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We are all capable of cumulative cultural evolution, but we don't need to all the time

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Vaesen and Houkes provide a new perspective on claims that cumulative culture (CCE) is a defining characteristic of humans. They argue that, contrary to the broadly accepted notion that humans exhibit CCE, a granular view of typical methodological approaches to study CCE has limitations, thus prohibiting a sound test of this claim. Here, we, as developmental and comparative experimental psychologists, reflect on some points they raise.

Vaesen and Houkes argue that the field of CCE relies too heavily on data from the technological domain. Many cultural traits are hidden or abstract, therefore studying the use and evolution of physical tools is valuable in terms of historical, experimental and comparative perspectives and allows us to empirically quantify mechanisms underpinning CCE. Our own examination of the use of novel artefacts, such as puzzle-boxes, allows us to study, in real-time and across diverse age-groups and species, candidate mechanisms supporting CCE. These include social learning strategies, imitation, innovation, cooperation, and prosocial behaviour. Science is itself a cumulative process, with subsequent scientists building upon previous evidence; a process that naturally hones emphasis on the same area and has done so very effectively within technological research. We believe this research domain would not have developed such a deep, inter-disciplinary and robust theoretical and experimental base had scientists not taken this approach. Indeed, we note that Vaesen and Houkes focus on technological examples when critiquing applied methodologies and suggesting future approaches.

We agree and welcome the call for the study of more varied phenomena. Indeed, there is a vibrant and growing body of work examining CCE across diverse domains including social norms, folktales and urban legends, cooking, language, mathematics, religion and rituals which is of course not a comprehensive list (see for example Acerbi, Kendal, & Tehrani, 2017; Lindenfors, Envall, Isaksson, & Enquist, 2015; Norenzayan et al., 2014; Savage, 2019; Stubbersfield, Flynn, & Tehrani, 2017; Subiaul, Winters, Krumpak, & Core, 2016). These lines of work have developed sophisticated methods of observing, coding and analysing complex behaviour. Accordingly, they provide substantial insights regarding how non-technical behaviour has evolved in ways analogous and different from technological CCE, as the references cited conclude.

A valuable call to move research beyond WEIRD (Western, Educated, Industrialised, Rich and Democratic) samples has rightly taken hold recently, and the authors add their voice to this. We strongly support this call, and those who have been making it within the field of cultural evolution (e.g., Kline, Shamsudheen, & Broesch, 2018) and within the broader study of human psychology (Henrich, Heine, & Norenzayan, 2010; Nielsen, Haun, Kärtner, & Legare, 2017). Developmental psychology in particular has embraced cross-cultural research. There is a growing corpus of developmental research documenting cultural variation and

continuity in the expression of the building blocks of CCE; imitation and innovation, advancing our understanding of the ontogeny of CCE (Neldner et al., 2020; Rawlings, Dutra, Turner, & Flynn, 2019; Van Leeuwen et al., 2018; Legare & Nielsen, 2015). Such cross-cultural research is crucial for improving our understanding of our capacity to flexibly adapt cultural learning to diverse ontogenetic environments. We further highlight the need to develop testable hypotheses to explain cultural consistency and variation. For example, exposure to formal education has been hypothesised as a potential factor in shaping the development of innovation and imitation (Neldner et al., 2019). The globalisation of formal education offers a unique opportunity to test this hypothesis and to provide insight into specific socio-cultural predictors of CCE.

A key issue raised in the article concerned claims that CCE is a “*unique and characteristic feature of human culture*”. The authors argue “*it is not enough to show that some human cultural behaviors result from CCE; rather, one must show that a large fraction of such behaviors result from CCE*”. We agree that as academic researchers we must consider our terms carefully, and avoid generalised terms based on the outcome of a given experiment using a specific demographic sample. However, we question why a large proportion of cultural behaviour should result from CCE, as CCE underpins the changes in culture, not the acquisition and transmission of culture? This is not to suggest that all humans are not capable of innovation. One look at the internet’s endless supply of “life hacks”, for instance, demonstrates humans’ abilities to innovate and transmit in everyday life. Yet we also conform to our cultural norms and conventions most of the time, thus allowing a streamlined societal functioning. We thus argue the universal human capacity for CCE rather than the volume of CCE behaviours is a more appropriate point of reference.

We also question the practicality - and therefore utility - of the solution presented by the authors. To meet their criterion for CCE “*a proper test requires a global and high-resolution sample that is representative of all of the cultural-evolutionary processes that have taken place in our species*”. Meeting this requirement seems logistically impossible, and thus has little value as a platform for future research. Similarly, the authors referred to cumulative culture as a process that produces traits that cannot be invented by a single individual within their lifetime. Although this is a commonly used criterion to attribute a given output as a product of cumulative culture, it is increasingly recognised that this is logistically impossible to test experimentally and thus has little utility as a diagnostic criterion (Mesoudi & Thornton, 2018; Miton & Charbonneau, 2018). Accordingly, we suggest that the authors propose a more feasible test of CCE to allow scientific knowledge accumulation on the subject.

As a final note, we turn to the reader and ask, if we step back and reflect upon our environment – our transport, language, medicines, culinary practices and so on, is it difficult not to think that our species holds something distinct, compared to other species, which allows rapid cultural and technological advances? Thus, it is not difficult from our everyday world to theorise that humans have a distinct cumulative culture process, which needs to be understood at both a holistic and granular level.