Neural repurposing as a driving force in the Baldwinian coevolution of emotional and propositional communications

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Natural speech is composed of two substantially different tools to transmit meaning i.e. affective prosody and the phonological system (Ackermann et al., 2014). Affective prosody mainly uses sounds to elicit a particular emotional state in the recipient, whilst the function of the phonological system is to transfer sound patterns into concepts – propositions. These two forms of communication are inseparable parts of every known natural speech. As speech prosody most likely has a genetic basis (Scartozzi et al., 2023) and shares many features with music, their ontogenetic development starts from a common phase (McMullen & Saffran, 2004), therefore many researchers have proposed that natural language evolved from a music-like protolanguage (Bannan, 2008; Brown, 2000, 2017; Fitch, 2005, 2013, Mithen, 2006).

However, although affective prosody is evolutionarily older than the phonological system and is shared by a broad group of mammalian species (Filippi, 2016), prosodic features such as pitch contour, stress, and timing are also more or less involved in the transmission of propositional meaning in speech (Nygaard et al., 2009). Yet, such an involvement is hardly present in music, probably because music is devoid of combinatorial symbolic meaning. Apart from this, natural language can take the form of sign language in which all speech properties are implemented (transduced) into the gestural domain. It has also been observed that non-human primates exchange propositional meaning by the means of culturally invented gestures (Hobaiter & Byrne, 2014) and vocalizations (Wright et al., 1990), which suggests that hominins also used some kinds of propositional communication independent of affective prosody. These observations challenge the hypotheses of a single common ancestor of language and music, and their subsequent linear independent evolution.

In this presentation, an alternative view is proposed in which affective prosody, sound symbols, and pantomime were all parts of a hominin communicative niche, but none of them were the main precursor of language. Instead, by being initially independent and different in terms of their communicative mechanisms, such as directly eliciting emotions (affective prosody), symbolizing sounds, and pantomime gesturing, they started to interact in response to new selective pressures resulting from increasing social complexity. On the one hand, unconscious and direct induction of emotions could have been involved in fulfilling adaptive functions such as strengthening social bonds (Savage et al., 2021) or in free rider recognition (Podlipniak, 2023). On the other hand, symbolic, indexical, and iconic tools could have developed in response to the need of selecting, amplifying, and sharing specific thoughts as well as planning the future. These functions could have led to the coevolution of consciousness (Dehaene, 2014) and natural language. As a driving force in this process, a proximal mechanism of 'neural repurposing' is proposed. Neural repurposing is a specific kind of exaptation (Gould & Vrba, 1982) and consists of reusing existing neural circuitry in a functionally novel neural tool (Schlaudt, 2022). Such a change can be culturally induced and achieved by neural plasticity which means that cultural invention could have been a source of interactions between affective prosody, sound symbols and pantomime among hominins. In fact, neural repurposing has been discovered in the contemporary communicative domain. For instance, it has been observed that native speakers of tonal languages differ in the lateralization of pitch processing from non-native speakers (Gu et al., 2013; Li et al., 2021; Liang & Du, 2018). The change of lateralization has also been noticed among users of Turkish whistle language (Güntürkün et al., 2015) – a culturally invented form of distance communication. Taking into account that pitch contour is a widely used clue to indicate grammatical mood (Jun, 2005; Warren & Calhoun, 2021), and prosodic accents are also an effective tool to communicate the hierarchy of words, it seems to be reasonable to assume that the elements of emotional communication were repurposed in order to fulfil new functions in the exchange of propositional meaning. Similarly, the use of pantomime to transmit propositional meaning opened the way to the emergence of conventionalized gestures (Zlatev et al., 2020). However, due to biological costs burdened on strenuous learning of these new hominin expressions, natural selection started to favor individuals (and their progeny) that were accidentally endowed with the predisposition to learn these expressions faster and less strenuously. This process – Baldwinian evolution (Baldwin, 1896a, 1896b) – could have led to the genetic canalization of the use of prosody in the transmission of propositional meaning.

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