kgweisman.github.io
kweisman@stanford.edu

The development of intuitions about the structure of mental life

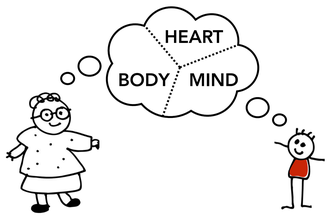
Kara Weisman, Carol S. Dweck, & Ellen M. Markman, Department of Psychology, Stanford University

BACKGROUND

How do people make sense of the various emotions, sensations, thoughts, etc. that make up mental life?

In recent work using a **bottom-up approach** to this question (see Gray et al., 2007), we found that both 7- to 9-y-old US children & US adults organize mental life into **three fundamental components** (Weisman et al., in press, 2017):

- Physiological abilities related to the **BODY** (e.g., hunger, pain)
- Social-emotional abilities related to the **HEART** (e.g., pride, sadness)
- Perceptual-cognitive abilities related to the **MIND** (e.g., vision, memory)



PRIMARY QUESTION: How does this conceptual structure develop across early and middle childhood?

Here we chart the development of these intuitions between ages 4-9y, a period of dramatic change in folk biology and psychology (Carey, 1985) as well as theory of mind (Wellman & Woolley, 1990).

We compare 4- to 6-y-olds' conceptual structure with that of older children (7-9y), with an eye toward **several possible patterns**, e.g.:

- As a group, younger children's mental capacity attributions might not arise from any sort of shared, stable conceptual structure.
- Younger children might focus on more fine-grained distinctions between specific mental capacities rather than over-arching categories.
- Younger children might share some or all of the conceptual structure that organizes older children's and adults' mental capacity attributions.

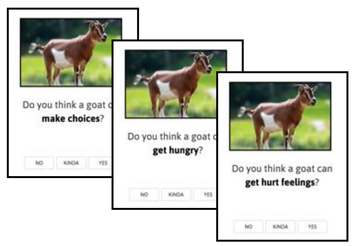
PROCEDURE

Each child was randomly assigned to evaluate 1 of the following characters:

computer *robot* *doll* *teddy bear* *beetle* *bird* *mouse* *goat* *elephant*

Children answered **20 questions** about this character's mental capacities, presented in a random order (see "RESULTS").

Children responded on a 3-point scale (no = 0, kinda = 0.5, yes = 1).



RESULTS

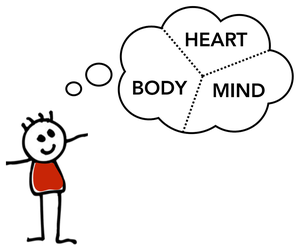
We used **exploratory factor analysis** to assess the conceptual structure underlying children's responses in each age group. This allowed us to assess which mental capacities patterned together in children's judgments—e.g., when a child said a character could feel happy, what other capacities did they attribute to it?

This bottom-up approach revealed different conceptual structures across age groups.

STUDY 1: *N*=123 OLDER children

(7.09-9.99y; median age: 8.57y)

Replicating our previous findings with 7- to 9-y-old children and adults (Weisman, et al., 2016, 2017), a **three-part conceptual structure** emerged, with factors corresponding to **BODY**, **HEART**, and **MIND**.



7-9y

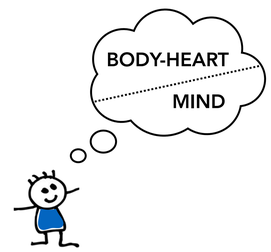
	BODY	MIND	HEART
get hungry	0.98	0.02	-0.11
smell things	0.78	0.06	-0.08
feel scared	0.73	-0.01	0.26
feel pain	0.69	-0.03	0.21
feel tired	0.49	0.25	0.25
feel sick...	0.48	0.16	0.00
feel guilty	-0.11	-0.04	0.78
feel embarrassed	-0.17	0.10	0.76
feel proud	0.13	0.02	0.71
get hurt feelings	0.06	0.02	0.67
feel sad	0.17	0.03	0.66
feel love	0.30	-0.05	0.51
get angry	0.41	0.14	0.43
feel happy	0.38	0.01	0.42
figure out how to do things	0.04	0.74	-0.11
make choices	0.05	0.73	0.09
remember things	-0.17	0.71	0.05
sense temperatures	0.05	0.65	-0.05
sense... close by or far away	0.04	0.54	-0.04
be aware of things	0.09	0.52	0.10

1 / 0 / -1

STUDY 2: *N*=122 YOUNGER children

(4.00-6.99y; median age: 5.03y)

In contrast, 4- to 6-y-old children's responses revealed a **two-part conceptual structure**, with factors corresponding to a combined concept of **BODY-HEART** and an adult-like notion of **MIND**.



4-6y

	BODY-HEART	MIND
feel happy	0.73	-0.05
feel proud	0.72	-0.05
feel love	0.71	-0.15
get hungry	0.68	0.10
feel sad	0.67	-0.07
get hurt feelings	0.66	0.01
feel sick...	0.66	0.01
get angry	0.61	0.08
smell things	0.57	0.06
feel scared	0.54	0.09
feel tired	0.51	0.30
feel pain	0.47	0.09
feel embarrassed	0.45	0.14
make choices	0.31	0.29
sense temperatures	-0.03	0.70
remember things	-0.03	0.57
sense... close by or far away	0.03	0.52
figure out how to do things	0.16	0.47
feel guilty	0.16	0.46
be aware of things	0.28	0.32

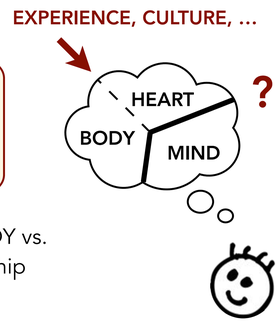
1 / 0 / -1

Tables show factor loadings for the factors that met retention criteria in each study (eigenvalue >1, explaining >5% of total variance, dominant for ≥1 item after oblimin rotation). Loadings could range from -1 (perfectly negative association with the latent construct) to +1 (perfectly positive association). Items are listed according to the strength of the factor loading on the dominant factor.

CONCLUSIONS & OPEN QUESTIONS

This bottom-up approach revealed the gradual emergence of an adult-like conceptual structure underlying mental capacity attributions:

- Younger children drew the general distinction between "warmer," visceral capacities (BODY-HEART) vs. "cooler," cerebral capacities (MIND).
- But unlike older children and adults, they did not draw the further distinction between BODY and HEART.



Together with ongoing cross-cultural work, these studies suggest that the distinction between "warmer," more visceral capacities vs. the MIND is primary (earlier to emerge, less variant across contexts), while the BODY vs. HEART distinction is secondary (later-emerging, contingent on experience and cultural input).

- Why might the BODY-HEART vs. MIND distinction be more primary? Is this distinction best characterized as "warm vs. cool," "visceral vs. cerebral," "more vs. less closely related to survival insticts," …?
- How might the emergence of a distinction between BODY vs. HEART reshape children's understanding of the relationship between biological life, mental life, and moral status?

ACKNOWLEDGEMENTS

Thanks to the staff and families at Bing Nursery School, the Palo Alto Junior Museum & Zoo, and the Tech Museum of Innovation; and to research assistants C. Field, L.D. Brenner, O. Homer, B. Radecki, J.N. Sullivan, C. Xie, and A. Yu. This material is based upon work supported by the National Science Foundation Graduate Research Fellowship Program under Grant No. DGE-114747, and by a William R. & Sara Hart Kimball Stanford Graduate Fellowship.

REFERENCES

Carey (1985). *Conceptual Change in Childhood*. MIT Press.
Gray, Gray, & Wegner (2007). The dimensions of mind perception. *Science*, *315*(5812), 619.
Weisman, Dweck, & Markman (in press). Rethinking people's conceptions of mental life. *PNAS*.
Weisman, Dweck, & Markman (2017). Children's intuitions about the structure of mental life. *Proc. of the 39th Annual Meeting of the Cognitive Science Society* (pp. 1333-1338).
Wellman & Woolley (1990). From simple desires to ordinary beliefs: The early development of everyday psychology. *Cognition*, *35*, 245-275.