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Variable cultural acquisition costs may explain contextual variation in peer cultures

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Abstract

Lew-Levy and Amir highlight contextual variation across both traits and societies in the influence of childhood peer cultures on mainstream adult culture. I suggest that this contextual variation can be explained in part by variable cultural acquisition costs, where some traits (e.g., technology) and societies (e.g., post-industrial) comprise accumulated cultural knowledge that is too costly for children to acquire.

Towards the end of their compelling and persuasive target article, Lew-Levy and Amir discuss how childhood peer cultures might vary across contexts. I think it is worth elaborating further on the drivers of this variation.

Lew-Levy and Amir identify variation first in the type of cultural trait involved (see Section 7.1: "What can peer culture reveal about cultural evolution?"). Children are more likely to innovate in spatial (e.g., location of food), linguistic (e.g., new vocabulary or grammatical rules), and social (e.g., communication norms) domains, rather than technological domains. Second, there is variation across societies (see Section 7.4: "How do peer cultures vary across contexts?"). While the influence of peer cultures seems frequent and persuasive in small-scale (e.g., forager) societies, it seems less likely in post-industrial societies where, while peer cultures still seem to be relatively autonomous (e.g., the playground games and rhymes of British children observed by the Opies), they are less likely to contribute to society-wide cultural innovation and change.

Both of these observations might plausibly be explained by variable cultural acquisition costs (Mesoudi, 2011). Even in small-scale societies, technology typically comprises multiple interacting parts that must be assembled in several steps, often without obvious causal links between a tool's eventual performance and its form or manufacturing process (Harris, Boyd, & Wood, 2021). And even if a novel technology works better than existing forms, there are still numerous social barriers preventing it from actually being adopted by others (Rogers, 1995). This makes technological innovation intrinsically harder than, say, linguistic or social innovation, where new word forms or customs can be invented and acquired easily, including by children. For technology, the lengthy acquisition of previously accumulated cultural knowledge represents a much greater limitation on the contributions that children can make to society-wide innovation, compared to non-technological domains.

Similarly, post-industrial societies have seen the exponential accumulation of scientific and technological knowledge over the last few centuries (Enquist et al., 2008; May, 1966; Price, 1963), accelerated by key cultural innovations such as the scientific method, mass communication, and tools such as microscopes and computers. As knowledge accumulates, however, so does the time and effort needed to acquire what previous generations have discovered or invented. Evidence for such increasing cultural acquisition costs comes from analyses showing that the mean age at which prominent scientists and inventors made their most significant advance increased from 32 years in 1900 to 38 years in 2000, with this increase specifically attributable to increased training periods (Jones, 2010). Consequently, it is not surprising that children are unable to innovate in post-industrial societies and have been relegated to receptacles of existing knowledge. Formal systems of education likely partly arose in response to these increasing acquisition costs, further removing children from situations in which they can influence wider cultural change.

Perhaps, however, this is too coarse-grained and too pessimistic. Derex (2021) recently argued that cumulative cultural evolution exhibits two dynamics: (i) periods of incremental optimisation of existing knowledge, interspersed with (ii) the opening of a new niche or domain, typically exploiting a new natural phenomenon. While the former requires the lengthy acquisition of incrementally accrued knowledge, the latter may be more amenable to innovation without lengthy acquisition costs, given the lack of established knowledge to acquire. For example, the advent of home computers in the 1980s led to a British computer games industry led by self-taught teenagers who mastered programming in their bedrooms entirely independently from either their parents or their teachers, at least until computer technology became so advanced that large teams of professionally trained programmers were needed (Andrews, 2020).

Further considerations of the dynamics of cumulative cultural evolution, particularly regarding the costs of acquiring previously accumulated knowledge and how this limits the opportunities for innovation, might help to elucidate exactly when, for what traits, and in what kind of societies, children are likely to contribute to society-wide cultural adaptation.

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Peer cultures in long-term cultural evolution

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Abstract

Lew-Levy and Amir's contribution highlights issues with our current frameworks and methods for understanding the evolution of human behaviour. We fully concur that more attention should be paid to integrating children's learning into models of cultural evolution and to positioning cultural adaptation in a long-term perspective to better understand the role of children in both the past and the present.

As scholars of childhood in the past and across evolutionary time, we warmly welcome Lew-Levy and Amir's work as an important, timely, and stimulating contribution to the behavioural sciences. It will doubtlessly generate productive research programmes. Here, we make three points about the consequences of this paper for cultural evolutionary work and our understanding of childhood in the present and past.

Firstly, although the authors do mention material culture, often cultural knowledge and products achieve momentous complexity over time through intergenerational processes of innovation and cultural transmission (Henrich, 2016; Mesoudi & Thornton, 2018). Moreover, material culture may persist across and transcend generations. Salient contributions in such domains require both the time to master the accumulated knowledge and a level of expertise not available without years of practice, which may begin as play but often requires practice and instruction. It is unclear from the present work what the role of children's learning and the ensuing peer cultures would be for skills and technology that require intergenerational accumulation and expertise. This is not a shortcoming of the target paper specifically but rather highlights blind spots in cultural evolutionary theory, which so far has not engaged seriously with differences across individuals (but do see Molleman, van den Berg, & Weissing, 2014; van den Berg, Van, & Molleman, 2024) or across the lifespan – in fact, children's learning has been virtually absent from formal investigations of cultural evolution (but see Deffner & McElreath, 2022; Frankenhuis & Panchanathan, 2011; Kandler, Fogarty, & Karsdorp, 2023, and our own work Miu et al., 2025). Moreover, while cultural evolutionary processes require both an understanding of the generation of novelty and its spread, most recent work in cultural evolution has focused exclusively on processes of cultural transmission, with innovation tending to be black-boxed or treated as random, as an error, or as a mutation-like process.

Cultural evolution needs to incorporate theories of creativity and innovation if it is to develop into a mature science of human behaviour that, as it likes to claim, can integrate across levels of explanation. This might require us to focus more on individual-level cognitive processes and to re-integrate the individual into our formal and experimental frameworks designed to study cultural transmission. While these calls to action are not new (Acerbi & Mesoudi, 2015; Perry et al., 2020; Singh et al., 2021), we suggest that focusing on children and their role in innovation can be a productive place to start. Developmental psychology makes specific claims about learning and exploration strategies that vary across the lifespan (Gopnik, 2020; Gopnik et al., 2017) that can be readily integrated into our models. Children's cognitive tendencies to explore broadly might be exactly the type of variation generation process that populations can build on even in the context of intergenerational accumulation in order to achieve better solutions (Miu et al., 2025). And these cognitive tendencies need to be situated cross-culturally and historically (Muthukrishna, Henrich, & Slingerland, 2021).

Second, the paper's rich behavioural examples are compelling, but from a long-term perspective the minimal focus on materials and material proxies for peer cultures is unfortunate. True longitudinal studies that demonstrate genuine peer-culture longevity will only be possible by integrating a deeper ethno-historical or archaeological perspective (where children are now beginning to be considered seriously; see Meyer & Riede, 2025; Milks et al., 2021; Nowell, 2021; Nowell & French, 2020; Riede et al., 2021), which, in turn, is only possible via material proxies. Much work in evolutionary human behavioural sciences, including at times the target article, often assumes rather than demonstrates that behaviour like peer cultures is adaptive, i.e., that it increases the fit between individuals or groups and their environment. This is partly an issue of time scales and partly of data collection – it is nigh impossible to capture true adaptiveness from the type of cross-sectional data typical of ethnographic studies, nor in the absence of considering real ecological changes. This can only be achieved by incorporating truly long-term perspectives and data sources beyond the behavioural sciences (i.e., genetics and the environmental sciences).

Lastly, while the current paper usefully summarises a wealth of evidence on peer cultures across societies, we felt that it lacked a more elaborate discussion on present-day children in Western societies. While it is indeed the case that childhood in these societies looks very different from childhood throughout most human history, there is still considerable variation between childhoods in the West that we expect would have consequences for the evolution of peer cultures. For instance, the US and Denmark differ greatly in terms of child safety and autonomy, the

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