Assessment of voice discrimination by children with PIMD

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Introduction

- Research in cognitive and in developmental psychology opens new theoretical and methodological perspectives in the study of cognitive and psychological functioning of people with PIMD.
  - i.e recent validation of the visual habituation paradigm in adults with PIMD (Chard, Roulin, & Bouvard, 2013; Chard, 2015)
- This study is closely linked to Juliane Dind's PhD

Objective

The aim of the present study was to observe if children with PIMD are able to discriminate between two auditory stimulations: their voice and the voice of a peer

Method

- Research design

= simplified form of the methological paradigm Head-Turn Preference Procedure for Auditory Perception (HPP)
(Kemler Nelson & al., 1995)

Method

- Sample

N = 17 (♂= 6 ; ♀= 11)
Mean average age: 8.0 years (7-12)

Inclusion criteria

- PIMD "diagnosis" according the definition of the SIRG PIMD (Nakken & Vlaskamp, 2002, 2007)
- Age (4-12 years)

Profound intellectual disabilities
Profound neuromotor dysfunctions
Frequent sensory impairments

Method

- 2 conditions

Self-voice condition: soundtrack with the participant self-voice (1 minute)
versus
Peer voice condition: soundtrack with the voice of a peer (1 minute)

3 times of measurement (T1, T2, T3)
interval of one week to one month

Task proposed at school (quiet room)

Procedural reliability: 86,6 %
Calculated on 35% of the data with 5 indicators (Child's position/place; instructions; interferent stimuli; operation sequence; stimuli)

Method

- Dependant variables

Choice based on developmental literature (Dondi, Simion & Caltran,1999; Legerstee, Anderson & Schaffer, 1998; Marsch, Stavropoulos, Nienhuis & Legerstee, 2010; Rochat & Striano 2002)
and PIMD specific literature (Petry and Maes, 2006; Munde, Vlaskamp, Maes and Ruijssennaars, 2014)

- Facial expression
  - Smile (present/absent)
  - Tongue protrusion*
  - Frowning*
- Vocalizations (present/absent)
- Active alert (present/absent)
- Orientation toward the voice (present/absent, if absent: contralateral)

*Not used in the analyses: insufficient data available

Construction of the categories for the coding sheet (7 iterations)

Final inter-observer reliability*

85-93%

the variable « vocalizations » obtained the higher score (93%)

*41% of the data (= 7 participants) has been coded by a second coder

Method

- Softwares (coding and statistics)

Data have been coded with EUDICO Linguistic Annotator (ELAN, version 4.9.4), in terms of occurrences and/or duration

Statistical analyses have been performed in SPSS 24 and in R

Research questions

- Should one observe differences in the participants' behaviour during the peer-voice *versus* the self-voice condition ?
  (Occurrences and/or duration for « Smile », « Vocalization », « Active alert », « Orientation »)
- Does the participants' membership in **self-awareness** clusters* predicts their ability to discriminate between peer *versus* self-voice condition ?

*** It seems that according to their self-awareness skills, three subgroups can be distinguished in children with PIMD (Dind, 2017)**

First results →

Discrimination skills
-> results of the whole sample

- Wilcoxon signed ranks

		Occurrences			Mean duration		
		V	Z	p-value	V	Z	p-value
Dependant variables	Smile	59	-1.532	.125	85	-1.995	.046*
	Vocalizations	44.5	-0.540	.972	74	-1.319	.187
	Active alert	65	-0.256	.798	106	-1.359	.174
	Orientation	75.5	-0.854	.393	51	-1.168	.243

***p<.01**

Discussion & interpretation

Results regarding the whole sample

- Participants smile longer when they are exposed to the voice of the peer in comparison to their own voice
- No statistical differences for the other variables

Is the predominance of the « Smile » due

- *To the social nature of the task?*
- *To the « availability » of the smile as a response behaviour, as it is a very precocious social skill in development?*

Discrimination skills
-> results of the cluster 2

- Wilcoxon signed ranks

		Occurrences			Mean duration		
		V	Z	p-value	V	Z	p-value
Dependant varia bles	Smile	12	-1.079	.280	16	-1.049	.294
	Vocalizations	5	-0.540	.589	15	-0.838	.402
	Active alert	19	-1.685	.092*	10	-0.556	.578
	Orientation	18.5	-0.678	.498	7	-1.043	.297

*p<.01

Discussion
Results of the cluster 2

- Within the cluster 2, the average number of active **alert** states tends to be higher when the child is exposed to the voice of the peer compared to the exposure to his own voice.

The children of the cluster 2 react more often during the peer-voice condition,

but their alert behaviour doesn't last very long

Discrimination skills
-> results of the cluster 3

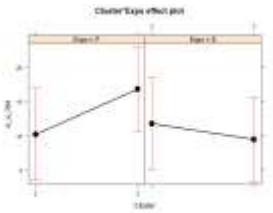
- Wilcoxon signed ranks

		Occurrences			Mean duration		
		V	Z	p-value	V	Z	p-value
Dependant variables	Smile	19.5	-0.847	.397	31	-1.751	.080*
	Vocalizations	14.5	-0.001	.999	15	-0.085	.932
	Alert	7.5	-1.405	.160	40	-2.064	.039*
	Orientation	22	-1.273	.203	14	-0.917	.359

*p<.01

Effect : condition x cluster

Behaviour of children in cluster 3 differs significantly from those in cluster 2. The average duration of their alert behavior increases when exposed to the voice of the peer compared to the exposure to the own voice.



	$Chi^2(1)$	p-valeur
Average number of alerts	2.635	0.105
Average duration of alerts	4.311	0.038

Generalized linear mixed model (GLMM)

Interpretation

- We cannot be sure that the participants recognize their own voice, but one can argue that they discriminate the stimuli according to their familiarity which is the first step of self-recognition development.
- The smile and the alert behaviour seem to be good indicators of the discrimination ability

Smile:

> social nature of the condition + precocity of the behaviour in human for the treatment of social events

Active alert:

> each participant displayed a level of vigilance permitting a tonical response as first reaction to one sensorial stimulation (cf Bullinger, 2013)

But only some of them (cluster 3) were able to keep their attention towards the stimulus

Other considerations

- Our results suggest that significant reactions may occur within only one minute of stimulus exposition; this confirms other authors' results (Munde, Vlaskamp, Maes, & Ruijssenaars, 2014)
- Results show the interest of an experimental design usually applied in developmental psychology in the study of children with PIMD

Limitations

- Sample size
- No systematic assessment of the participants' auditory acuity
- Task proposed in a quiet room at school however not free from contextual interferences
- Manual **switch-on** of the devices (precision of the interval between the two conditions)
- Giving up of some (idiosyncratic) indicators

Conclusion

- The results of the present study join those obtained with the situation-based list of inducing situations on ecological self-awareness (Dind, 2017)
- The participants' membership in self-awareness clusters has an impact on the behaviours depending on the exposure condition.

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