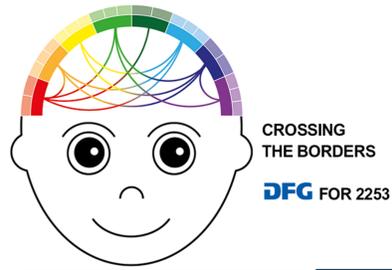# Relations between early mental state language and perspective taking at 27 months

Irina Jarvers[1], Beate Sodian[1], Susanne Kristen-Antonov[1], Stella Serena Grosso[1] & Tobias Schuwerk[1]

[1]LMU Munich, Germany

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Background

Children's talk about the mind, emerging in the third year of life, is one of the first signs for an explicit understanding of mental states. Recent research findings indicate that there is more genuine reference to mental states (more specifically to knowledge states) in 25- to 33-month-olds' spontaneous speech than was previously assumed (Harris, 2016). Consistently, a correlational study by Chiarella et al. (2013) has shown that at 30 months, mental state vocabulary correlates with level-1 visual perspective taking skills, independently of general language abilities. Furthermore, longitudinal studies have shown specific predictive relations from joint attention around the age of 9-12 months, to desire and cognition language 30 months, which in turn predicts TOM around the age of 4 years, indicating conceptual continuity in the mental domain (Brooks & Meltzoff, 2014; Kristen et al., 2011). However, research into the relation between MSL and mental state understanding is sparse.

Goals

To gain further evidence on interrelations between spontaneous MSL production, understanding of mental terms, and mental state understanding, we assessed MSL, mental verb understanding, perspective taking skills, and metacognitive awareness of own ignorance as well as domain-general cognitive and language abilities in a large sample.

Participants

107 children (42 male) were tested twice at the age of 24 and 27 months for **general cognitive skills** (Bayley Scales III, Bayley, 2006), **general language skills** (SET-K 2, Grimm, 2000), **visual** and **epistemic perspective taking** abilities (Gonzales et al., 2017), **metacognition of own ignorance** (Bartz et al., 2016) and **MSL vocabulary** and production (Olineck & Poulin-Dubois, 2005), measured with the parent report scale (MSLQ) and a task assessing children's **understanding of the pragmatics of "know" and "want"**.

Tasks	N	Mean (SD)
Bayley Scales (Cognition)	107	83% (8%)
Visual PT (VPT)	98	18% (30%)
Epistemic PT (EPT)	98	10% (24%)
Metacog. of Ignorance (MI)	102	53% (31%)
MSLQ (MSL)	97	40% (20%)
Want	103	40%(49%)
Know	107	13%(34%)

Discussion

In sum, the present findings confirm correlations between the acquisition of mental state terms and children's understanding of visual perception and desires at the age of 27 months. However, at such a young age neither one of the correlations was independent of general language abilities, which explained 31% of the variance in MSL.
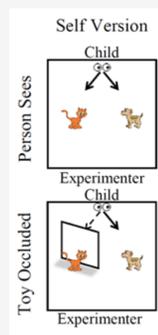
Tasks

Know-Want Task

Tests for children's understanding of the pragmatics of the words 'know' and 'want' in the form of a hiding game. The first experimenter (E1) hides two objects in four boxes while a second experimenter (E2) is away. Upon return E2 addresses the child with a knowledge or desire statement, e.g. "I know where the ball is. I do not know where the chair is.", "I want the ball, I don't want the chair." The order of negation was varied, resulting in two trials for "know" and for "want". The child is asked to choose a box based on the statement. Performance was coded with 1 for the correct box (unknown/wanted location) and 0 for an incorrect box (known/unwanted/empty location).

Visual and Epistemic PT Task (Gonzales et al., 2015)

Self Version
Child
Person Sees
Experimenter Child
Toy Occluded
Experimenter

Self-version
Child
Person Looks
Experimenter Child
Boxes Closed
Experimenter

Visual: children are asked to report on whether they can see an animal that is in open sight and another which is hidden behind an occluder. This is repeated while asking about perspective of a puppet.

Epistemic: children are asked to report on whether they know the content of a box they looked inside and another they did not. Repeated with the perspective of a puppet.

Scoring: 2 trials per condition with 1 point if both correct.
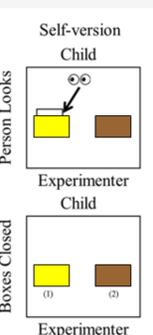
Metacognition of Ignorance (Bartz, Rowe, & Harris, 2016)

Tests children's awareness of their own ignorance. Children are shown real (Fig.1) and fake (Fig.2) objects and asked to name them. Indications of uncertainty such as saying *"I do not know"*, *shaking the head*, saying *"no"* or *"hmph"* are coded. Scoring: On how many out of 6 trials children showed a sign of uncertainty. Therefore a sign in each of the 6 trials resulted in 6 points, which corresponded to 100% performance.
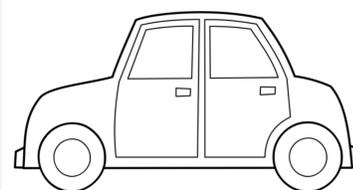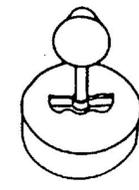

Fig.1

Fig.2

Results

The percentage of terms on the MSLQ ranged from 0-96%. 85% of the children knew at least one cognition term and 94% at least one volition term at 27 months. On average they knew 3.7 cognition terms, ranging from 0-16 terms, and 2.7 volition terms, ranging from 0-8. Understanding "want" was significantly correlated with the total MSLQ score, $r=.24$, $p < .05$, and volition terms, $r=.23$, $p<.05$. Similarly, one's own VPT was correlated with the MSLQ, $r=.25$, $p<.05$. However, these correlations were not significant after controlling for language. The MSLQ was significantly correlated with the Bayley scales, $r=.38$, $p<.001$, as well as with general language $r=.54$, $p<.001$. A linear regression analysis revealed that the MSLQ was predicted mainly by general language; $(F(2,87)=19.58$, $p<.001)$, with an R^2 of .31.

% of competent children (score of 1 or at least 1 sign of ignorance)
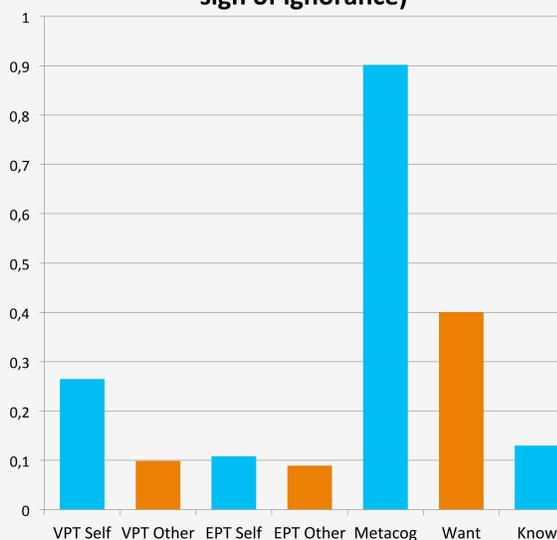
Tasks	1.	2.	3.	4.	5.	6.	7.
1.Bayley Scales (Cog)	-	**.44*****	**.22***	.12#	**.38*****	**.20***	-.12
2.SET-K 2	-	-	**.37*****	**.23***	**.54*****	.14	.05
3.Own Visual PT	-	-	-	**.22***	**.25***	.17	.11
4. Metacog. Ignorance	-	-	-	-	.10	.07	.00
5. MSLQ	-	-	-	-	-	**.24***	-.06
6. Want	-	-	-	-	-	-	.05
7. Know	-	-	-	-	-	-	-

= trend, * $p< .05$, ***$p<.001$

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