates reconsideration of the “ancestral null” hypothesis. This hypothesis states that “without positive [archaeological] evidence to the contrary, past humans should not be considered cognitively or behaviorally sophisticated,” (p. 10). The ancestral null is tacitly accepted by the interdependence hypothesis (Tomasello et al., 2012). Consequently, that hypothesis suggests an unnecessarily vague and temporally inaccurate phylogeny of shared intentionality. An alternative links psychological with ethnographic and fossil data to suggest that shared intentionality may have been favored by persistence hunting in *H. erectus*.

The interdependence hypothesis describes the phylogeny of shared intentionality. Shared intentionality is the motivation and skills to align mental states. Arguably, shared intentionality underlies humans' derived communicative and cooperative behavior (Tomasello, 2019). The evolutionary model is the stag hunt (Skyrms, 2004). In stag hunts, cooperation maximizes individual payoff. Thus, partners have a stake in ensuring that both cooperate adequately (Roberts, 2005). However, partners are fallible, and their intentions are uncertain. Thus, cooperation is risky. Sharing intentions by communicating reduces uncertainty and, therefore, risk. Consequently, cooperators can outcompete noncooperators by sharing intentions with likeminded partners.

As an evolutionary narrative of shared intentionality, the above has two shortcomings. First, there is unnecessary vagueness about the form of stag hunts. It is “unnecessary” because some evidentiary sources, like ethnographies and fossils, are neglected. Tomasello et al. (2007) demonstrate the cooperative function of white sclera, but sclera do not fossilize. Instead, Tomasello et al. (2012) only consider archaeological evidence for interdependent hunting. Moreover, all hypothetical examples include only material culture (e.g., spears). This suggests acceptance of the ancestral null, which invites inaccurate phylogenetic timelines. Indeed, this is the second problem. Tomasello et al. (2012) suggest that interdependent foraging first occurred in *H. heidelbergensis* (also, Tomasello, 2014, 2019, 2022). This understates the antiquity of shared intentionality.

Rather, shared intentionality may have been favored by persistence hunting in *H. erectus*. Persistence hunters use endurance running to chase prey to exhaustion (Carrier, 1984). Exhausted prey can be safely killed with simple weapons, e.g., rocks. Persistence hunting by *H. erectus* explains its cursorial adaptations (Bramble & Lieberman, 2004), patterns of meat acquisition, and

encephalization (reviewed in Pontzer, 2017). In short, if (i) contemporary persistence hunting is an interdependent, energetically profitable subsistence strategy and (ii) fossil evidence does not preclude persistence hunting by *H. erectus* (i.e., insofar as cursorial traits are attested), then shared intentionality may have been favored by persistence hunting in *H. erectus*.

Is there evidence for (i)? Ethnographies portray persistence hunting as interdependent and profitable. Lieberman et al. (2020) argue that effective persistence hunting requires cooperation. Those authors discuss Rarámuri individuals' recollections of persistence hunting. All persistence hunts were performed by groups. Sometimes, groups drove prey into traps while others ran alongside to prevent its escape, or else groups chased prey to exhaustion and killed it with rocks. Aboriginal peoples have reportedly jointly pursued kangaroos (Tindale, 1974). One individual chases while the other intercepts the kangaroo's path, reversing roles until the kangaroo becomes exhausted. Liebenberg (2006) discusses Kalahari bushmen alternating tracker or chaser roles in persistence hunts. All three citations suggest the importance of (joint commitment to) shared goals and individual roles for persistence hunting. Moreover, tracking is often collaborative. Liebenberg (1990) discusses how "tracks are commented on by... gesture [and] soft whispers" so as not to spook prey (both p. 55). He argues that "success... depends on how quickly the animal can be tracked down," (*ibid.*, p. 61). This implies ecological pressure for derived communicative skills and motivations, like shared knowledge ('What do we both know and what do only I know?'), the motivation to increase shared knowledge (e.g., via linguistic reference; Vasil, 2023), and false belief and joint reasoning ('Why should we follow which tracks?'). The metabolic expense of using the body as a foraging tool—compared to, say, shopping carts or guns—probably contributes to the rarity of persistence hunting, today (Lieberman et al., 2007). However, persistence hunting

can kill prey large enough to require cooperation to transport and consume (for prey sizes, see Morin & Winterhalder, 2024). Consequently, persistence hunting is likely to be profitable, on average (*ibid.*). Altogether, this supports (i) that contemporary persistence hunting is interdependent and energetically profitable.

Is there evidence for (ii)? *H. erectus* possessed derived cursorial traits, like a plantar medial longitudinal arch (reviewed in Holowka & Lieberman, 2018). The arch is maintained by bony and soft tissue structures (Huang et al., 1993). The vertical loads of running compress bony structures, and compression stretches soft structures, like the plantar aponeurosis (Ker et al., 1987). The stretched plantar aponeurosis stores elastic strain energy. Releasing this energy at push-off propels runners forward, like hopping on springs (Holowka et al., 2021). This increases locomotor efficiency because elastic strain is generated passively (Alexander, 1991). Importantly, the arch's spring is likely a cursorial adaptation, and not a spandrel associated with bipedal walking. Walking compresses the arch (Caravaggi et al., 2010). However, only running causes compression sufficient to engage the spring mechanism (Stearne et al., 2016). Moreover, similarities in the walking kinematics of humans and nonhuman apes (who lack the arch) suggest that the arch is not required for hominin stiff-lever walking (Holowka & Lieberman, 2018); and the transverse arch greatly stiffens the foot during walking and predated *Homo* (Venkadesan et al., 2020). Thus, evidence of a longitudinal arch in *H. erectus* suggests cursorial adaptedness. Perhaps the arch supported persistence hunting by cooperative *H. erectus* groups (Hatala et al., 2016). Altogether, this supports (ii) that fossil evidence does not preclude persistence hunting by *H. erectus*.

In conclusion, shared intentionality may have been favored by persistence hunting in *H. erectus*. This “first step” in the evolution of shared intentionality enabled its “second step” (Tomasello et al., 2012), partially preserved in the archeological record as evidence of “mosaic cumulative culture” and “technological ratchets” (Target Article, p. 29). This discussion excluded necessary questions of life history. Perhaps shared intentionality was also favored by alloparenting in *H. erectus* (O’Connell et al., 1999; see Hrdy, 2009; relatedly, Lieberman et al., 2021).

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