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Beyond “Uniqueness”: Habitual Traits in the Context of Cognitive-Communicative Continuity

Abstract. The paper discusses a longstanding and prevailing debate in the fields of comparative psychology and language evolution, namely the problem of continuity of cognitive and communicative abilities. It is suggested that although this problem has been addressed by multiple researchers, it remains a persistent topic of discussion and an important meta-theoretical theme in the field of language evolution. To support this claim, the paper first provides a brief overview of the continuity debate by discussing examples of prominent research work in comparative communication and cognition. It further suggests that the problem of continuity can be partly resolved by focusing on cognitive and behavioural trait distribution both between and within species. Specifically, it is proposed that conceptualising given traits as habitual, rather than human-unique, is informative for understanding evolutionary processes shaping human communicative abilities. Finally, the paper suggests that the debate on continuity would benefit from being placed in a broader framework of evolution of phenotypic plasticity and the role of cognition and behavior in evolutionary processes.

Keywords: continuity; comparative communication; comparative cognition; language evolution; comparative method; habitual trait; gesture; primate communication; infant pointing.

Introduction

The so-called problem of cognitive continuity is probably one of the oldest topics in psychology and the philosophy of science. From *scala naturae*,

through Cartesian dualism and up to modern discussions in philosophy of science, scholars continue to argue what unique properties constitute human mind and language; can these properties be found in other species; and how sharp are the differences between humans and non-human animals. This problem of continuity is thus central for disciplines more closely aligned with evolutionary research, such as comparative and evolutionary psychology, ethology, as well as the field of language evolution. Evolutionary approach to cognition and language is an interdisciplinary field of research its own right. However, the interdisciplinary nature of the field subjects it to the conventional approaches and traditions of disciplines encompassing the field, such as psychology and ethology.

Some of these traditions become meta-theoretical realms of debate in themselves. Consequently, it is important to recognise such *meta-theoretical debates and themes* that are still prevailing in research on evolutionary origins of cognition and language. The problem of cognitive and communicative continuity is an example of such a meta-theoretical theme. Its importance is exacerbated by the impact it can have on the way research results are interpreted and conceptualised.

This problem of continuity is central to disciplines investigating the origins of human linguistic and cognitive abilities. However, while such investigation relies on traditional methods of evolutionary analysis utilised for example by evolutionary biology (such as comparative method), difficulties arise when researchers attempt to apply these methods in the fields of evolutionary cognition and communication. First, these fields are dealing with traits that are not directly observed and do not fossilise, complicating objective description of these traits. Consequently, the way in which cognitive and linguistic phenotypes are conceptualised and defined in various species matters for the analysis and reconstruction of these traits' evolutionary history. Additionally, the interdisciplinary nature of the fields imposes further constraint on the discussion of continuity. These constraints result in a situation where the traditional evolutionary fields such as evolutionary morphology utilize continuity approach, while many researchers in cognitive studies have a harder time applying this concept (de Waal & Ferrari, 2010). A thorough description of the way in which the continuity debate manifests in various subfields of evolutionary cognition and communication studies is beyond the scope of the paper. Rather, the aim of this paper is to discuss a specific aspect of the continuity debate, namely the way traits of interest are conceptualised in reference to their "uniqueness". In order to illustrate the meta-theoretical debate associated with this classification, the paper provides specific examples of studies in comparative communication and cognition.

In discussing the limitations of the dichotomous approach to the problem of continuity, the paper provides a partial solution by implementing a broader evolutionary framework and examining traits distribution both between and within species.

Continuity in Comparative Cognitive and Communication

Before proceeding to proposed shortcomings of the continuity debate, it is necessary to briefly outline what cognitive continuity debate means and what positions can be attributed to “discontinuity” and “continuity” camps. The problem of continuity is closely associated with the question of “human uniqueness”, and specifically, whether human mind and language are unique (or comprise unique features), or whether many of the so-called human-unique characteristics can be found in non-human animals. A famous quote by Darwin, that “the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind” (1871), tellingly characterises the “continuity position”, suggesting that only a rather small amount (if any) of mental abilities can be considered unique to humans. Such abilities can in principle be found in animals, although it does not mean that they necessarily resemble the same functional, neurological and physiological substrate that provide these capacities in humans (de Waal & Ferrari, 2010; Roth & Dicke, 2005). Additionally, the continuity position does not presuppose that animals necessarily possess capabilities to the same degree. Animals are likely to have precursors to so-called human-specific abilities, that in humans can be amplified to a much greater degree. The discontinuity assumption suggests that human cognition and language represent abilities that have no match in non-human animals, and thus are species-specific to humans (e.g. Premack, 2007). It is important to note that discontinuity stance does not necessarily promote a view that no aspect of human cognition or communication is shared with other animals, but there are some core features of these abilities that are unique for our species. Examples of such human-unique features might include theory of mind, representational abilities, syntax or social learning (e.g. Tomasello & Rakoczy, 2003; Penn, Holyoak, & Povinelli, 2008; Tallerman, 2016).

The continuity debate inevitably brings to the discussion a number of additional assumptions, such as evolutionary history of a trait or a “unique” feature, not to mention that such discussion might spark a number of empirical studies on comparative cognition. If we postulate presence of a particular “human-unique” phenotype, logically, we need to have a good

understanding of its molecular and neurological foundation. For example, Fitch (2017) in discussing empirical approaches to language evolution, notes that one of promising research directions is investigation of key innovations required for language that had evolved after the separation from the chimpanzee-human last common ancestor. Fitch suggests that these key innovations (although small in number) present a special interest, as they can explain emergence of language in our species, and importantly, absence of human-type language in non-human animals. In other words, such research programs would investigate language-unique, and hominin-evolutionary-unique components of language. It would require a good understanding of the genetic, neurological and functional account of these components, their development in hominis, as well as differences in these components (or their total absence) in other animals. Thus, even a broadly stated question of continuity tackles smaller, more specific ones, such as mechanistic and evolutionary explanations for a given trait. Importance of the continuity debate can be additionally illustrated by the fact that some researchers attempt to directly address questions associated with it from a meta-research perspective. For example, Ullrich, Mittelbach and Liebal (2017) investigated whether there is any evidence that researchers in the field of language evolution are implicitly affected by the *scala naturae* assumption. Such studies indicate growing understanding that meta-theoretical assumptions existing in current scientific discourse might impact the overall quality of research. Given the wide range of topics that are associated with the continuity debate, we might expect this assumption to persist in scientific discourse. Moreover, since human language is considered a hallmark of our species, is frequently argued to be unique, or rely on unique properties or features (e.g. Hauser, Chomsky, & Fitch, 2002), it is understandable why the continuity debate is so prevailing in the field of language evolution.

However, despite the prevailing nature of the continuity debate, the way this debate is being carried out has been frequently criticized (e.g. Fitch, 2012; Martins & Boeckx, 2016; Leavens, Bard, & Hopkins, 2017). The goal of this paper is not to evaluate the whole complexity of continuity debate and review its application in language evolution field, but rather to discuss in more detail a specific aspect of this debate, namely the *circular nature* of a search for human – unique traits. My reading of literature on comparative cognition and communication suggests that the continuity discussion goes in a sort of circular manner. First, some kind of particular cognitive (or linguistic) ability is defined and conceptualised as “human-unique”. Reasons for the uniqueness of this characteristic are provided, often on several levels (e.g. why it is specific to humans, why non-human animals

do not have it, what specific mechanism allows functioning of this ability, or which evolutionary scenario likely explains the unique character of this ability). Once such an ability is determined, researchers in comparative psychology, or animal cognition fields investigate presence of an allegedly unique ability in non-human animals and find some evidence towards its presence in other species. Presence of a given ability in non-human animals seemingly debunks the “unique” character of it, and the search for *yet another* characteristic that *can explain why* humans have e.g. language, is carried on. Such circular search usually spans over a number of papers, including empirical work directly testing the proposed unique ability in humans and non-human animals, as well as theoretical and conceptual papers that discuss interpretation of the data and implications of the findings. Before proceeding further, I would like to provide some examples of what I refer to as a *circular debate* in language evolution and comparative cognition research.

For example, a number of papers investigated the role of declarative communication and its relation to language in human infants (Bates, Bretherton, & Snyder, 1991; Camaioni, Perucchini, Bellagamba, & Colonesi, 2004; Southgate, van Maanen, & Csibra, 2007; Cochet & Vauclair, 2010). Declarative gestural communication is contrasted with imperative gestural communication. The former is sometimes referred to as triadic communication, while the latter as dyadic communication. Although early research on these two types of gestures (Bates, Camaioni, & Volterra, 1975; for a discussion see Leavens, Racine, & Hopkins, 2009) did not initially advocate that these gestures significantly differ in complexity, modern research tradition commonly assumes such differences (Legerstee & Barillas, 2003). Imperative gestures, such as pointing gesture, are commonly conceptualised as proto requests, which meaning is to request something from a caregiver. The meaning of a declarative gesture is to share information about an object or an event. Consequently, some researchers suggest that declarative gesture is more complex, than the imperative one, and is more tightly associated with the development of language and Theory of Mind (Camaioni, Perucchini, Bellagamba, & Colonesi, 2004). This notion prompted a suggestion that primates do not communicate declaratively (Tomasello, 2006), an assumption aligning logically with absence of human-level linguistic and ToM abilities in primates. However, such a view was not shared by other researchers. For example, Lyn, Greenfield, Savage-Rumbaugh, Gillespie-Lynch and Hopkins (2011) published a paper quite tellingly titled “Non-human primates do declare! A comparison of declarative symbol and gesture use in two children, two bonobos, and a chimpanzee”, where they report the results of a study demonstrating that apes are capable

of declarative communication. At the same time, some researchers have argued that the difference in gestural communication between human infants and primates might be more refined, and be that infants communicate to infer and manipulate conspecific mental states (Liszkowski, Carpenter, & Tomasello, 2007). A strong form of such a claim would postulate that while both primates and human infants communicate gesturally, in humans such forms of communication are linked with a human-unique ability for understanding the mental states of conspecifics. In other words, since the initial absence of declarative communication in primates was not confirmed, it must be that human declarative communication relies on some kind of *unique* mechanisms absent in primates.

Another example of a “circular debate” concerns a property of language that for a long time has been considered human-unique – syntax. This traditional approach to the role of syntax for language, strongly supported by the school of generative linguistics, suggests that syntax is one of the key features central to human language that crucially distinguishes it from animal communication. Contrary to this claim, some researchers propose the existence of at least proto-syntactic abilities in the communication of language-trained apes (Kako, 1999). Moreover, recent lines of research with avian species suggests that bird songs demonstrate syntactic structures (ten Cate, 2016). Naturally, not all researchers agree that the given examples strongly support the view that non-human animals have syntactic abilities (Tallerman, 2016).

Finally, another feature of language that was considered specific to humans was functional flexibility of vocalizations. Oller et al. (2013) investigated vocalizations in pre-linguistic infants and concluded that such vocalizations are functionally flexible, suggesting that infants vocalize differently depending on the context. Even at such early stage of pre-linguistic communicative development infants demonstrate some pragmatics in communication. It was proposed, that functional flexibility contributes to further linguistic ontogenetic development and is unique to humans, as primates demonstrate functionally fixed vocal behavior. However, a study by Clay, Archbold and Zuberbühler (2015) demonstrates some evidence of functional flexibility in a type of vocal behavior typical for chimps (namely peeps). The authors stress that their study contributes to growing evidence (Crockford, Wittig, Mundry, & Zuberbühler, 2012; Koda, Lemasson, Oyakawa, Pamungkas, & Masataka, 2013) suggesting that functional flexibility is a trait that is not human-unique, as it has previously been thought, and on the contrary has a longer history in the primate lineage.

My goal in discussing the aforementioned examples is not to endorse any particular position or side with any particular author, but to illustrate the circular nature of the meta-theoretical continuity debate. On the one hand, the circular nature of the debate can be considered a part of standard scientific inquiry: we formulate hypotheses, we test them, and if our colleagues disagree with the conclusions, they formulate and test alternative hypotheses. However, I consider such circular manner of the meta-theoretical debate problematic, as it limits our ability to analyse cognitive and behavioral phenotypes in a comprehensive manner. It forces researchers to overlook important aspects of trait distribution, that can be informative for our understanding of the evolutionary history of this trait. When a given ability is found in non-human animals, a good volume of work might be dedicated to defying specific aspects and features of this particular ability, that might explain some observed differences in its manifestation in humans and non-human animals. However, if enough evidence accumulates to conclude that a given trait is not human-unique, it seems as if this *non-unique* character of the trait provides enough reason to not look into more details of this particular trait but to search for *another unique* trait that in turn is supposed to explain differences between humans and non-human animals in a given domain. In the above example of declarative gesture usage by primates, it seems that the fact that primates (contrary to initial assertions) in fact gesture declaratively, somehow *lessens* the importance of this trait for its role in human language evolution. In other words, it seems that since primates exhibit declarative communication, this trait is in a way less informative than traits that are not observed in primates. It is necessary to stress that such assumptions may not be explicitly articulated by researchers, however, in my opinion, they are nonetheless pervasive in the field of comparative cognition and evolution on a meta-theoretical level.

Trait Distribution and Continuity Problem

Loss of interest for a trait that is *not unique anymore* might stem from a tendency to define characteristics in a dichotomous manner: either a trait is present in a given species, or not. Such an approach is indeed useful in some contexts; however, it overlooks the fact that trait distribution might not be less informative for understanding trait evolution than the presence or absence of a trait itself. I suggest that not only the presence of a trait, but whether it manifests in animals to the same degree as in humans, is equally important for our understanding of trait evolution. A paper by Pika (2008)

reviews evidence of declarative and imperative communication by primates and human infants. It concludes that although primates seem to engage in declarative communication, the biggest proportion of their communicative repertoire tend to consist of imperative gestures. Human infants, on the contrary, utilise both imperative and declarative gestures from the very onset of communicative abilities (Colonesi et al., 2010).

I believe the importance of this difference is frequently overlooked by researchers. It is undoubtedly necessary to analyse whether a trait is present or absent in other species at all. However, it is equally informative to address traits that are *habitual*, that is, traits that are *routinely, continuously present* in humans, and demonstrate a different distribution in non-human animals. I refer to habitual traits as the ones that are *routinely* exhibited in the *species natural habitat* and are *species-typical* rather than *species-unique*. Investigation of habitual traits presents an additional level of analysis that in the context of continuity discussion, are distinguished from absolute traits, that is traits indeed present in one species. Moreover, such a distinction allows researchers to formulate a testable hypothesis regarding the type of environmental pressures that are affecting formation of a trait in evolution.

In order to illustrate the difference in such analysis, we can refer to a morphological trait that has been intensively studied in evolutionary research: bipedalism. Bipedal locomotion is important for human evolution and is probably one the most intensively-studied characteristic of humans in comparison with modern day primates. Interestingly, although bipedalism is considered an adaptation, a number of competing explanations exist in terms of what exactly it is an adaptation for (Niemitz, 2010; Alexander, 2004). Nevertheless, it is possible to say there is a consensus among researchers regarding adaptive nature of human bipedalism in itself. Two notions regarding bipedalism in the contexts of continuity debate are important: the presence of bipedalism in extinct hominins and the fact that partial bipedal-like locomotion is in principle possible in modern-day non-human animals. Indeed, bipedal locomotion is a general trend in the hominin line dating back to Australopithecines. For example, well-known footprints in Laetoli (Day & Wickens, 1980) likely belonged to two *Australopithecus afarensis* individuals that walked bipedally over 3.5 mya. It is important to stress that the fact that bipedalism was characteristic of many species in the hominin family does not preclude us from considering bipedalism an adaptation in humans. In other words, following this example, a given trait does not have to be absolutely *unique* in order to be considered a human adaptation. The second notion is probably even more important in the context of continuity debate. Not only is bipedalism a characteristic of multiple species in the hominin line,

it can be occasionally observed in modern day non-human animals. Chimps are known to locomote bipedally for quite long distances, especially when they need to carry objects (e.g. rocks) from one location to another (Carvalho et al., 2012). Gibbons move on their lower limbs occasionally (Vereecke, D’Août, van Elsacker, De Clercq, & Aerts, 2005), although they do not employ this mode of locomotion exclusively. More anecdotal observations of animals such as dogs and bears engaged in biking, board skating and walking on their lower limbs that nowadays can be found on internet, again, imply that bipedal locomotion can in principle be *occasionally* employed by other animals. Hardly anyone would suggest however, that any of these cases indicates that bipedalism is not an adaptation in humans, or that we should necessarily employ a more broad perspective on what is bipedal locomotion, that would conceptually incorporate the previously mentioned examples. The important aspect here is that modern humans are not simply bipedal, but are *habitually bipedal*, meaning that for humans bipedalism is the primary mode of locomotion. It is associated with the specific shape of human pelvis, which in turn is associated with changes in mechanics and morphology of the lower limbs, functioning of the respiratory system during intensive physical activity, and the apparent trade-off relationship between the size of female human pelvis and the size of an infant head, factors crucial for birth process. Interestingly, as discussed in Fitch (2012), research in a number of animal species indicates that when bipedalism is artificially enforced from a young age, some aspects of morphology associated with bipedalism emerge and might even resemble features typical for humans (Slijper, 1942; Moss, 1961; Kay & Condon, 1987; Hayama et al., 1992; Nakatsukasa et al., 1995). However, in none of the animal species discussed above we observe the same set of features associated with bipedalism (in the case of typical ontogenetic development), and this is partly because none of these animal species employs bipedalism *habitually*. In other words, it is not only the absolute presence or absence of a trait in a non-human animal that is informative for us. The question of whether the trait is *habitual* is of equal importance. Humans have such and such features not only because they are bipedal, but because they are *habitually bipedal*. Similarly, in a more obvious example, while humans can climb trees, comparative morphology between an orangutan (e.g. *Pongo pygmaeus*) and a human indicate clearly, which species habitually employs brachiation.

The discussed above examples seem to be pretty straightforward if not obvious. However, application of a non-dichotomous approach to the question of continuity in cognitive and linguistic evolution is less common, despite its utility. Cognitive and behavioral phenotypes can be present or

absent in a non-human animal, or they can be present, but not be *habitual*. And this non-habituality in itself is informative for evolutionary analysis. Such conceptualisation differs from a more common approach that was previously described as a “circular” one. Evolutionary logic suggest that humans share many cognitive traits with other species. And it is the habituality of these traits that should be addressed for a comprehensive evolutionary analysis. Such approach allows moving beyond the dichotomous definitions and the search for a unique trait, or a unique characteristic of a shared trait. If two species demonstrate differences in trait manifestation, it is not necessary to presuppose differences in the trait itself. Instead, the same trait can be present in both species, but it is the *distribution* of it that differs. Implementation of such analysis differentiates *species-specific* traits from *species-typical* ones. This logic can be applied to comparative research on communication. As it was mentioned previously, primates communicate declaratively but do so to much lesser degree than human infants (Pika, 2008). It is not necessary, then, to assume that human infants use declarative communication in a unique, different way than primates (for example in attributing mental states (Liszkowski, Carpenter, & Tomasello, 2007). It might be the case that declarative communication in at least closely related primates does not differ significantly from that of humans (Leavens, Hopkins, & Bard, 2005). Primates however are not employing declarative communication *habitually*. Continuing the analogy with bipedalism, habitual declarative communication in humans emerging early in ontogeny would set up a different developmental trajectory and interaction with environment, that in turn would be associated with a number of features that can constitute a more human-unique “communicative set”. Thus, declarative communication should not be dismissed as an important factor in human language phylogeny and ontogeny, even though it is not a unique trait in itself. The fact that humans use declarative communication *habitually*, while primates do so *occasionally* might be just as important for understanding the trajectory of human language evolution. Fitch (2017) in discussing differences in communication between primates and humans, also addresses the fact that primates seem to be less interested in sharing information with conspecifics. He suggests that the fact that children seem to have a strong desire to communicate and share information might be an important distinction between humans and primates. While Fitch discusses this propensity for information sharing as a sort of a separate trait (although not necessarily human-unique, as it is observed in bees), I suggest it might not be necessary to consider it a separate trait. Possibly primates are capable of communicating the information they possess, however they prefer

“to keep it to themselves”, as Hurford (2014) puts it. To paraphrase this distinction in the context of proposed trait classification, primates do not share information habitually, and thus it is the distribution of the trait, that distinguishes them from humans.

Additionally, at least for the present time, most compelling evidence of declarative communication usage is reported in captive, often language-trained primates, while reports of primate declarative communication in the wild are scarce (Pika, 2008). Habitual, species-typical traits are exhibited in a species natural environment. The importance of this notion can be illustrated by a discussion of pointing gesture usage by non-human primates. Development of pointing gestures in human infants is related to language and theory of mind (Colonesi et al., 2010). Some researchers suggest that this gesture constitutes a human-unique phenotype (Povinelli, Bering, & Giambrone, 2003), with Liszkowski et al. (2011) referring to pointing as a “prelinguistic human universal”. Growing amount of evidence, however, suggests that non-human primates produce and understand pointing gesture (at least to some degree) (Call & Tomasello, 1994; Lyn, Russell, & Hopkins, 2010; Douglas & Moscovice, 2015; Halina, Liebal, & Tomasello, 2018). However, two important notions should be made in this regard. First of all, a pointing gesture is produced by primates in captivity, and there is no strong evidence of primates using this gesture in the wild. Additionally, even in captivity, primates usually do not point to conspecifics but to human caregivers. Some researchers, e.g. Povinelli et al. (1997), suggest that such differences indicate that pointing gesture is fundamentally different in primates and humans. Primates do not understand pointing gesture on the same level that humans do, relying rather on some perceptual cues of the produced gesture. However, Leavens, Hopkins and Bard (2005) argue against this position and highlight the fact that captive chimpanzees develop pointing without explicit training. This observation is more in line with an assertion, that development of such trait is a result of ecological circumstances. Similarly, in human infants, pointing gestures is likely a result of an ontogenetic adaptation, rather than some kind of universal biologically-based trait. Human infants develop pointing gesture as this is an available mode of communication, that makes sense in their environment and conditions in a way similar to the ones experienced by primates in captivity. This example highlights the importance of analysing the context of trait habituality for inferring evolutionary significance of a given trait.

In conclusion of this section it is necessary to stress that the proposed classification of traits as habitual does not advocate complete abandonment of classification of cognitive or communicative phenotypes as absolute,

or species-unique. Such characteristics are often warranted and absolutely appropriate, as every species, including humans, undoubtedly possesses certain phenotypes that are unique and species-specific. However, conceptualisation of traits as habitual could be useful in some contexts and should complement a more traditional comparative analysis carried out in research on comparative cognition and language evolution.

Cognitive and Behavioral Phenotypes in Evolution

The previous sections of the paper have outlined principles of comparative analysis applied to cognitive and behavioral phenotypes, namely distinguishing habitual traits from the absolute ones. It was argued that analysis can be additionally informative for our understanding of human cognitive-linguistic evolution and can bring meaningful contribution to meta-theoretical continuity debate. The final section of the paper briefly discusses some notions supporting the validity of the proposed classification of traits as habitual and absolute.

A number of researchers have argued that non-dichotomous approaches to comparative analysis of cognitive and communicative abilities are aligned with the core principles of evolutionary research. For example, de Waal and Ferrari (2010) argue:

Over the last few decades, comparative cognitive research has focused on the pinnacles of mental evolution, asking all-or-nothing questions such as which animals (if any) possess a theory of mind, culture, linguistic abilities, future planning, and so on. Research programs adopting this top-down perspective have often pitted one taxon against another, resulting in sharp dividing lines. Insight into the underlying mechanisms has lagged behind. A dramatic change in focus now seems to be under way, however, with increased appreciation that the basic building blocks of cognition might be shared across a wide range of species. We argue that this bottom-up perspective, which focuses on the constituent capacities underlying larger cognitive phenomena, is more in line with both neuroscience and evolutionary biology. (p. 201)

Indeed, for the last several decades, a growing body of research demonstrates presence of abilities previously considered “human-unique” in other species. To name just a few: concept formation (Smirnova, Zorina, Obozova, & Wasserman, 2015), turn-taking (Pika, Wilkinson,

Kendrick, & Vernes, 2018), ToM (Hare, Call, Agnetta, & Tomasello, 2000) and numerosity (Kilian, Yaman, von Fersen, & Güntürkün, 2003). Such examples suggest that the tendency to consider solely “unique” phenotypes as informative for evolutionary analysis seems to be less and less plausible.

The passage from de Waal and Ferrari (2010) highlights another aspect that has far reaching implications for the continuity debate: mind and language are not unified entities, but rather have a multicomponent structure. A similar argument has recently been discussed by Fitch (2017) in a paper on language evolution, where he argues that instead of treating language as a unique, unified ability, or any particular unique aspects of language, it is necessary to acknowledge that language is a unique aggregation of several abilities each of them in turn present in other species. Importantly, as Fitch (2017) notes, this view of the mind and language is not exactly novel, however only now it finally starts gaining traction and becoming more widespread, notably contrasting from a common tendency to seek *the key feature* defining language or cognitive competency.

Multicomponent structure stands in sharp contrast with the modular accounts of mind and is gaining more evidence from neuroscience and evolutionary studies (de Waal & Ferrari, 2010). The application of evolutionary logic to the multicomponent, systemic account of the mind and language suggests that the aggregation of existing components in a new manner can produce novel functions (Toomela, 2010; Kurismaa, 2015). Thus, the new abilities not necessarily appear in evolution “from scratch”, but rather a unique functional ability is created by a particular assembling of non-unique characteristics. Cognitive or communicative continuity between different species is thus context-dependent. And thus, it is rather the distribution of these components, their mechanistic structure, and interconnection with other cognitive subsystems in each particular case, that is more telling than a simple presence or absence of traits.

Importantly, multicomponent structure of mind highlights the fact that cognitive and behavioral phenotypes in different species can rely on a varied neurological substrate. Varied assembling of different components results in a situation in which the mechanisms and functions of traits might differ. In other words, the same functional traits might depend on different mechanisms, and similar mechanisms can be involved in different functional traits. For example, birds (Smirnova, Zorina, Obozova, & Wasserman, 2015) and primates (Thompson & Oden, 2000) are capable of some degree of concept formation and analogical reasoning, however these abilities are supported by different neurological mechanisms and are likely a product of convergent evolution. As Fitch (2012, 2017) points out, careful description

of correlated cognitive traits in different species can be solved on a case-by-case basis. Such an individual analysis would require separate evaluation of the ecological and phylogenetic history of a given species, and the neurological and genetic basis of a given trait.

Another important aspect concerning reconstruction of evolutionary history of a trait is that components of language and mind are subjects to various constraints. Fitch (2012) provides an excellent review of this issue in reference to language evolution. In summary, constraints significantly complicate evolutionary analysis and comparison of a given trait, as trait's morphology and final structure might be a result of a number of constraints, rather than direct product of evolutionary processes. In this respect, a "unique" design of a trait (or a trait itself) might not necessarily indicate the adaptive nature of the trait of interest. It can rather originate from constraints on developmental programs (Fusco, 2001; Shubin, Tabin, & Carroll, 2009), epigenetic constraints (Jablonka & Lamb, 2008) or constraints imposed by metabolic processes in the brain (Herculano-Houzel, 2011). As Fitch points out (2012) understanding of the structure of a give ability is impossible without understanding the constraints that affected it in phylo- and onto- development. He further notes that "the role of phylogenetic and developmental constraints has been drastically underestimated in much of the recent work on language evolution, and human cognition more generally" (p. 627). Furthermore, evolutionary-developmental research indicates that the biological foundations of various phenotypes are more similar than was previously believed, and it is the variation in developmental trajectories and early ontogenetic processes that result in observed trait differences (Scharff & Petri, 2011). The nature of many traits that seem novel or unique on the surface level is actually reorganizational (West-Eberhard, 2005), meaning that evolution routinely reorganizes components of existing variation, rather than consistently creates novel forms from scratch. As Jacob (1977) notes, evolutionary processes are largely concerned with tinkering of existing variation. Taken together these notions highlight the importance of non-dichotomous approach to trait classification, as most of the time the boundaries between species cognitive abilities are not as sharp. Instead of examining clearly observed cognitive and behavioral phenotypes, researchers are dealing with similar abilities that vary in their distribution and degree of manifestation.

Finally, the multicomponent account of mind and language complicates reconstructing their evolutionary history, as many components in humans are likely involved in both cognitive functioning and language. In animals, similarly, various components can be utilised in both cognitive processes and

communication. Some general functional traits likely do not require specific neurological adaptations and result from general processes of learning and social transmission of information (Andrews, Gangestad, & Matthews, 2002). This situation again highlights the importance of analyzing trait distribution, rather than focus solely on unique traits.

The question of continuity of cognitive abilities in various species is closely associated with the discussion on the role of mind in evolution. Increasing cognitive abilities can be a factor in evolutionary processes (e.g. Roth & Dicke, 2005). Growing number of researches suggests that animals are far more cognitively and communicatively apt, than was previously thought (Butler, 2008). More and more studies continuously indicate that animals can demonstrate abilities previously considered beyond their mental capacities, should they be provided with species-sensitive, methodologically appropriate testing conditions (Lyn et al., 2014).

Furthermore, nervous systems in various species are designed for a plastic response to environment (Fitch, 2017). Recent research in turn suggests that phenotypic plasticity is a factor in evolution (Fusco & Minelli, 2010), and modeling of evolutionary processes should include complexity of individual organism cognitive response to environmental change (Foster, 2013). Phenotypic plasticity is pervasive at various levels of biological organisation (Gilbert & Epel, 2009), and in multicellular organisms provides variation necessary for phenotypic evolution. Behavioral plasticity is the first response of a population to novel environmental change (Foster, Wund, & Baker, 2015), and changes in behavioral phenotypes can expose populations and individuals to diverse environmental conditions and adaptive zones (Zuk, Bastiaans, Langkilde, & Swanger, 2014). Phenotypic plasticity facilitates genetic variation and evolvability that takes place along the major axes of environmental variation (Foster, 2013). Taken together such findings suggest that phenotypes in general, and especially the most plastic phenotypes, such as cognitive and behavioral traits would vary *within* populations, rather than only *between* populations and species. The nature of this variation, in turn, is crucial for understanding the direction of evolutionary selection in a given phenotype. Thus, compelling evolutionary analysis requires addressing trait variation and distribution, such as an analysis of trait habituality, rather than employing a dichotomous approach to trait classification.

Reflecting on the role of cognitive abilities in evolution, Severcov (1922) suggested that mind is a separate factor in evolution, and thus its development can be considered a separate evolutionary trend. Furthermore, he believed that the adaptivity of cognitive and behavioral programs in principle available for an animal lies in their excessive nature. In other words,

cognitively apt living organisms do not reveal their full potential in normal, standard environmental conditions. The mind is an array of abilities, some of which can be utilised habitually, and thus become species-typical. Should the environmental conditions change, however, some additional, previously not used cognitive capacities can be utilised by an animal. Severcov called such additional abilities the “potential” mind. If we apply this terminology to the question of continuity, the “potential” mind refers to qualities that reflect absolute boundaries of a trait. However, animals do not need to exhibit full array of available traits in stable natural environment. Perhaps such a distinction can explain why primates tend to point in captivity, but do not do so in the wild with conspecifics. Pointing gesture production and understanding is a part of the “potential mind” that animals possess in principle, but do not exhibit in normal, standard environmental conditions. It is a behavioral-cognitive phenotype that is available to them, but unlike that in humans, is not a habitual trait. Similarly, as discussed by Zorina and Smirnova (2006) primates in captivity might demonstrate behavior that is not expected of them, however they will do so only occasionally (or even once) and not repeat it again for a long time. It might be that this behavior is not a part of their habitual repertoire. Such a notion again stresses that not only trait manifestation in principle, but the habitual or non-habitual nature of it should be examined for a comprehensive evolutionary analysis.

Conclusions

The question of continuity of mental and communicative abilities became a meta-theoretical theme in the fields of language evolution and comparative cognition. The debate is traditionally built upon determining human-unique or language-unique traits, and further research of this trait presence in non-human animals. Such an approach has been criticized as dichotomous (de Waal & Ferrari, 2010) and limited (Scharff & Petri, 2011). The current paper discusses a specific limitation of such a debate – namely its circular nature – and suggests a possible solution in a form of complementary analysis of traits of interest. Besides evaluating absolute differences in trait distribution between species, it is important to evaluate trait habituality. Such an approach does not require the presence of unique trait characteristics to explain the differences in observed trait distribution. Non-human animals might be capable of a particular ability but not utilise it habitually in their natural environment. Classification of traits as habitual vs absolute is informative for understanding evolutionary processes. It allows

formulating a testable hypothesis regarding, for example, environmental factors favouring habitual implementation of a given ability.

A growing amount of research in evolutionary biology favours application of the non-dichotomous approach. The multicomponent nature of the mind, the notion of plasticity of cognitive and behavioral phenotypes, development of mind as a separate factor in evolutionary processes, and comparative work across a wide range of species taken together point to the fact that humans share a good portion of cognitive and communicative abilities with non-human animals. Thus, the fields of language evolution and comparative cognition would benefit from taking the continuity debate beyond dichotomous approach and search for unique traits. Trait distribution between species, and specificity of its manifestation, such as habituality, can meaningfully contribute to a more comprehensive evolutionary analysis.

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