
The Formation of Scientific Conceptions in Early Childhood: A Result of “Over”-Development?

Michael Hast ¹

IU International University of Applied Sciences, Germany

doi: <https://doi.org/10.37745/ejedp.2013/vol11n21423>

Published June 17 2023

Citation: Hast M. (2023) The Formation of Scientific Conceptions in Early Childhood: A Result of “Over”-Development? *European Journal of Educational and Development Psychology*, Vol.11, No.2, pp.14-23

ABSTRACT: *Conceptual development in the scientific domain initiates at an early stage, leading to the emergence of “overthinking” in the form of mis- and alternative conceptions. This contribution aims to delve deeper into the origins of scientific misconceptions by examining the parallels found in three other areas of early learning characterised by an overapplication of rules: overextension, overregularisation, and overimitation. One prominent characteristic shared by these is the presence of U-shaped trajectories, indicating an initial simplicity, followed by an overapplication of rules, and eventually leading to a more sophisticated understanding. It is evident that both linguistic and non-linguistic forms of overdevelopment interact and influence each other. Language, specifically the role of dialogue, assumes particular significance in both formal and informal educational settings. Conversations and dialogue, whether in the formal classroom or during everyday interactions, play a crucial role in shaping children's understanding and facilitating conceptual change. By engaging in meaningful conversations, children can challenge and refine their existing conceptions, allowing for a more accurate and nuanced understanding of scientific principles.*

KEY WORDS: overextension, overregularisation, overimitation, overconceptualisation.

INTRODUCTION

Both children and adults often develop conceptions that diverge from scientific positions on various subjects. This incongruity between everyday thinking and scientific understanding warrants caution when considering conceptual development in a classroom context. Children exhibit a wide range of ideas regarding the functioning of the world (Hast, 2020a; Hast & Howe, 2012). These ideas emerge early in their developmental trajectory, typically surfacing by the age of 3 years (see e.g., Hast, 2018, 2019; Povinelli et al., 2012). Notably, it remains a well-established observation that changing such conceptions continues to pose challenges, even for educators themselves (Hast, 2017). Consequently, an important question arises: Can

¹ Affiliation: IU International University of Applied Sciences, Germany.

Contact: michael.hast@iu.org

we approach the cultivation of scientific knowledge formation from an alternative perspective that we term “overconceptualisation”? This research aims to explore whether we can draw insights from other forms of over-development in early childhood to gain a deeper understanding of conceptual development and, in turn, facilitate more effective conceptual change approaches. Specifically, the paper examines three phenomena from which to draw insight towards the alternative perspective: overextension, overregularisation, and overimitation.

Overextension

One of the most notable over-developments in the context of early language acquisition is overextension. In overextension, young children frequently use words in contexts where adults would typically not. By and large, this is simply a result of limited vocabulary. For instance, where an adult might have various names for different animals that share certain characteristics (e.g. dog, wolf, hyena, coyote) a child may initially only hold the lexical concept “dog” and will readily apply this to any animal for which a specific name may not be known but that could feasibly be considered to be “dog” based on conceptual and perceptual similarities (such as the wolf, hyena or coyote). Overextensions make their first appearances in the earlier stages of language development, when vocabulary has only begun to be acquired. They are relatively frequent, occurring with around a third of word types in a one-year-old’s repertoire. Thanks to a rapid vocabulary build-up, by around two and a half years of age overextensions begin to decline (Naigles & Gelman, 1995). A more contemporary illustration for the particular example of dog versus wolf can be found on Wordbank (cf. Frank et al., 2017): By 16 months of age, around two thirds of children are reported to already have “dog” in their productive vocabulary repertoire, but close to none have “wolf”. At 30 months, “wolf” exists in just over half of the reported vocabularies. Therefore, even among 2½-year-olds, for many of them “dog” would still be the most suitable option to use when labelling what is actually a wolf.

Overextensions should not be considered a negative. Children overcome them with increased vocabulary acquisition. But more importantly, they demonstrate sophistication in thought. They show children can extrapolate rules based on the developing formation of categories, especially basic level categories. Their application of existing labels as the next best thing is indicative of creativity in solving problems. In this, there are some clear parallels here to conceptual knowledge development in the scientific domain. For one, it is around the same time that mis- and alternative conceptions emerge in young children’s reasoning, and they use their expressed understanding in ways that seems to be generalised from their experiences with the everyday world (Hast, 2020b; Hast & Howe, 2012).

What is further worth considering is that while language overextensions decline, they occasionally reappear even in adulthood – though at this stage it is usually a result of slip of tongue or, like with younger children, ignorance of the proper word to use. This is not unlike the case of naïve scientific theories. While adults may have learnt scientifically appropriate concepts through instruction in the classroom, these do not supplant or override prior naïve ideas. Instead, the naïve ideas may re-emerge under certain conditions, such as when

performing under timed constraints (see e.g., Shtulman & Valcarcel, 2012; Shtulman & Young, 2020), just as overextensions can do. It is thus worth noting that conceptual learning is both linguistic and non-linguistic, with a necessary differentiation between children's verbal and non-verbal performance, with the former seemingly being less prone to overextensions (e.g., Hast & Howe, 2015, 2017).

Overregularisation

A second notable form of early over-development in language acquisition is overregularisation. Here, children apply language-based rules in a consistent manner even when the rules do not apply for specific cases. In the English language, for instance, a common example to illustrate is the use of the past tense. Frequently, this involves adding the suffix *-ed* to the present tense stem – so “I walk” becomes “I walked”. But there are many exceptions to this rule. Yet as a result of overregularisation, a child that has extrapolated the *-ed* rule but is still having to acquire the exceptions to that rule will readily use this approach even in cases where it is not applicable – “I go” may become “I goed” instead of “I went”. While most studies have focused on English language acquisition in particular, research has also shown similar developmental effects in other languages, such as German and Spanish (Clahsen et al., 2002; Clahsen & Rothweiler, 1993).

These errors make their first appearance roughly between two and three years of age (Pinker, 1995), typically seeming to become evident at around 2½ years of age for most children (Marcus, 1995). However, as is frequently the case in early development, understanding seems to precede production such that even 16-month-olds already have a preference for listening to incorrect *-ed* versions over correct past tense forms that are irregular, suggesting rule extrapolation in the preverbal period (Figuroa & Gerken, 2019). Despite Marcus' study being based on a small sample, it nonetheless does correspond with the suggestion that children's “overthinking” in science domains emerges around the age of 2½ or 3 years (Hast, 2020a). Pinker (1995) also makes a notable observation as to the developmental trajectory. It would appear that the progression over time appears in a U-shaped pattern such that initial correct usage of past tenses is high, then dips before rising back. A recent study on children's understanding of the concept “animal” in different languages shows a very similar pattern – 4-year-olds showed a high level of correct recognition of what was an animal and what was not, as did 10-year-olds. Between this, the 7-year-olds showed recognition levels that seemed to be based on a more restricted definition of what qualified as “animal” and what did not (Hast, 2022). Allen's (2015) study similarly shows that 3-year-olds' understanding of “animal” is less restricted than that of 5-year-olds. While these patterns emerge a little later than they would for overregularisation, it is useful to note that both are linked to learning of rules based on language concepts.

In the particular case of the past tense, Marcus et al. (1992) outlined overregularisation as a result of a lack of blocking, which leads to a failure in retrieving irregular past tense forms. Irregulars have to be stored through rote memorisation, and a progressively more frequent exposure to these irregulars increases their usage, but this requires time. In the meantime, the

“mental concatenation operation” (Marcus et al., 1992, p. 129), whereby the -ed suffix is attached to the stem, is more readily available as a rule. Because children will not have come across irregulars too frequently in their early language use, the -ed rule cannot yet be successfully blocked where it would need to be. This explanation, too, chime well with arguments put forward by other studies in science concept development, such as where certain rules – “heavy objects fall faster because they are heavier” – are consistently applied in explicitly stated predictions of dynamic events, but simpler recognition tasks can block this rule from being expressed (Hast & Howe, 2015, 2017). And just as increasing exposure to irregulars will eventually help to avoid the overapplication of -ed (Pinker, 1995), relevant intervention tasks have shown that with practice explicit scientific rules can be reformulated in appropriate ways (see e.g., Howe et al., 2013).

As with overextensions, overregularisations can and should be seen in a positive light since they demonstrate that the child has already learnt language-related rules and is able to apply these in a consistent if not always correct manner. Of particular importance is the regular exposure to correct linguistic examples, possibly enhanced through scaffolding processes to correct errors in the conversational process (Bruner, 1978). However, it is clear that misconceptions persist. This raises the question whether children experience insufficient talking around relevant topics, or indeed whether it is the quality of talk that is to be considered problematic (cf. Hast, 2014a).

Overimitation

In order to reflect that overdevelopment is not uniquely related to language, the third example to be considered here is overimitation. Much like language, imitation is an important early skill for human interaction and learning. Imitation, too, appears early in development, and is possibly even already present at birth (e.g., Meltzoff & Moore, 1989; but also see Oostenbroek et al., 2013, for a more critical review of this argument). Infants seem to be largely rational in their copying behaviours, differentiating between goals and actions, and demonstrating the understanding that some actions are not necessary to achieve certain outcomes (e.g., Schwier et al., 2006). However, this imitative behaviour seems to then progress towards a concept of overimitation: From around three years of age, children will begin to copy actions modelled for them even if the specific actions are not necessary for reaching a goal (Kenward et al., 2011; McGuigan et al., 2011). This behaviour pattern appears even more marked among five-year-olds – three-year-olds, on the other hand, are still more likely to leave out irrelevant actions (McGuigan et al., 2007). The pattern appears to show high consistency across different cultures (Stengelin et al., 2020). Critical to overimitation seems to be the intentionality that underpins the modelled actions (Lyons et al., 2011). Eventually, this overimitation behaviour reduces again towards more rational goal-oriented copying.

The reasons for this behaviour are not fully understood; or rather, different possible explanations are on offer (see e.g., Hoehl et al., 2019). One of these is that children at this age are learning to apply social norms; the observed actions of others are considered part of convention, regardless of whether they are functionally necessary or not. Children will copy

actions even when it is very obvious, such as through the use of see-through boxes, that the actions do not have any required function towards the goal (McGuigan et al., 2007). It is the subsequently more frequent experience of such activities as well as interaction with others who are performing these activities that may help a child learn whether there is a need – social or functional – for specific actions. As a result, we can consider overimitation in similar ways as overextension and overregularisation. Basic rules of social behaviour and convention have been extrapolated, but rather than applying these rules selectively or considering whether they *need* to be applied, children will do so consistently.

In addition to the social norm argument, which can be viewed from a cultural perspective of wishing to demonstrate affiliation (Hoehl et al., 2019), the process of communication seems to be a critical factor as well. Gergely and Csibra (2006) have argued that because tasks where children overimitate are frequently underpinned by communication from adults, children may copy because they anticipate that the adult's communication would surely serve the purpose of conveying culturally relevant information. This may also help explain why in the overall developmental trajectory overimitation occurs after overextension and overregularisation.

A place for “overconceptualisation”?

This paper has so far considered three significant areas of over-development and has attempted to position them alongside the acquisition process of early scientific concepts. Despite occurring at slightly different times in child development, there are important similarities among them that in turn may help us understand conceptual development in science domains as well as consider some of the resulting implications.

First, there are some good reasons to assume that all areas of “over”-development considered here have their roots in some preverbal form of learning – whether innate or not. Taking the example of language acquisition, it is reasonable to assert that infants rely on a preverbal basis to facilitate their journey towards becoming proficient native listeners (e.g., Kuhl, 2014). They do so by subconsciously absorbing statistical patterns from the language that surrounds them. This notion gains support from studies indicating that newborns possess the ability to imitate facial expressions (e.g., Meltzoff & Moore, 1989), highlighting their innate capacity to mimic and learn from their environment. Beyond the realm of language, there exists a wealth of research exploring the awareness of scientific principles in preverbal infants (e.g., Carey, 2009). These studies suggest that even before they can articulate their thoughts, infants demonstrate a rudimentary understanding of certain scientific concepts. Thus, it becomes evident that children construct mental models of the world around them, enabling them to perceive and interpret events, as well as make predictions. Notably, different cognitive processes are engaged based on the specific demands of a given task (Hast, 2014a).

As with overimitation, tasks requiring conceptual analysis are typically underpinned by a communicative factor, such as conversations with parents or discussions in the classroom. This enables to understand why in similar vein overconceptualisation follows overextension and overregularisation and appears to begin at roughly the same time as overimitation. The connections between conceptual development and language are hardly surprising as such.

While it is possible that concepts can exist without linguistic representation, as is likely in preverbal infants (see e.g., Carey, 2009), an explicit demonstration of such knowledge will require some form of symbolic representation for sharing, with language being the most common tool for doing so. Studies show that children are more likely to predict outcomes on the basis of one object being heavier than the other, and only rarely make the inference that inverse outcomes would occur because one object is lighter than the other (Hast, 2014b, 2016; Hast & Howe, 2013). This is possibly linked to language development and the role played by salience of terms. For instance, Marschark (1977) highlights that children tend to learn unmarked concepts like “big” before their marked counterparts like “small”. The marked terms are typically used in comparative contexts, whereas the unmarked terms have a broader range of usage. This distinction has implications for task performance, even among children as young as 3 and 4 years old.

CONCLUSION

Typically, conceptual development in childhood is seen with some caution from a classroom perspective. Children bring with them a very wide range of ideas about how they believe the world functions, and many of these ideas are incommensurate with accepted scientific positions – those that the classroom will need to convey. And it is widely observed that changing such conceptions can be difficult, including by teachers themselves (Hast, 2017). In the first instance, the “lesson learnt” from overextension, overregularisation and overimitation is that – at least in the early stages – conceptual developments in science domains should be considered in a positive light since they demonstrate sophistication in thought. Children are extrapolating rules of linguistic and social processes and are applying them until they learn the specific exceptions to those rules and are able to overcome any form of blocking or inhibition.

The fact that these ideas persist even into adulthood is the more critical aspect, of course. It may therefore be necessary to consider further what efforts can be placed to support the completion of the U-shape, which represents the progression from initial intuitive understandings, through the development of more sophisticated concepts, and eventually towards a refined conceptual framework. Considering the parallels elucidated in this paper, two noteworthy recommendations can be proposed.

Firstly, the pivotal role of dialogue must continue to be emphasized. Although not a novel insight, dialogue has already been recognized as a critical factor in early science education within formal classroom settings (France, 2021). Similarly, research has shown that parent-child dialogue exerts a significant influence on the construction of scientific knowledge (Eberbach & Crowley, 2017). This underscores the importance of fostering meaningful conversations and exchanges of ideas to support conceptual change programs. Furthermore, the significance of modelling should not be underestimated. Alongside language development, modelling plays a crucial role in facilitating conceptual change. The utilization of structured and scaffolded procedures, as proposed by Bruner (1978), becomes essential in supporting individuals through the process of transforming their existing conceptions. By providing clear

examples, demonstrations, and guidance, individuals can gradually shift their understanding and build new, more accurate conceptual frameworks.

Finally, it is crucial to recognize that conceptual change is a dynamic and ongoing process. Rather than being a one-time event, it requires continuous reinforcement and revision of ideas over time. Conceptual change programs should thus adopt a longitudinal perspective, allowing for sustained engagement and revisitation of key concepts. This long-term approach ensures that individuals have ample opportunities to refine their understanding, integrate new information, and consolidate their conceptual frameworks.

Notes: Parts of this article were presented at the 14th World Conference on Educational Sciences.

REFERENCES

- Allen, M. (2015). Preschool children's taxonomic knowledge of animal species. *Journal of Research in Science Teaching*, 52(1), 107-134. <https://doi.org/10.1002/tea.21191>
- Bruner, J. S. (1978). The role of dialogue in language acquisition. In A. Sinclair, R. Jarvella & W. J. M. Levelt (Eds.), *The child's conception of language* (pp. 241-256). Springer.
- Carey, S. (2009). *The origin of concepts*. Oxford University Press.
- Clahsen, H., Aveledo, F., & Roca, I. (2002). The development of regular and irregular verb inflection in Spanish child language. *Journal of Child Language*, 29(3), 591-622. <https://doi.org/10.1017/s0305000902005172>
- Clahsen, H. & Rothweiler, M. (1993). Inflectional rules in children's grammars: Evidence from the development of participles in German. In G. Booij & J. van Marle (Eds.), *Yearbook of Morphology 1992* (pp. 1-34). Springer.
- Eberbach, C., & Crowley, K. (2017). From seeing to observing: How parents and children learn to see science in a botanical garden. *Journal of the Learning Sciences*, 26(4), 608-642. <https://doi.org/10.1080/10508406.2017.1308867>
- Figueroa, M., & Gerken, L. (2019). Experience with morphosyntactic paradigms allows toddlers to tacitly anticipate overregularized verb forms months before they produce them. *Cognition*, 191, 103977. <https://doi.org/10.1016/j.cognition.2019.05.014>
- France, A. (2021). Teachers using dialogue to support science learning in the primary classroom. *Research in Science Education*, 51(3), 845-859. <https://doi.org/10.1007/s11165-019-09863-3>
- Frank, M. C., Braginsky, M., Yurovsky, D., & Marchman, V. A. (2017). Wordbank: An open repository for developmental vocabulary data. *Journal of Child Language*, 44(3), 677-694. <https://doi.org/10.1017/S0305000916000209>
- Gergely, G., & Csibra, G. (2006). Sylvia's recipe: The role of imitation and pedagogy in the transmission of cultural knowledge. In N. J. Enfield & S. C. Levenson (Eds.), *Roots of human sociality: Culture, cognition, and human interaction* (pp. 229-255). Berg Publishers.

- Hast, M. (2014a). Collaborating with the 'more capable' self: Achieving conceptual change in early science education through underlying knowledge structures. *ReflectED, St Mary's Journal of Education*, 3, 18-25.
- Hast, M. (2014b). Exploring the shift in children's incline motion predictions: Fragmentation and integration of knowledge as possible contributors. *Journal of Educational and Developmental Psychology*, 4(2), 74-81. <https://doi.org/10.5539/jedp.v4n2p74>
- Hast, M. (2016). Children's reasoning about rolling down curves: Arguing the case for a two-component commonsense theory of motion. *Science Education*, 100(5), 837-848. <https://doi.org/10.1002/sce.21237>
- Hast, M. (2017). Technology and early science education: Examining generalist primary school teachers' views on tacit knowledge assessment tools. *International Education Studies*, 10(11), 135-147. <https://doi.org/10.5539/ies.v10n11p135>
- Hast, M. (2018). It's all relative: The role of object weight in toddlers' gravity bias. *Journal of Experimental Child Psychology*, 166, 696-704. <https://doi.org/10.1016/j.jecp.2017.09.013>
- Hast, M. (2019). Representational momentum in displacement tasks: Relative object weight matters in toddlers' search behavior. *International Journal of Behavioral Development*, 43(2), 173-178. <https://doi.org/10.1177/0165025418820689>
- Hast, M. (2020a). "It is there but you need to dig a little deeper for it to become evident to them": Tacit knowledge assessment in the primary science classroom. In C. Koh (Ed.), *Diversifying learner experience: A kaleidoscope of instructional approaches and strategies* (pp. 13-28). Springer.
- Hast, M. (2020b). Children's understanding of the rainbow: A trajectory of conceptual development across middle childhood. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(6), em1859. <https://doi.org/10.29333/ejmste/8230>
- Hast, M. (2022). Acquisition of naïve and scientific conceptions: How linguistic context matters in Singaporean children's understanding of "animal". *Eurasia Journal of Mathematics, Science and Technology Education*, 18(5), em2102. <https://doi.org/10.29333/ejmste/11964>
- Hast, M., & Howe, C. (2012). Understanding the beliefs informing children's commonsense theories of motion: The role of everyday object variables in dynamic event predictions. *Research in Science & Technological Education*, 30(1), 3-15. <https://doi.org/10.1080/02635143.2011.653876>
- Hast, M., & Howe, C. (2013). Towards a complete commonsense theory of motion: The interaction of dimensions in children's predictions of natural object motion. *International Journal of Science Education*, 35(10), 1649-1662. <https://doi.org/10.1080/09500693.2011.604685>
- Hast, M., & Howe, C. (2015). Children's predictions and recognition of fall: The role of object mass. *Cognitive Development*, 36, 103-110. <https://doi.org/10.1016/j.cogdev.2015.10.002>
- Hast, M., & Howe, C. (2017). Changing predictions, stable recognition: Children's representations of downward incline motion. *British Journal of Developmental Psychology*, 35(4), 516-530. <https://doi.org/10.1111/bjdp.12191>

- Hoehl, S., Keupp, S., Schleihauf, H., McGuigan, N., Buttelmann, D., & Whiten, A. (2019). 'Over-imitation': A review and appraisal of a decade of research. *Developmental Review*, 51, 90-108. <https://doi.org/10.1016/j.dr.2018.12.002>
- Howe, C., Devine, A., & Taylor Tavares, J. (2013). Supporting conceptual change in school science: A possible role for tacit understanding. *International Journal of Science Education*, 35(5), 864-883. <https://doi.org/10.1080/09500693.2011.585353>
- Kenward, B., Karlsson, M., & Persson, J. (2011). Over-imitation is better explained by norm learning than by distorted causal learning. *Proceedings of the Royal Society B*, 278, 1239-1246. <https://doi.org/10.1098/rspb.2010.1399>
- Kuhl, P. K. (2004). Early language acquisition: Cracking the speech code. *Nature Reviews Neuroscience*, 5(11), 831-843. <https://doi.org/10.1038/nrn1533>
- Lyons, D. E., Damrosch, D. H., Lin, J. K., Macris, D. M., & Keil, F. C. (2011). The scope and limits of overimitation in the transmission of artefact culture. *Philosophical Transactions of the Royal Society B*, 366, 1158-1167. <https://doi.org/10.1098/rstb.2010.0335>
- Marcus, G. F. (1995). Children's overregularization of English plurals: A quantitative analysis. *Journal of Child Language*, 22(1), 447-459. <https://doi.org/10.1017/S0305000900009879>
- Marcus, G. F., Pinker, S., Ullman, M., Hollander, M., Rosen, T. J., Xu, F., & Clahsen, H. (1992). Overregularization in language acquisition. *Monographs of the Society for Research in Child Development*, 57(4), v-165. <https://doi.org/10.2307/1166115>
- Marschark, M. (1977). Lexical marking and the acquisition of relational size concepts. *Child Development*, 48(3), 1049-1051. <https://doi.org/10.2307/1128358>
- McGuigan, N., Makinson, J., & Whiten, A. (2011). From over-imitation to super-copying: Adults imitate causally irrelevant aspects of tool use with higher fidelity than young children. *British Journal of Psychology*, 102(1), 1-18. <https://doi.org/10.1348/000712610X493115>
- McGuigan, N., Whiten, A., Flynn, E., & Horner, V. (2007). Imitation of causally opaque versus causally transparent tool use by 3- and 5-year-old children. *Cognitive Development*, 22, 353-364. <https://doi.org/10.1016/j.cogdev.2007.01.001>
- Meltzoff, A. N., & Moore, M. K. (1989). Imitation in newborn infants: Exploring the range of gestures imitated and the underlying mechanisms. *Developmental Psychology*, 25(6), 954-962. <https://doi.org/10.1037/0012-1649.25.6.954>
- Naigles, L. G., & Gelman, S. A. (1995). Overextensions in comprehension and production revisited: Preferential-looking in a study of dog, cat, and cow. *Journal of Child Language*, 22(1), 19-46. <https://doi.org/10.1017/S0305000900009612>
- Oostenbroek, J., Slaughter, V., Nielsen, M., & Suddendorf, T. (2013). Why the confusion around neonatal imitation? A review. *Journal of Reproductive and Infant Psychology*, 31(4), 328-341. <https://doi.org/10.1080/02646838.2013.832180>
- Pinker, S. (1995). Why the child holds the baby rabbits: A case study in language acquisition. In L. R. Gleitman & M. Liberman (Eds.), *An invitation to cognitive science: Language* (2nd ed., Vol. 1, pp. 107-133). MIT Press.

- Povinelli, D. J., Vonk, J., & Castille, C. (2012). Developing f(weight). In D. J. Povinelli (Ed.), *World without weight: Perspectives on an alien mind* (pp. 250-293). Oxford University Press.
- Schwier, C., van Maanen, C., Carpenter, M., & Tomasello, M. (2006). Rational imitation in 12-month-old infants. *Infancy, 10*(3), 303-311. https://doi.org/10.1207/s15327078in1003_6
- Shtulman, A., & Valcarcel, J. (2012). Scientific knowledge suppresses but does not supplant earlier intuitions. *Cognition, 124*(2), 209-215. <https://doi.org/10.1016/j.cognition.2012.04.005>
- Shtulman, A., & Young, A. (2020). Why do logically incompatible beliefs seem psychologically compatible? Science, pseudoscience, religion, and superstition. In K. McCain & K. Kampourakis (Eds.), *What is scientific knowledge? An introduction to contemporary epistemology of science* (pp. 163-178). Routledge.
- Stengelin, R., Hepach, R., & Haun, D. B. (2020). Cross-cultural variation in how much, but not whether, children over imitate. *Journal of Experimental Child Psychology, 193*, 104796. <https://doi.org/10.1016/j.jecp.2019.104796>