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Theory of Mind

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Theory of mind refers to our everyday ability to understand how mental states like beliefs, desires, and intentions shape our own and others' actions. Each day we construe people as engaging in actions they *believe* will get them what they *want*. Seeing a woman search expectantly through her purse, I think, "She wants something (her phone?) and thinks it's in her purse"; seeing someone do a doubletake at their dinner bill, I think, "They didn't want to pay so much and thought it would be less." These mundane understandings manifest our theory of mind—our common-sense belief-desire psychology. Developing a theory of mind is an important achievement of childhood. Thus, a key focus of theory of mind research concerns how children develop these understandings.

History

Asking how people understand mind has a long history in philosophy and psychology. More recently, two writings sparked interest for developmental scientists. [Jean Piaget \(1929\)](#) influentially claimed young children were realists: they were only able to think of such internal, immaterial things as thoughts and dreams in concrete ways—dreams were actual pictures displayed to the sleeping eyes; thinking was overt speech.

Later, in a seminal 1978 article, [David Premack and Guy Woodruff](#) asked, "Does the chimpanzee have a theory of mind?" Primatologists answered "no" and then shelved this query (but have revisited the question as discussed below), but it sparked child researchers to ask when children have a theory of mind (e.g., [Wimmer & Perner, 1983](#)).

Core concepts

Consider two basic, everyday understandings of mind. First, there is a mind–world distinction—thoughts and physical objects are two very different things: one nonmaterial and mental, the other physical and tangible (e.g., thoughts about dogs versus dogs: dreams versus pictures). Contradicting [Piaget's \(1929\)](#) claims about childhood realism, even 3-year-old children proved surprisingly good at this nonobvious and abstract understanding ([Wellman & Estes, 1986](#)).

Second, there is an understanding on how agents' mental states work to produce intentional behavior. Here, an intriguing development appeared between 3 and 7 years old that revealed children's (mis)understanding of false beliefs.

False beliefs

In a prototypic false-belief task, children see Jill put a toy in a drawer. While Jill is gone, the toy is moved to a cupboard. When Jill comes back, "Where will Jill look for her toy?" Older children answer correctly. Younger children consistently say Jill will look in the cupboard (where it really is). Several factors make these tasks easier or harder, but nonetheless, children go from consistently wrong to consistently correct

worldwide, typically in the preschool years. As shown in [Figure 1](#), children everywhere come to understand that a person's actions depend on what they think, not just reality itself.

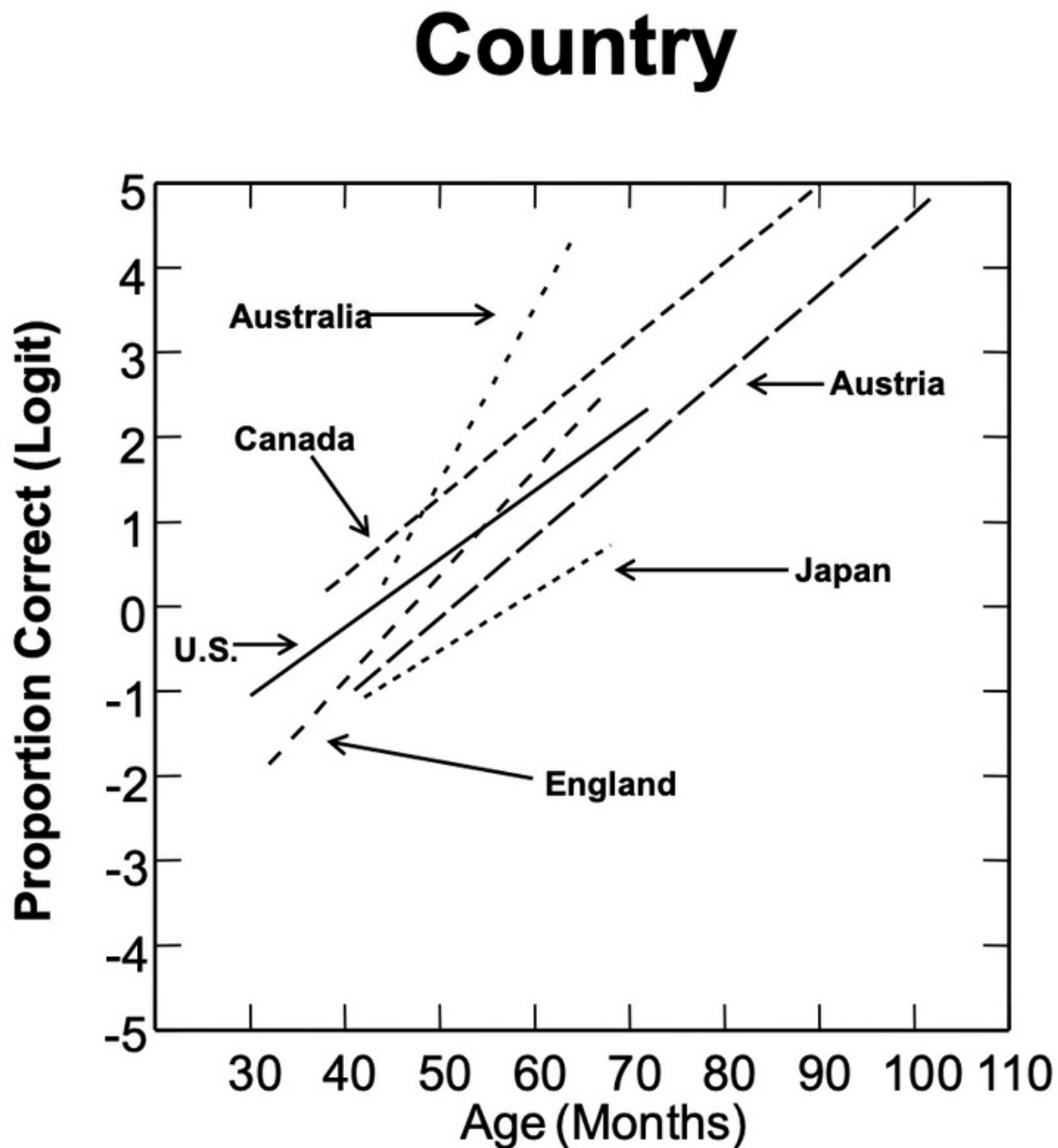


Figure 1

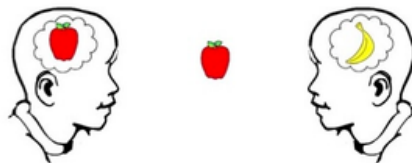
Children in different cultural linguistic communities achieve false-belief understanding somewhat more quickly or slowly, yet in all locales they evidence the same trajectory—from below chance to above chance performance (0 = chance in this graph) typically in the preschool years (Wellman et al., 2001).

Normal variation in when children come to understand false beliefs (see [Figure 1](#); [Wellman et al., 2001](#)) allows investigators to show that theory-of-mind developments have wide-ranging consequences. These include significant impacts on children's friendships, engagement in lying and deception, game playing, strategies for persuading others, and transition to school (e.g., [Lecce et al., 2017](#); [Slaughter et al., 2015](#)).

Sequences

Clearly, for belief-desire psychology, understanding desires is as central as understanding beliefs. And other understandings are important too. Consider those depicted in [Figure 2](#): understanding that people (a) can have different desires for the same things (diverse desires, DD), (b) can have different beliefs, even about the exact same situation (diverse beliefs, DB), (c) can be ignorant of something (knowledge access, KA), (d) can believe something false (false belief, FB), or (e) can feel one way but display a different emotion (hidden emotion, HE).

Using such a battery of tasks, studies encompassing hundreds of preschoolers in North America and Europe evidence a clear and consistent order of difficulty, as listed in [Figure 2](#) ([Wellman & Liu, 2004](#)), with diverse desires easiest and hidden emotions hardest. For shorthand, $DD > DB > KA > FB > HE$.

Wellman & Liu (2004)**Diverse Desire:****Diverse Belief:****Knowledge-Ignorance:****False Belief:****Hidden emotion:****Figure 2**

Graphical depiction of a progression of theory-of-mind understandings. Tasks testing these concepts were first devised by Wellman and Liu (2004) but have since been translated into dozens of languages and tested worldwide.

Such progressions of understanding have shed key light on the mechanisms of theory-of-mind development. Here are two examples.

DD > DB > KA > FB > HE characterizes children in the western world. But an alternate sequence characterizes children in China, Japan, and Singapore, where understanding knowledge (KA) and diversity of beliefs (DB) are reversed. Differences between individualist versus collectivist cultures makes this divergence sensible as exemplified by China and the United States. Back to Confucius, Chinese culture has valued attaining the common knowledge that all right-minded people should know. Individualistic U.S. values put greater weight on beliefs, including belief differences: individuals may

have, and indeed have the right to, their own beliefs. Relatedly, parent–child conversations in China emphasize knowing; U.S. parent–child conversations emphasize thinking ([Johnston & Wong, 2002](#)).

Deaf children in the United States and Australia follow the same order their hearing peers do. However, deaf children of hearing parents have serious delays in their understandings. Theory-of-mind milestones achieved by hearing preschoolers often take deaf children until adolescence to achieve ([Peterson et al., 2005](#)). This too makes sense—deaf children of hearing parents can't hear their parents speak about other people and their invisible internal states. This delays their theory-of-mind understandings, which in turn impacts their friendships, peer relations, and transition to school. (Theory of mind in children with autism is also seriously delayed but for neurological more than conversational reasons) [see [Autism](#)]. These delays in deaf children are fading (but are still apparent) as more very young deaf children get cochlear implants, allowing them to hear speech ([Yu et al., 2021](#)).

Questions, controversies, and new developments

Infants

Year-old infants show early understanding of agents' intentional (versus accidental) actions, diverse desires, and differences in perceptual perspectives (e.g., [Woodward, 1998](#)). Some researchers have claimed that infants even understand false beliefs ([Onishi & Baillargeon, 2005](#)). Infant false belief is a contentious issue, however (see, e.g., the many contradictory findings in [Paulus & Sabbagh, 2018](#)), and most researchers still think theory of mind is a preschool achievement.

Apes

Renewed research with monkeys and chimpanzees (post [Premack & Woodruff, 1978](#)) has illuminated some distinctively human theory-of-mind understandings as well as some shared understandings. Apes and monkeys understand the desires and knowledge/ignorance of others, but whether they understand false beliefs remains doubtful ([Bettle & Rosati, 2021](#)). But primate research inspires the social brain hypothesis ([Dunbar, 1998](#)), which argues that evolutionary increases in social cognition fueled advances in hominid intelligence more broadly.

Broader connections

The social brain hypothesis exemplifies theory-of-mind connections to other disciplines. Childhood theory-of-mind findings have also inspired debate and revised theorizing within philosophy of mind ([Carruthers, 2009](#)). Further, neuroscientists have identified a distinctive theory-of-mind network in the brains of adults [see [Social Cognitive Neuroscience](#)] ([Gallagher & Frith, 2003](#)). That theory-of-mind network is not apparent in infants. Rather, it emerges over childhood, apace with progressions found in children's cognitive understandings ([Sabbagh et al., 2009](#)).

Further reading

- Wellman, H. M. (2020). *Reading minds: How childhood teaches us to understand people*. Oxford University Press.
- Hare, B., & Tomasello, M. (2005). Human-like social skills in dogs? *Trends in Cognitive Sciences*, 9(9), 439-444. <https://doi.org/10.1016/j.tics.2005.07.003>
- M. Banaji, & S. Gelman (Eds.), *Navigating the social world: What infants, children, and other species can teach us* (pp. 69-74). Oxford University Press.

References

- Bettel, R., & Rosati, A.G. (2021). The primate origins of human social cognition. *Language Learning and Development*, 17(2), 96-127. <https://doi.org/10.1080/15475441.2020.1820339>
- ↩
- Carruthers, P. (2009). How we know our own minds: The relationship between mindreading and metacognition. *Behavioral and Brain Sciences*, 32(2), 121-138. <https://doi.org/10.1017/S0140525X09000545>
- ↩
- Dunbar, R. I. M. (1998). The social brain hypothesis. *Evolutionary Anthropology: Issues, News, and Reviews*, 6(5), 178-190. [https://doi.org/10.1002/\(SICI\)1520-6505\(1998\)6:5<178::AID-EVAN5>3.0.CO;2-8](https://doi.org/10.1002/(SICI)1520-6505(1998)6:5<178::AID-EVAN5>3.0.CO;2-8)
- ↩
- Gallagher, H. L., & Frith, C. D. (2003). Functional imaging of “theory of mind.” *Trends in Cognitive Sciences*, 7(2), 77-83. [https://doi.org/10.1016/S1364-6613\(02\)00025-6](https://doi.org/10.1016/S1364-6613(02)00025-6)
- ↩
- Johnston, J. R., & Wong, M.-Y. A. (2002). Cultural differences in beliefs and practices concerning talk to children. *Journal of Speech, Language, and Hearing Research*, 45(5), 916-926. [https://doi.org/10.1044/1092-4388\(2002/074\)](https://doi.org/10.1044/1092-4388(2002/074))
- ↩
- Lecce, S., Caputi, M., Pagnin, A., & Banerjee, R. (2017). Theory of mind and school achievement: The mediating role of social competence. *Cognitive Development*, 44, 85-97. <https://doi.org/10.1016/j.cogdev.2017.08.010>
- ↩
- Onishi, K. H., & Baillargeon, R. (2005). Do 15-month-old infants understand false beliefs? *Science*, 308(5719), 255-258. <https://doi.org/10.1126/science.1107621>
- ↩

- Paulus, M. & Sabbagh, M. A. (2018) Understanding theory of mind in infancy and toddlerhood. *Cognitive Development*, 46, 1-124.

↩

- Peterson, C. C., Wellman, H. M. & Liu, D. (2005). Steps in theory-of-mind development for children with deafness or autism. *Child Development*, 76(2), 502-517. <https://doi.org/10.1111/j.1467-8624.2005.00859.x>

↩

- Piaget, J. (1929) *The child's conception of the world*. London: Routledge & Kegan Paul.

↩

- Premack, D. & Woodruff, G. (1978) Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences*, 1(4), 515-526. <https://doi.org/10.1017/S0140525X00076512>

↩

- Sabbagh, M. A., Bowman, L. C., Evraire, L. E., & Ito, J. M. B. (2009). Neurodevelopmental correlates of theory of mind in preschool children. *Child Development*, 80(4), 1147–1162. <https://doi.org/10.1111/j.1467-8624.2009.01322.x>

↩

- Slaughter, V., Imuta, K., Peterson, C. C., & Henry, J. D. (2015). Meta-analysis of theory of mind and peer popularity in the preschool and early school years. *Child Development*, 86(4), 1159–1174. <https://doi.org/10.1111/cdev.12372>

↩

- Wellman, H. M., & Estes, D. (1986). Early understanding of mental entities: A reexamination of childhood realism. *Child Development*, 57(4), 910-923. <https://doi.org/10.1111/j.1467-8624.1986.tb00254.x>

↩

- Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, 72(3), 655–684. <https://doi.org/10.1111/1467-8624.00304>

↩

- Wellman, H.M. & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development*, 75(2), 523–541. <https://doi.org/10.1111/j.1467-8624.2004.00691.x>

↩

- Wimmer, H. & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, 13(1), 103-128. [https://doi.org/10.1016/0010-0277\(83\)90004-5](https://doi.org/10.1016/0010-0277(83)90004-5)

↩

- Woodward, A. L. (1998). Infants selectively encode the goal object of an actor's reach. *Cognition*, 69(1), 1-34. <https://doi.org/10.1016/S0010-02>

[↵](#)

- Yu, C.-L., Stanzione, C. M., Wellman, H. M., & Lederberg, A. R. (2021). Theory-of-mind development in young deaf children with early hearing provisions. *Psychological Science*, 32(1), 109–119. <https://doi.org/10.1177/095679762096038>

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