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AUTISM SPECTRUM DISORDER

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Theory of Mind in autism: more variations and more complexity than once believed

Introduction

The presented studies are aimed at a finer understanding of autism (autism spectrum disorders) at the cognitive level. As such, they are motivated by the conviction that a satisfying scientific understanding of autism is a multi-level interdisciplinary enterprise. As autism has genetic roots in most of the cases, even evolutionary issues arise about the persistence of its genetic background in the human genetic pool. It is a task for genetics, neuro-embryology and developmental neurology to explain how genetic and environmental factors interact in giving way to the atypical neural development as the biological foundation of this syndrome. The psychological/cognitive level is often seen as a conceptual link between brain and behaviour. By understanding autism on this level we hope to get a deeper insight into which psychological mechanisms work atypically in autism, due to the atypical organisation of the neural bases of these psychological/cognitive functions. On the other hand, understanding the cognitive background of autism offers us an explanation for the specific behavioural patterns seen in this disorder.

All this implies also that a relevant and valid psychological explanation of autism is necessarily very 'sensitive' to findings on the neural background of autism, as well as to the more and more refined descriptions of the symptoms and other behavioural characteristics. The research summarised below has been conducted with the intention to incorporate the relevant neural and behavioural findings when designing the studies and interpreting the results.

As the last introductory remark here, it should be emphasise that these works were inspired by the conviction that autism, though not entirely, but still essentially is a cognitive or, more precisely, a neuro-cognitive disorder. That is, although non-cognitive psychological and neuro-physiological mechanisms, such as arousal-regulation processes, emotional processes, motivational factors and low-level sensory processes do often function atypically in this syndrome, the core features arise from an atypical organisation of *cognitive* mechanisms. That is, efforts to reveal the cognitive basis of autism are, at the same time, efforts to understand the essence of this syndrome on the psychological level.

The 'Theory of Mind' hypothesis of autism as a single-factor explanation

It was clearly a breakthrough in the psychological understanding of autism when Baron-Cohen, Leslie and Frith (1985) suggested that 'Theory of Mind' ability may be impaired in autism, and this impairment may lead to the core triad of behavioural symptoms.

Theory of Mind ability, or, more precisely, naïve Theory of Mind ability (briefly: ToM), is widely defined as the human cognitive ability to attribute mental states to various agents, and to interpret, explain and predict their actions as causal consequences of the attributed mental states. It is widely held to be a crucial basis of human social intelligence and intentional communication, although many aspects of the cognitive organisation, neural basis, and developmental history of this ability are still unclear.

It was an important starting point for our studies to see that the original, early version of the ToM hypothesis was a very strong one, in at least five respects. Namely, it assumed that:

1. ToM impairment is universal in autism; it is present in all cases.
2. At the same time, it is specific to autism; no other (developmental) disorder involves such a deficit.
3. ToM impairment explains all core features of autism, that is, it causally determines the 'autistic triad'.
4. It is a primary deficit – there is no more elementary and earlier cognitive deficit that could give rise to it.
5. And, finally, at the very heart of the ToM impairment in autism there lies an inability to represent mental states, as the very essential cognitive deficit in autism.

This early, strong form of the ToM hypothesis of autism is represented – with more or less cautionary reservations – by, for example, Baron-Cohen et al. (1985), Baron-Cohen (1995), Happé (1994), or Leslie and Thaiss (1993).

Since 1985, hundreds of studies confirmed that a ToM impairment exists in autism, but, at the same time, a considerable bulk of evidence suggests that the original, strong variant of the ToM hypothesis cannot be maintained in all five respects. Now, I just shortly refer to a few kinds of findings that have lead to a necessary revision of the strong hypothesis – the points below are very far from an exhaustive review.

1) *The existence of passers*. It has been demonstrated convincingly in several studies that many individuals with autism do pass formal Theory of Mind tasks, including several forms of false belief tasks (for a review, see Györi, 2006). This fact, in the first approximation, goes against the claims that ToM is universally impaired in autism and that this impairment leads to the core symptoms.

2) *Missing/uncertain causal links*. Although the hypothesis that a deeply impaired ToM might lead to all the three core clusters of the 'autism triad' is undoubtedly plausible (see, e.g., Györi, 2006; Happé, 1994), surprisingly little evidence supports the existence of these causal links. There seems to be no such evidence at all concerning the third area of impairments, i.e. repetitive behaviours and restricted interests (see Russell, 1997). Available evidence on the causal links between ToM impairment and symptoms in reciprocal socializations and communication, on the other hand, are also considerably ambiguous (see, e.g., Frith and Happé, 1994; Frith et al., 1994; Happé, 1993; for a summary also Györi, 2006).

3) *Other documented cognitive deficits*. In the late 1980s and early 1990s several other cognitive impairments/characteristics of autism were documented. The most important among these seem to be impairments in executive functions and detail-focused processing ('weak central coherence'), but various deficits in sensory processing, facial processing, attentional processes, memory functions, etc. have also been demonstrated.

4) *The unfolding complexity of the neural background*. Studies on the neural basis of autism show that the 'autistic brain' is different from the 'neurotypical brain' at several points and on various levels, and that the pattern of anomalies changes quite dynamically in the course of development (see, e.g., the volume edited by Zimmerman, 2008).

These and many other kinds of findings should make all researchers in the field at least cautious about maintaining a strong variant of the ToM hypothesis of autism – and about maintaining any single-factor explanation of this syndrome on the psychological level. But, on the other hand, one should be equally cautious about not rejecting ToM impairment as a part of the cognitive explanations of autism. As I emphasised above, a huge bulk of evidence shows that this impairment is present in this population, and supports that there is a causal link from this impairment to several symptoms. Instead of throwing away this important part of the mosaic, it is better to find its precise place in the complex image that is emerging.

A better understanding of the precise nature and role of ToM impairment in autism requires asking and answering a set of more specific questions, partly old, partly new ones. Our studies briefly presented below have been aimed at clarifying a few of these. I emphasise three of them here.

Heterogeneity? Does ToM impairment show heterogeneity in autism? Is it the case that ToM functioning/dysfunctioning shows highly variable patterns across individuals?

Is passers' ToM ability based on genuine understanding of mental states? It is a key issue, for many reasons, if passers, or at least some of them, have a genuine ToM mechanism.

How is theory of mind related to other cognitive functions? As ToM impairment seems to be a part of a highly complex pattern of cognitive impairments, it appears important to understand the relationship between this ability and other relevant cognitive abilities in autism.

How stable/unstable is theory of mind ability in autism – if it exists? As I shall discuss in somewhat more detail below, little is known about the stability of cognitive functions in autism. It may prove important in the future to understand to what extent complex cognitive functions, such as ToM, are stable/unstable in autism.

Do passers have a genuine Theory of Mind ability?

Since the first empirical testing of the (strong) ToM hypothesis of autism, it has been an important question if those individuals with autism who pass Theory of Mind tasks in controlled, laboratory situations possess a genuine theory of mind ability, or not. This problem, often called 'the problem of passers', has inspired considerable empirical research as well as theorising. We do not yet have the final answer to this problem, and the proposed theoretical solutions range from the claim

that ToM may be sound in passers (e.g., Ozonoff et al., 1991a, b), via the assumption that ToM development is significantly delayed (Baron-Cohen, 1989), to various claims about atypical, compensatory cognitive processing underlying passers' success in standard ToM tasks (see., e.g., Happé, 1994; Klin et al., 2000) – just to mention a few from the theoretical spectrum on passers (for a more detailed review, see again Györi, 2006).

In our view, solving the problem of passers requires evidence from various methodologies, such as findings from experimental psychology, neuroscience, developmental studies, and so on. These investigations should take into account the potential heterogeneity of the cognitive mechanisms behind ToM task success, too. In the studies I'm going to concisely present here, we applied an experimental methodology and, in order to handle potential cognitive heterogeneity, we amalgamated it with a single-case design. More detailed reports of these studies can be found in Chapter 6 of Györi (2006) and are in preparation in a revised and updated form (Györi et al., in preparation, a and b).

We used a paradigm adapted from experimental psycholinguistics (Gibbs, 1986) to investigate if high functioning individuals (adolescents and young adults) with autism (n = 22) are able to understand and interpret ironic versus literally meant utterances in context and to compare their performance to a matched control sample of individuals without autism (n = 21). The major methodological novelty of this study was the way of presentation – subjects read little stories in a sentence-by-sentence, self-paced way from a computer screen – and the way we combined the experimental design with a single case design was to allow conclusions on the cognitive processes underlying task success even on an individual level.

We used understanding irony as a test field of ToM ability, as both theoretical-conceptual theorising and some empirical evidence show that interpreting ironic utterances requires second-order understanding of intentions; see Sperber and Wilson (1988) and Happé (1993). Moreover, the specific paradigm we applied allowed us to take processing time measurements. We expected these data to open a window into the more specific processing patterns associated with task success. Below you see an example for an ironic story with the test and control questions:

Kate and Eve are good friends.
They often go out together.
As they met today, it began to rain.
So they went to a cinema.
Kate said as they stood up at the end of the film:

Now, it is time to go back to that nice weather!

- Did Kate really mean that they are going back to nice weather?
- When she said this, was she happy?
- Why did she say this?
- Was the weather indeed nice when Kate said this?

Our first study with 14 literally ending and 14 ironically ending stories as stimuli has brought some expected and some non-expected results (see Gyori et al., in preparation, *a*). As an expected result, non-autistic controls understood significantly more stories than the experimental group with autism. However, the difference between the two groups was less dramatic than we expected (the average success rate was 84.5% in the autism group, and 92.8% in controls), and the group with autism showed much better performance than expected in such a complex task requiring second-order understanding of intentions: 3 of the 22 subjects made no error at all, and only one of the 22 performed on a random level!

Also surprisingly, the analyses on the processing time *patterns* and error *patterns* did not reveal dramatic differences between the two groups: by and large, the same effects of story variables were found in the two groups on the group level, although there was a generally higher variability in the autism group and some differences were present in the individual-level effects we found.

In sum, though the autism group was weaker in the task as expected, both performance data and processing time data indicated a surprisingly high level of understanding of non-literal meaning, and, assumedly, a surprisingly high level of ToM functioning.

Although such findings are not alone in the literature as some studies have found success in relatively complex tasks of ToM in autism, such as Bowler (1992), or Happé (1993), it appeared that it would be worth remaining cautious about accepting too quickly a conclusion that complex ToM indeed functions in our sample.

Instead of accepting such a conclusion quickly, we wished to investigate the possibility that passers, or at least some of them, applied *some non-Theory-of-Mind-based compensatory strategy* to solve the simple irony task outlined above. We speculated that a hypothetical compensatory strategy we named 'Reality-Based Short-Cut Strategy' could in principle help our subjects solve the simple irony tasks without ToM. Figure 1 below shows the relatively simple algorithm of the hypothetical 'Reality-Based Short-Cut Strategy'.

Fig. 1. Reality-Based Shart-Cut Strategy for solving irony tasks without ToM

Our question in the second study (see Györi et al, in preparation, *b*) was, naturally, if any of our subjects with autism indeed used this non-ToM compensatory strategy when solving a simple irony task – normally solved by attribution of an ironic intention requiring ToM ability. In order to answer this question we needed a task that would be able to tell apart those who did use ToM from those who used the 'Reality-Based Short-Cut Strategy'. We devised the *False Irony Task* to do this.

The False Irony Task can be seen as an amalgam of the Simple Irony Task and a false belief task, in the sense that the False Irony Task is centred on an utterance which *is meant ironically*, but – due to changes in the context unknown to the speaker – is, at the same time, *literally true*. A false ironic version of the above sample story is shown below here:

Kate and Eve are good friends.
They often go out together.
As they met today, it began to rain.
So they went to a cinema.
Sitting in the cinema, they did not notice that the rain stopped outside, and now it was shining.
Kate said as they stood up at the end of the film:

Now, it is time to go back to that nice weather!

- *Did Kate really mean that they are going back to nice weather?*
- *When she said this, was she happy?*
- *Why did she say this?*
- *Was the weather indeed nice when Kate said this?*

The key feature of false ironic stories is that by relying on ToM ability, that is, by understanding the beliefs and intentions of the speaker they are interpreted as ironic (the utterance of the speaker is meant ironically), while using the 'Reality-Based Short-Cut Strategy' they are interpreted as literal (as if the utterance of the protagonist is meant literally). That is, false ironic stories are able to tell apart genuine mental state understanding (ToM) from a specific compensatory strategy.

In this second study, therefore, we presented simple ironic, simple literal, false ironic and false literal stories – these last being literal counterparts of false ironic stories – to 16 high functioning subjects with autism, 15 of whom took part previously in our first study as well.

Our goal was to categorise subjects in terms of ToM ability vs. compensation on the basis of their patterns of performance. As the False Irony Task is highly complex in terms of required ToM ability, we can assume with considerable certainty that those subjects who pass these tasks and all the simpler tasks do possess – a quite complex – ToM ability. Seven of our 16 subjects showed this pattern: performance at ceiling. One has good reason to conclude that these subjects have quite complex ToM ability – although this does not mean at all that their ToM ability is unimpaired.

Those subjects who *consequentially* fail in the False Irony Tasks and in the False Literal Tasks, while consequentially succeeding in simple ironic and simple literal stories, most probably apply the 'Reality-Based Short-Cut Strategy'. Two of our subjects in this study showed this pattern of performance.

And finally, 3 subjects showed another, relatively clear pattern of success and failure: they failed in the more complex tasks due to a failure to represent and remember the context of the stories. We may cautiously conclude that these subjects have a complexity limitation in representing and remembering the context for mental state attributions.

Our results, of course, do not represent a decisive, final word about the problem of passers but are informative on some aspects of the issue. They form strong evidence for considerable cognitive heterogeneity in terms of ToM ability in autism. Moreover, the errorless performance in a set of quite complex ToM-related tasks by a considerable proportion of our subjects strongly suggests that some high functioning individuals with autism do possess complex Theory of Mind ability. Besides, some subjects clearly showed a pattern that indicates the application of an algorithmically identified compensatory strategy – for the first time in the literature. Finally, a part of our findings suggests that in a third sub-group some kind of general cognitive complexity limitation may underlie ToM failure.

These findings, especially if verified by further studies, naturally raise a set of novel questions – questions about the stability of these sub-groups, the dependence of the variability of ToM performance and compensatory strategies on other cognitive characteristics (such as general intelligence and language), the actual developmental pathways these variations may be part of, and so on. I shall return to some of these issues later in this paper.

Does language have a specific role in understanding minds in autism?

The relationship between ToM abilities and linguistic abilities is an important question both in typical development and in autism, for many reasons. From among these I now emphasise the issue of compensation. As we have just seen, language-based compensatory strategies may play an important role in substituting to some extent the missing ToM ability in some individuals with autism. From this conclusion, the question naturally follows if there is a specific developmental relationship between ToM and language in autism.

We investigated this issue by developing *a novel non-verbal false belief test method* to test ToM ability without relying on linguistic skills, and by designing a correlative study based on this novel tool. Preliminary findings from this study have been published in Hungarian (Györi et al., 2007), while a report in English on the 'final' findings is in preparation (Györi et al, in preparation, c).

As our review of the existing (published) non-verbal false belief tasks showed important disadvantages for each of these methods (such as a need for previous training and knowledge transfer, as in, for example, Call and Tomasello, 1999), we decided to design a novel non-verbal false belief test. Our aim was to create a procedure that (1) is fully non-verbal, (2) expects a complex, goal-directed action as a manifestation of ToM ability, (3) does not require previous training and

knowledge transfer, (4) is developmentally adequate at the critical (mental) age of 3–6 years.

The basis of our procedure is to enact short scenes by puppets and pass over the control of the protagonist puppet to the child at a crucial moment. The way the child completes the scenes is indicative of her/his grasp of the mental states (beliefs) of the protagonist puppet.

The actual testing scenes are preceded by tuning scenes, where no mental state attribution is expected yet, but where the goal is to familiarise the child with the basic setup and, at the same time, to increase the complexity of the scenes gradually. The final version of our procedure, which also includes a demonstration phase (when the experimenter demonstrates a false belief-driven response), is shown below in Figure 2.

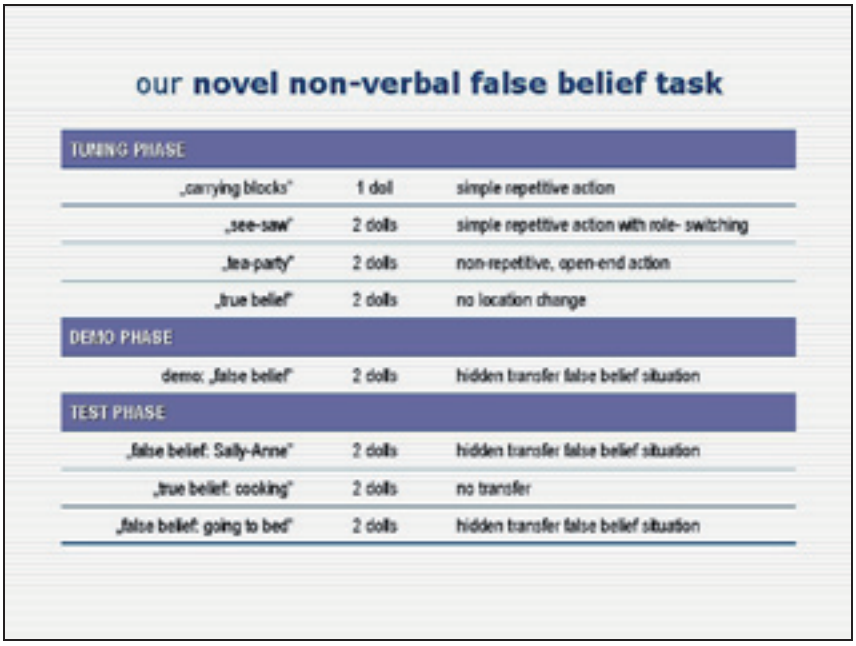

Fig. 2. Non-verbal false belief task

In order to reveal any specific relationship between langauge and ToM in autism, we applied this method in the context of a comparative correlational study.

Our subjects were 16 children with autism with an average verbal mental age of 97 months, 55 typically developing children with an average verbal mental age of 49 months, and 22 children with various developmental language disorders with an average non-verbal mental age of 68 months.

In the correlative study, four kinds of data were analysed for all groups: (1) data from standard, first-order, verbal false belief tasks; (2) data from our non-verbal false belief test; (3) data from a test of grammatical development (TROG-H – under Hungarian standardisation and adaptation, for the original TROG, see Bishop, 1983); (4) data from a test for lexical development (the Hungarian version of the Peabody Picture Vocabulary Test, Csányi, 1974)

In the autism group the adequate module of ADOS (Lord et al., 1999) was administered to each child to control the severity of symptoms.

Without going into detail in this paper, I will just shortly state that our non-verbal false belief test yielded the expected results in the neurotypical sample. Figure 3 below illustrates this by comparing findings from this method to those from standard verbal false belief tasks.

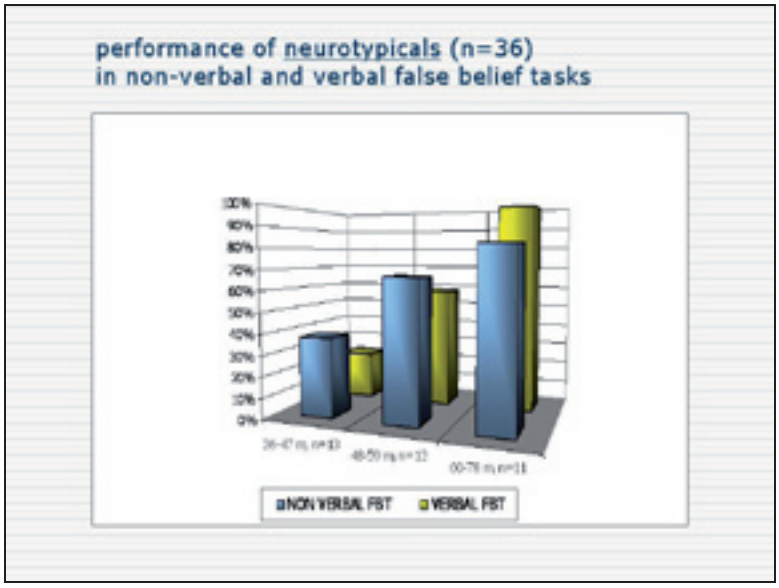

Fig. 3. The performance of verbal and non-verbal false belief tasks by neurotypicals (adapted from Györi et al., 2007)

The pattern of correlations was quite similar in the neurotypical and in the autism groups and fundamentally in line with previously published findings (see, e.g., Tager-Flusberg, 2000), also in the sense that the correlations between verbal false belief understanding and linguistic measures were even stronger in the autism group. The crucial finding for us here is that the severity of social-communicative symptoms in the autism group showed no correlation with verbal false belief task performance, while a significant negative correlation ($r = - 0.44$) was found between the severity of these symptoms and performance on our novel non-verbal false belief task! This, in other words, means that there is no relationship between social-communicative symptoms and the level of false belief understanding in verbal tasks, while the level of non-verbally measured false belief understanding indeed shows a relationship with social and communicative competence in everyday life. Yet in other words: the better the non-verbal ToM ability, the weaker the socio-communicative symptoms – while there's no such relationship between verbally measured ToM ability and these symptoms in our study.

These findings are in line with the assumption that language represents a compensatory route to apparent mental state understanding not only in the algorithmic way, as demonstrated in the studies reported first, but also in a developmental

sense. A possible explanation of our findings is that linguistic measurement of ToM activates this compensatory mechanism, which is not indeed efficient in everyday life, while non-verbal testing of ToM activates an ability to attribute mental states spontaneously, without explicit verbal cues. This more 'genuine' ToM ability, although still impaired, is more efficient in guiding social behaviour in everyday life.

The stability of existing ToM competence

Our last issue to touch upon in this paper is that of the stability of the performance patterns shown in ToM-related tasks by individuals with autism. Without going into detail, it is worth emphasising how little is known about the stability of cognitive performance in autism. This is especially true of relatively *short-term stability in specific cognitive tasks* – as, of course, several studies targeted long-term (developmental) stability of such general abilities as IQ. In our conviction the issue of (short-term) stability/instability may prove important both from a clinical and a theoretical-explanatory point of view – if clarified by empirical data.

Below I report the first case-study-like findings from an ongoing study of ours that is aimed at gaining more insight about short term stability/instability of complex but specific cognitive abilities in high functioning autism normally linked to the prefrontal cortex.

In this study we use a relatively simple but requiring methodology: we measure ToM ability, executive functions, working memory functions, and source memory functions repeatedly and by various tasks. Our main question is whether high functioning subjects with autism show more instability in these cognitive functions than matched controls and developmental controls.

Here I report preliminary findings only from the first 5 subjects with high functioning autism and only from a version of the paradigm introduced in the first part of this paper – the False Irony Test.

This novel version of the False Irony Test contains 2 practicing and 12 target stories (tasks) presented on a computer in a written form in a self-paced sentence-by-sentence way. From among the 12 target stories, 3 are false ironic, 3 are false literal, 3 are simple ironic, while 3 are simple literal. The stories are presented in a randomised order.

The simplified design of these repeated measurements is shown below in Figure 4.

A summary of the findings from 5 subjects (all with a diagnosis of autism, with a normal IQ, and in the age range of 15 to 25 years) can be seen below in Table 1. This table shows the success/failure patterns of these subjects in the 12 tasks of each of the three False Irony Test measurements. It also shows two indices calculated to characterise their level of performance and stability of this performance across the three measurements. The *performance index* is simply the ratio of passed tasks from among a total of 36. The *stability index* was calculated in the following way: if the performance in the given task was the same across the three measurements, a score of 1 was given; if just two measurements gave the same result, the score was 0.5; if all three measurements in the given task gave different results, the score for the task was 0. The sum of scores could possibly range from 0 (total lack of stability)

to 12 (total stability). The stability index was then calculated as the ratio of this sum to the total of 12 tasks. Its maximum value is 1 (total stability), the minimum is 0 (no stability at all).

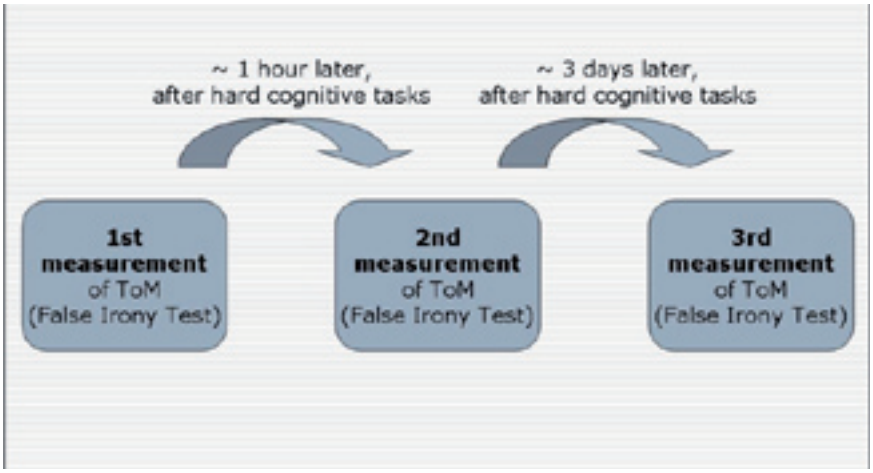

Fig. 4. The stability of ToM competences

		False Irony Tasks			False Literal Tasks			Simple Ironic Tasks			Simple Literal Tasks			performance index	stability index
subject	measurement	FI1	FI2	FI3	FL1	FL2	FL3	IR1	IR2	IR3	LI1	LI2	LI3		
nr 1 (male)	1	I	CF	CF	F	F	CF	F	P	P	I	P	P	0,47	0,708
	2	P	CF	CF	P	CF	CF	P	P	P	F	P	P		
	3	F	CF	CF	P	CF	CF	P	I	P	P	P	P		
nr 2 (female)	1	P	P	P	P	P	P	P	P	P	P	P	P	1	1
	2	P	P	P	P	P	P	P	P	P	P	P	P		
	3	P	P	P	P	P	P	P	P	P	P	P	P		
nr 3 (male)	1	P	P	P	P	P	P	P	P	P	P	P	P	0,92	0,91
	2	P	P	P	P	P	CF	P	I	P	P	P	P		
	3	P	P	P	P	P	CF	P	P	P	P	P	P		
nr 4 (male)	1	P	P	CF	CF	P	I	P	P	P	P	P	F	0,78	0,83
	2	P	P	P	CF	P	I	P	P	P	P	P	P		
	3	P	F	P	CF	P	P	P	P	P	P	P	P		
nr 5 (male)	1	CF	CF	CF	CF	I	I	I	I	I	I	P	P	0,22	0,96
	2	CF	CF	CF	CF	CF	I	I	I	I	I	P	P		
	3	CF	CF	CF	CF	CF	I	I	I	I	I	P	P		

Tab. 1. The performance of 5 subjects in three subsequent administrations of our False Irony Test. Abbreviations: P – passed; F – failed; CF – failure due to compensatory strategy; I – invalid response

The table 1 exemplifies interesting heterogeneity both in terms of ToM performance and ToM stability. In line with the results of the first studies summarised in this paper, we found subjects with quite high performance, that is, with quite complex ToM performance (subjects nr. 2 and 3), as well as a subject with quite low performance (subject nr 5). Very interestingly, however, we see remarkable stability of both high performance and erroneous performance: both subject 2 and subject 5 showed remarkable stability though they are at the two extremes in terms of ToM ability, as reflected in this study. Subject nr 1, however, whose performance is between these two extremes, showed a lower level of stability in his pattern of failure and success. An important next step in understanding these patterns as well as high functioning autism, as such, should be a clarification of what determines stability vs. instability, how stability/instability in ToM is related to stability/instability in other cognitive abilities, and, finally, how stability/instability is related to symptoms. We do trust that the continuation of this study may offer at least tentative answers to these questions.

Summary

Our findings – largely in line with some results in the literature – suggest that the issue of Theory of Mind ability and its impairment is a highly complex one. With the important reservation that some of our findings need further replication/confirmation, the following tentative general conclusions can be drawn:

- First of all, the population of high functioning autistics seems highly heterogeneous in terms of the level of complexity of their ToM abilities.
- Secondly, within this heterogeneity there exist individuals who have quite complex ToM abilities – even if this is manifested reliably in unnatural experimental settings. On the other hand, there also exist individuals who, at least for some tasks, use non-ToM-based compensatory strategies to solve tasks typically solved by mental state attribution.
- Thirdly, verbally mediated ToM ability seems non-efficient in controlling everyday social behaviours as it does not show a significant correlation with socio-communicative symptoms.
- Not verbally mediated ToM ability, on the other hand, seems to have such a causal significance.
- Finally, high functioning individuals with autism, as a group, seem to be heterogeneous also in terms of the stability of their ToM ability. While we find subjects with both quite high levels of ToM ability and subjects with quite low levels of ToM ability who show, at the same time, remarkable stability of the patterns of their success and failure, we see subjects whose performance is much less stable in repeated measurements. It is one of the interesting questions emerging here, how this neurocognitive instability – if further confirmed – contributes to the clinical picture of high functioning autism.

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Theory of Mind in autism: more variations and more complexity than once believed

Abstract

The present paper is an overview of our research from the last few years, which was aimed at getting a finer image of Theory of Mind impairment and its consequences in autism. Theory of Mind is a crucial human cognitive ability to understand and predict others' behaviour by attributing mental states to them. This ability is, as it is well-known, developmentally impaired in autism, but relatively little is known about the individual varieties and the precise nature of this impairment.

The studies summarised in this paper were aimed at three issues: (1) if those individuals who are able to solve Theory of Mind problems indeed have a Theory of Mind ability, (2) how existing Theory of Mind abilities are related to linguistic abilities and to social-communicative symptoms in autism, and (3) if the existing Theory of Mind competence in autism is stable over time or shows atypical fluctuation.

In order to solve these issues we applied various methodologies of cognitive psychology, including experimental, psycholinguistic and psychometric methods. Our findings show that Theory of Mind ability shows a striking variation in high functioning autism, from deep impairment to relatively complex understanding of minds, including compensatory strategies in some cases. Also, we found that language and Theory of Mind show a very specific relationship in autism, and existing Theory of Mind ability shows remarkable stability in some subjects, while others are more unstable in this sense.

In sum, these findings indicate that the impairment of Theory of Mind ability in autism is a far more complex issue than once believed, and calls for further intensive research.

Teoria umysłu w autyzmie: większe zróżnicowanie i większa złożoność niż wcześniej sądzono

Streszczenie

Niniejsza praca stanowi przegląd naszych kilkuletnich badań, których celem było uzyskanie dokładniejszego obrazu zaburzenia teorii umysłu oraz jego konsekwencji w autyzmie. Teoria umysłu stanowi zasadniczą zdolność poznawczą człowieka, która pozwala rozumieć i przewidywać zachowanie innych poprzez przypisywanie im stanów umysłu. Jak doskonale

wiadomo, zdolność ta jest rozwojowo zaburzona w autyzmie, jednakże stosunkowo niewiele wiadomo na temat poszczególnych odmian i dokładnego charakteru tego zaburzenia.
Celem badań opisanych w niniejszej pracy była analiza trzech zagadnień: (1) czy jednostki, które są w stanie rozwiązać problemy teorii umysłu, rzeczywiście posiadają zdolność w zakresie teorii umysłu, (2) w jaki sposób istniejąca zdolność w zakresie teorii umysłu związana jest z umiejętnościami językowymi oraz społeczno-komunikacyjnymi objawami w autyzmie, (3) czy istniejąca kompetencja w zakresie teorii umysłu w autyzmie jest trwała, czy przejawia nietypowe wahania.
W celu przeanalizowania tych zagadnień, zastosowaliśmy różnorodne metody psychologii poznawczej, łącznie z metodami eksperymentalnymi, psycholingwistycznymi oraz psychometrycznymi. Wyniki naszych badań pokazują, że zdolność w zakresie teorii umysłu wykazuje istotne różnice w autyzmie wysokofunkcjonującym, począwszy od poważnego zaburzenia do stosunkowo złożonego rozumienia stanów umysłu, włączając także strategie kompensacyjne w niektórych przypadkach. Ponadto, dowiedzieliśmy się, że w autyzmie pomiędzy językiem a teorią umysłu zachodzi specyficzna relacja, a teoria umysłu u niektórych osób przejawia niezwykłą stałość, podczas gdy u innych nie.
Podsumowując, niniejsze wyniki pokazują, że zaburzenie w zakresie teorii umysłu w autyzmie jest problemem o wiele bardziej złożonym niż wcześniej sądzono oraz wymaga dalszych intensywnych badań.

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