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ORIGINAL ARTICLE

A novel task assessing intention and emotion attribution: Italian standardization and normative data of the Story-based Empathy Task

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Abstract Theory of Mind (ToM), the process by which an individual imputes mental states to himself and others, is presently considered as a multidimensional cognitive domain, with two main facets (i.e., cognitive and affective ToM) accounting, respectively, for the ability to understand others' intention (intention attribution-IA) and emotions (emotion attribution-EA). Despite the large amount of literature investigating the behavioural and neural bases of mentalizing abilities in neurological conditions, there is still a lack of validated neuropsychological tools specifically designed to assess such skills. Here, we report the normative data of the Story-Based Empathy Task (SET), a non-verbal test developed for the assessment of intention and emotion attribution in the neurodegenerative conditions characterized by the impairment of social–emotional abilities. It is an easy-to-administer task including 18 stimuli, sub-grouped into two experimental conditions assessing, respectively, the ability to infer others' intentions (SET-IA) and emotions (SET-EA), compared to a control condition of causal inference (SET-CI). Normative data were collected in 136 Italian subjects pooled across subgroups homogenous for age (range 20–79 years), sex, and education (at least 5 years). The results show a detrimental effect of age and a beneficial effect of education on both the global score and each subscale, for which we provide correction grids. This new task could be a useful tool to investigate both affective and cognitive aspects of ToM in the course of disorders of socio-emotional behaviour, such as the fronto-temporal dementia spectrum.

Keywords Mentalizing · Empathy · Italian standardization · Affective ToM · Cognitive ToM · Social cognition

Introduction

Theory of mind (ToM) is defined as the process by which "an individual imputes mental states to himself and others" [1], and is currently recognized as a multidimensional process [2] requiring the integration of several components, such as the ability to attribute intention (cognitive ToM—IA) and emotion (affective ToM—EA) to others [3, 4]. Many studies focusing on the neural correlates of mental states attribution [3–10] suggested the existence of both specific [5, 7] and shared neural networks [3, 6] for affective and cognitive mental state attribution. In agreement with these findings, studies in clinical population have shown both selective and generalized impairments of ToM abilities [3, 5, 7, 8]. An increased vulnerability of EA skills have been shown, for example, in amyotrophic lateral sclerosis (ALS) [10], reflecting a selective involvement of

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the inferior frontal gyrus and anterior cingulate cortex. In contrast, other conditions, such as Parkinson's disease [9] major depression [11], schizophrenia [12, 13] and the behavioural variant of fronto-temporal dementia (bvFTD) [14] showed impairments in both aspects of this cognitive ability. The two sub-components have, however, in general been investigated using different tasks, making a direct comparison of results difficult. In addition, many of the tasks, because of length or complexity, are difficult to apply in clinical settings. Cognitive ToM is conventionally measured through verbal or non-verbal first- and second-order false belief tasks, in which an individual must infer a person's beliefs about the reality (i.e., first-order) or about another individual's thoughts (i.e., second-order) [15]. On the other side, the affective facet of ToM ability has been classically investigated with tasks requiring subjects to mentalize about others' feelings. A prototypical example is the Reading the Mind in the Eyes (RME) task, based on the definition of a mental state according to the eye gaze [16].

Despite the large number of experimental paradigms evaluating IA or EA abilities, only a few of them have been developed to assess both affective and cognitive facets of ToM in the same task. Among these, the Yoni task [7] and the Social Faux Pas Recognition Task [17] represent the most popular ones. However, both are presented verbally, limiting the use in pathological populations with possible language deficits, such as neurodegenerative dementias or schizophrenia [18, 19]. A single, easy-to-administer, non-verbal task assessing both cognitive and affective ToM facets (i.e., IA and EA) is still lacking. Moreover, normative data for the Italian population are available only for one of the above-mentioned test (i.e., RME task) [20], and the existing social cognition battery [21] uses different tasks to assess affective and cognitive ToM.

Thus, based on previous studies [13, 22, 23], we constructed a novel cartoon task of intention and emotion attribution (i.e., the Story-based Empathy Task—SET) and tested it on different populations of neurological patients with known disorders of social cognitions [10, 14], as well as temporal lobe epilepsy [24]. Here, we report the normative data and the correction grid for an Italian population.

Materials and methods

Participants

A sample of 136 healthy Italian adults were recruited (67 women: mean age = 49.67 ± 18.09 years; mean education = 13.67 ± 4.017 years; mean Mini Mental State Examination (MMSE) raw score = 29.39 ± 0.71; 69 men: mean age = 48.57 ± 17.65 years; mean education = 13.20 ± 3.93 years; MMSE raw score = 29.14 ± 0.81) (Table 1). Exclusion criteria included a history of neuropsychiatric disorders, presence of signs on the neurologic examination, a Clinical Dementia Rating scale (CDR) global score >0, and an MMSE raw score ≤28 if education was ≥8 years, and ≤27 if education was ≤8 years.

Story-based Empathy Task construction

The SET is a non-verbal task developed by our group and based on original cartoons. It lasts 15/20 min and consists of two main experimental conditions, i.e., identifying intentions (SET-IA) and emotional states (SET-EA), plus a control condition entailing the inference of causality reaction based on the knowledge of the physical properties of objects and human bodies (SET-CI) (see Fig. 1). Each condition includes six trials requiring to select the correct ending of a comic strip. An upper (story) and a lower row of three vignettes (possible endings) compose each comic strip. The possible endings are presented only later. A score of 1 is assigned only in case of selection of the correct ending, and the global score is computed based on the number of correct answers given by the subjects for each cartoon. A global score (GS) of 18 indicates the best possible task performance. Each condition has a maximum score of 6 points. To ensure subjects' intact comprehension of the instructions, subjects were required to describe the story and to formulate a possible story ending, by presenting them only the upper vignettes without the possible endings.

A "trial" run preceded the task, consisting of an example of causal attribution that would not appear in the

Table 1 Demographic data of the 136 healthy controls

Education in years	Age in years							
	20–29	30–39	40–49	50–59	60–69	70–79	Total (F/M)	Total
3–8	NA	NA	2/2	3/3	5/5	3/3	13/13	26
9–13	1/7	2/2	3/2	7/7	5/5	3/3	21/26	47
>13	14/8	4/6	2/3	5/5	5/5	3/3	33/30	63
Total (F/M)	15/15	6/8	7/7	15/15	15/15	9/9	67/69	136
Total	30	14	14	30	30	18	136	–

In each cell, the number of female/male participants is reported

F female, *M* male, *NA* not available

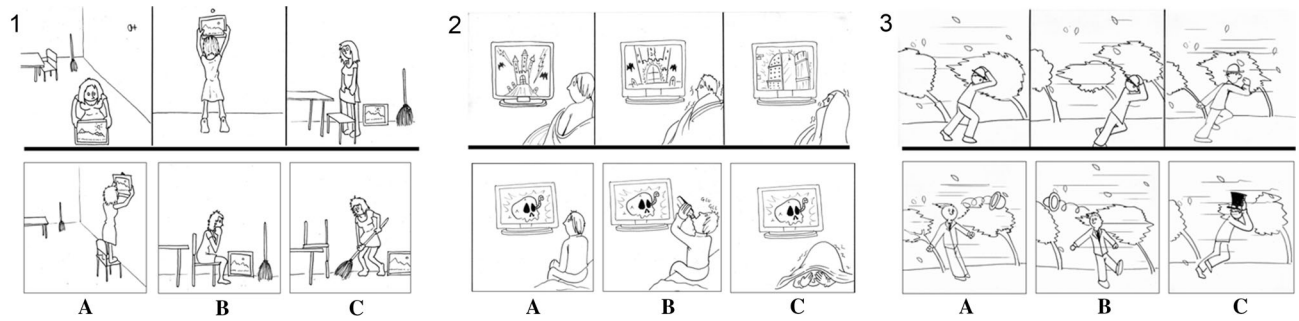

Fig. 1 Vignettes from the Story-based Empathy Task. **1** Intention attribution (SET-IA), **2** Emotion attribution (SET-EA) based on fear, **3** causal inference (control condition—SET-CI). *A*, *B* and *C* represent the possible endings of the story among which subjects must choose the correct one

Table 2 Raw descriptive values of the Story-based Empathy Task global score (GS) and single conditions sub-scores in 136 healthy subjects

	Mean	Standard deviation	Median	Minimum	Maximum	95 % confidence interval
SET-GS	15.73	2.30	16	7	18	15.34–16.12
SET-EA	5.22	1.02	6	1	6	5.05–5.39
SET-IA	5.36	0.94	6	1	6	5.20–5.52
SET-CI	5.14	1.03	5	1	6	4.97–5.32

EA emotion attribution, *IA* intention attribution, *CI* causal inference

testing phase. Within the whole sample of 136 subjects, 85 % answered correctly to the trial run, while the other 15 % interpreted correctly the story and the possible endings, even when selecting a wrong one.

The Story-based Empathy task material can be obtained directly from the first author.

Statistical analyses

Based on the performance of 136 subjects, we computed descriptive statistics for SET global (SET-GS) and sub-tasks scores, i.e., SET-IA, SET-EA and SET-CI (see Table 2). Seven different linear regression analyses were performed for each performance score, to establish which demographic variables had to be included in the final model, as the most effective in reducing the residual variance. Adjusted values were calculated by adding (or subtracting) the contribution of each variable for each subject [25]. We derived correction grid to adjust the performance of each newly tested individual for the effect of the demographic variables. Finally, we classified the adjusted SET-GS into five categories, i.e., equivalent scores (ES) ranging from 0 to 4 [25]. The "0" corresponds to scores located below the outer unidirectional non-parametric tolerance limit, with a confidence of the 95 % (the third observation for 136 subjects [26]). The "4" score corresponds to the median and above median values; "1", "2", and "3" are intermediate values on a quasi-interval scale calculated with reference to the left half of the distribution [25]. Statistical analyses were performed with STATISTICA 8 software (http://www.statsoft.com).

Results

Descriptive SET raw scores are reported in Table 2. The final model of multiple regression showed age (converted into a logarithm of 100-age) and square root of education in years as the best predictors of both the SET-GS performance [$F(2133) = 28.25$, $p < 0.001$, $f^2 = 0.43$] and single sub-task scores [SET-IA = $F(2133) = 8.29$, $p < 0.001$, $f^2 = 0.12$; SET-EA = $F(2133) = 14.29$, $p < 0.001$, $f^2 = 0.22$; SET-CI = $F(2133) = 22.87$ $p < 0.001$, $f^2 = 0.34$], with higher scores for younger and more educated subjects. The correction grids and normative data for each SET sub-task are reported in Tables 3 and 4.

Discussion

In this study, we provide the Italian normative data of the Story-Based Empathy Task (i.e., SET), a novel test for the assessment of intention and emotion attribution. In addition, the task comprises a control condition of physical causality, allowing the evaluation of mentalizing deficits and controlling for the impairment in basic cognitive functions.

The standardization in the Italian population identified age and years of education as predictive variables of all

Table 3 Age and education adjustment grid for the Story-based Empathy Task global score and sub-conditions

Education	Age												
	20	25	30	35	40	45	50	55	60	65	70	75	80
SET-GS													
5	0.29	0.31	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.43	0.46	0.49	0.52
8	0.14	0.15	0.16	0.17	0.18	0.20	0.21	0.23	0.25	0.27	0.29	0.32	0.36
13	−0.08	−0.07	−0.06	−0.05	−0.03	−0.02	0	0.01	0.03	0.05	0.08	0.11	0.14
17	−0.22	−0.21	−0.20	−0.19	−0.18	−0.16	−0.15	−0.13	−0.11	−0.09	−0.06	−0.04	0
SET-IA													
5	0.22	0.23	0.23	0.24	0.25	0.26	0.26	0.27	0.28	0.30	0.31	0.33	0.35
8	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.21	0.23
13	−0.04	−0.04	−0.03	−0.02	−0.01	0	0	0.01	0.02	0.03	0.05	0.06	0.08
17	−0.14	−0.14	−0.13	−0.12	−0.12	−0.11	−0.10	−0.09	−0.08	−0.07	−0.06	−0.04	−0.02
SET-EA													
5	0.17	0.18	0.19	0.20	0.21	0.22	0.24	0.25	0.27	0.29	0.31	0.33	0.36
8	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.15	0.16	0.18	0.20	0.23	0.26
13	−0.07	−0.06	−0.05	−0.04	−0.03	−0.02	0	0.01	0.03	0.05	0.07	0.09	0.12
17	−0.16	−0.15	−0.14	−0.13	−0.12	−0.10	−0.09	−0.08	−0.06	−0.05	−0.02	0	0.03
SET-CI													
5	0.30	0.31	0.32	0.33	0.34	0.35	0.37	0.38	0.40	0.42	0.44	0.47	0.50
8	0.14	0.15	0.16	0.17	0.18	0.19	0.21	0.22	0.24	0.26	0.28	0.31	0.34
13	−0.07	−0.06	−0.05	−0.04	−0.03	−0.02	0	0.01	0.03	0.05	0.07	0.1	0.13
17	−0.21	−0.20	−0.19	−0.18	−0.17	−0.16	−0.14	−0.13	−0.11	−0.1	−0.07	−0.04	−0.01

Corrected SET-GS = raw score − 0.371 × (log(100 − age) − 1.679) − 0.277 × ($\sqrt{}$education − 3.619);

Corrected SET-IA = raw score − 0.203 × (log(100 − age) − 1.679) − 0.194 × ($\sqrt{}$education − 3.619);

Corrected SET-EA = raw score − 0.317 × (log(100 − age) − 1.679) − 0.176 × ($\sqrt{}$education − 3.619);

Corrected SET-CI = raw score − 0.332 × (log(100 − age) − 1.679) − 0.27*($\sqrt{}$education − 3.619)

SET Story-based Empathy Task, *SET-GS* SET global score, *SET-IA* SET intention attribution score, *SET-EA* SET emotion attribution score, *SET-CI* SET causal inference score

SET scores, with a better performance for younger and more educated subjects. This result is consistent with previous studies showing that cognitive ageing is accompanied by a decline in mentalizing abilities [27], which in turn are related to educational level [28]. In contrast, gender has no effect on SET performance, a result in agreement with previous reports of a female advantage in empathic abilities limited to emotional empathy [29].

While behavioural and personality modifications accompanied by social behaviour alterations are frequently reported symptoms in neurological patients, standard clinical assessment cannot quantify them. Thus, the use of easy-to-administer and validated neuropsychological tools focused on different facets of social cognition has a large potential value to identify specific impairments in this domain. To date, only a few tasks of social cognition have been standardized and validated for the Italian population [20, 21, 30, 31]. These tests are focused on specific social cognition facets, such as emotion recognition [30], affective ToM [20] or moral reasoning [31]. Only one is an extensive social cognition battery [21], assessing ToM and the ability to detect moral and behavioural violations. To the best of our knowledge, the majority of these studies [20, 21, 31] do not report equivalent scores [25], allowing comparison among different tasks, and some may be difficult to apply in clinical settings because of length or complexity [21, 31]. The SET is a shorter and easier to administer task (administration time: 20 min), assessing both affective and cognitive facets of ToM with non-verbal stimuli, and may be a useful tool to add to the existing neuropsychological instruments [21].

Additionally, the SET may help in quantifying the subtle deficits of social cognition that characterize the early stages of many pathological conditions, such as the fronto-temporal dementia spectrum, thus representing a useful aid for the early diagnosis and possibly also for the assessment of disease progression. Our recent findings of emotion attribution deficits, mainly related to grey matter reduction in fronto-temporal and limbic regions in the early stages of bvFTD [14] and in ALS [10] confirm this hypothesis. The

Table 4 Equivalent scores (ES), intervals for Story-based Empathy Task global score and single sub-conditions

Equivalent Score	SET-GS	SET-IA	SET-EA	SET-CI
0	0–8.29	0–2.34	0–2.20	0–2.41
1	8.30–10.93	2.35–3.56	2.21–3.43	2.42–3.35
2	10.94–13.57	3.57–4.78	3.44–4.66	3.36–4.28
3	13.58–16.20	4.79–5.99	4.67–5.88	4.29–5.22
4	16.21–18	6	5.89–6	5.22–6

SET Story-based Empathy Task, *SET-GS* SET global score, *SET-IA* SET intention attribution score, *SET-EA* SET emotion attribution score, *SET-CI* SET causal inference score

availability of standardized socio-emotional tasks, such as the SET, may prove useful to assess ToM deficits in clinical populations in which social cognition is still poorly explored (e.g., Parkinson and Huntington disease, for a review see [32]), or in conditions characterized by a focal involvement of fronto-temporal regions, as brain tumours [33] or traumatic brain injury [34].

Several studies [32, 35] underlined the importance of introducing ToM tasks in the standard neuropsychological assessment, as social deficits can be present in the absence of other cognitive impairments. It is thus advisable that the standard neuropsychological battery routinely includes an accurate investigation of the social cognition domain.

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Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

1. Premack D, Woodruff G (1978) Does the chimpanzee have a theory of mind? Behav Brain Sci 1:515–526
2. Frith CD, Frith U (2006) The neural basis of mentalizing. Neuron 50(4):531–534
3. Poletti M, Enrici I, Adenzato M (2012) Cognitive and affective theory of mind in neurodegenerative diseases: neuropsychological, neuroanatomical and neurochemical levels. Neurosci Biobehav Rev 36(9):2147–2164
4. Shamay-Tsoory SG, Harari H, Aharon-Peretz J, Levkovitz Y (2010) The role of the orbitofrontal cortex in affective theory of mind deficits in criminal offenders with psychopathic tendencies. Cortex 46(5):668–677
5. Shamay-Tsoory SG, Aharon-Peretz J, Perry D (2009) Two systems for empathy: a double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. Brain 132(Pt 3):617–627
6. Sebastian CL, Fontaine NM, Bird G, Blakemore SJ, Brito SA, McCrory EJ, Viding E (2012) Neural processing associated with cognitive and affective theory of mind in adolescents and adults. Soc Cogn Affect Neurosci 7(1):53–63
7. Shamay-Tsoory SG, Aharon-Peretz J (2007) Dissociable prefrontal networks for cognitive and affective theory of mind: a lesion study. Neuropsychologia 45(13):3054–3067
8. Brune M (2005) "Theory of mind" in schizophrenia: a review of the literature. Schizophr Bull 31(1):21–42
9. Bodden ME, Mollenhauer B, Trenkwalder C, Cabanel N, Eggert KM, Unger MM, Oertel WH, Kessler J, Dodel R, Kalbe E (2010) Affective and cognitive theory of mind in patients with Parkinson's disease. Parkinsonism Relat Disord 16(7):466–470
10. Cerami C, Dodich A, Canessa N, Crespi C, Iannaccone S, Corbo M, Lunetta C, Consonni M, Scola E, Falini A, Cappa SF (2014) Emotional empathy in amyotrophic lateral sclerosis: a behavioural and voxel-based morphometry study. Amyotroph Lateral Scler Frontotemporal Degener 15(1–2):21–29
11. Wang YG, Wang YQ, Chen SL, Zhu CY, Wang K (2008) Theory of mind disability in major depression with or without psychotic symptoms: a componential view. Psychiatry Res 161(2):153–161
12. Bora E, Yucel M, Pantelis C (2009) Theory of mind impairment: a distinct trait-marker for schizophrenia spectrum disorders and bipolar disorder? Acta Psychiatr Scand 120(4):253–264
13. Sarfati Y, Hardy-Bayle MC, Besche C, Widlocher D (1997) Attribution of intentions to others in people with schizophrenia: a non-verbal exploration with comic strips. Schizophr Res 25(3):199–209
14. Cerami C, Dodich A, Canessa N, Crespi C, Marcone A, Cortese F, Chierchia G, Scola E, Falini A, Cappa SF (2014) Neural correlates of empathic impairment in the behavioral variant of frontotemporal dementia. Alzheimers Dement 10(6):827–834
15. Baron-Cohen S (1989) The autistic child's theory of mind: a case of specific developmental delay. J Child Psychol Psychiatry 30(2):285–297
16. Baron-Cohen S, Wheelwright S, Hill J, Raste Y, Plumb I (2001) The "reading the mind in the eyes" test revised version: a study with normal adults, and adults with Asperger syndrome or high-functioning autism. J Child Psychol Psychiatry 42(2):241–251
17. Baron-Cohen S, O'Riordan M, Stone V, Jones R, Plaisted K (1999) Recognition of faux pas by normally developing children and children with Asperger syndrome or high-functioning autism. J Autism Dev Disord 29(5):407–418
18. Blair M, Marczinski CA, Davis-Faroque N, Kertesz A (2007) A longitudinal study of language decline in Alzheimer's disease and frontotemporal dementia. J Int Neuropsychol Soc 13(2):237–245
19. Li X, Branch CA, DeLisi LE (2009) Language pathway abnormalities in schizophrenia: a review of fMRI and other imaging studies. Curr Opin Psychiatry 22(2):131–139
20. Serafin M, Surian L (2004) Il Test degli Occhi: uno strumento per valutare la" teoria della mente". Giornale italiano di psicologia 31(4):839–862
21. Prior M, Sartori G, Marchi S (2003) Cognizione sociale e comportamento: uno strumento per la misurazione. Domenghini Editore, Padova
22. Brunet E, Sarfati Y, Hardy-Bayle MC, Decety J (2000) A PET investigation of the attribution of intentions with a nonverbal task. Neuroimage 11(2):157–166

23. Vollm BA, Taylor AN, Richardson P, Corcoran R, Stirling J, McKie S, Deakin JF, Elliott R (2006) Neuronal correlates of theory of mind and empathy: a functional magnetic resonance imaging study in a nonverbal task. Neuroimage 29(1):90–98
24. Realmuto S, Zummo L, Cerami C, Agrò L, Dodich A, Canessa N, Zizzo A, Fierro B, Daniele O (2015) Social cognition dysfunctions in epileptic patients: evidence from temporal lobe and idiopathic generalized epilepsy patients. Epilepsy Behav **(In press)**
25. Capitani E, Laiacona M (1997) Composite neuropsychological batteries and demographic correction: standardization based on equivalent scores, with a review of published data. The Italian Group for the Neuropsychological Study of Ageing. J Clin Exp Neuropsychol 19(6):795–809
26. Wilks S (1941) Determination of sample sizes for setting tolerance limits. Ann Math Stat 12(1):91–96
27. Bernstein DM, Thornton WL, Sommerville JA (2011) Theory of mind through the ages: older and middle-aged adults exhibit more errors than do younger adults on a continuous false belief task. Exp Aging Res 37(5):481–502
28. Li X, Wang K, Wang F, Tao Q, Xie Y, Cheng Q (2013) Aging of theory of mind: the influence of educational level and cognitive processing. Int J Psychol 48(4):715–727
29. Thakkar KN, Brugger P, Park S (2009) Exploring empathic space: correlates of perspective transformation ability and biases in spatial attention. PLoS One 4(6):e5864
30. Dodich A, Cerami C, Canessa N, Crespi C, Marcone A, Arpone M, Realmuto S, Cappa SF (2014) Emotion recognition from facial expressions: a normative study of the Ekman 60-Faces Test in the Italian population. Neurol Sci 35(7):1015–1021
31. Manfrinati A, Sarlo M, Lotto L (2013) Un nuovo set di 60 dilemmi morali: dati normativi italiani per giudizi di accettabilità morale, tempi di decisione e valutazioni emozionali. Giornale italiano di psicologia 40(1):211–230
32. Adenzato M, Poletti M (2013) Theory of mind abilities in neurodegenerative diseases: an update and a call to introduce mentalizing tasks in standard neuropsychological assessments Clinical. Neuropsychiatry 10:226–234
33. Campanella F, Shallice T, Ius T, Fabbro F, Skrap M (2014) Impact of brain tumour location on emotion and personality: a voxel-based lesion-symptom mapping study on mentalization processes. Brain 137(Pt 9):2532–2545
34. McDonald S, Flanagan S (2004) Social perception deficits after traumatic brain injury: interaction between emotion recognition, mentalizing ability, and social communication. Neuropsychology 18(3):572–579
35. Pardini M, Emberti Gialloreti L, Mascolo M, Benassi F, Abate L, Guida S, Viani E, Dal Monte O, Schintu S, Krueger F, Cocito L (2013) Isolated theory of mind deficits and risk for frontotemporal dementia: a longitudinal pilot study. J Neurol Neurosurg Psychiatry 84(7):818–821