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# The Autism Psychodynamic Evaluation of Changes (APEC) scale: a reliability and validity study on a newly developed standardized psychodynamic assessment for youth with Pervasive Developmental Disorders

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**Abstract**

The present study was designed to examine the reliability and validity of the Autism Psychodynamic Evaluation of Changes (APEC) scale, developed to assess the evolution in individuals with autism under treatment. The APEC scale focuses on the key role of impairment in body image construction, which requires cross-modal sensory integration through emotional communication with motor representations. Thus, the body image construction is associated simultaneously with spatial and temporal organization and allows the emergence of self- and others-representations. The use of the APEC scale, with its seven domains (expression of emotion in relationships, eye contact, body image, graphic productions, exploration of space and objects, time perception, and verbal language ), underlines the importance in autistic disorder of anxieties related to body and spatial representations, and of impairment in the body ego construction which is closely linked to the emergence of individuation/separation processes. This study was conducted on 73 children and adolescents with autistic disorder. They were recruited in day care facilities where two caregivers independently gave their ratings based on their clinical observation on a daily basis during the same month. Analyses included assessing construct validity through correspondence analyses and inter-rater reliability using kappa coefficients. The APEC scale offers a reliable and validated psychodynamic assessment of interest for professionals (such as child psychiatrists, caregivers, therapists or teachers) and researchers working with children, adolescents and adults with autistic disorder, especially in the follow-up of their evolution. The APEC scale provides an approach at the interface of psychoanalysis and neuroscience, and is also of interest for clinical and developmental psychology. Using the APEC scale in a range of different practical and research settings will foster links between psychoanalytic perspectives and educational training for children with autistic disorder, and will contribute to the dialogue between psychoanalysis, neuroscience and psychology.

**Keywords:** APEC scale (Autism Psychodynamic Evaluation of Changes), Reliability, Validity, Psychodynamic, Assessment, Autistic disorder

## 1. Introduction

Definitions of diagnostic categories of mental disorders, such as autistic disorder, evolve over time due to conceptual shifts and technological progress. In addition, diagnostic categories used to establish benchmark criteria may have limited utility or insufficient empirical support (Fisch, 2005). The problems created by benchmark criteria could be avoided by adopting a multidimensional approach (Robins and Helzer, 1986). As underlined by Fisch (2005), some studies using factor or cluster analyses suggest that three dimensions (cognitive abilities, social function and restrictive interest or activities) are necessary in the assessment and conceptualization of autism (Dihoff et al., 1993; Szatmari et al., 2002). Based on a factorial analysis of the Autism Diagnostic Interview-Revised (ADI-R), Georgiades and collaborators (2007) proposed that autistic phenomenology be composed of three domains: social-communication impairments, inflexible language and behavior, and repetitive sensory and motor behavior. In our view, socio-communication and stereotyped behaviors as well as graphic and expressive verbal language delays are strongly interconnected with delays in the formation of the body image and organization of space and time perception. This interconnection between body and cognition is supported by the emergence of cognitive impairments in autism associated with early motor defects (Sutera at al., 2007). Early self-representations are deeply embodied. In the infant, the formation of inner representations of the body, and the emergence of representations of the outside environment emerge from the sensory background and progress towards more cohesiveness in parallel with sensorimotor integration. These representations emerge in particular from cross-modal sensory integration involving different sensory channels (visual, auditive, tactile, etc.) that reinforces the congruence of sensory information with an important role of propioception (Berthoz, 2003). This process suffers from severe impairment in autism and case reports in children with autistic disorder from psychoanalytic sessions consistently reported either the non-integration of body perceptions or the instability of the body image occurring in reaction to a relational context (Haag et al., 2005a, 1991a, 1991b). Many clinicians view Pervasive Developmental Disorders (PDD) as a condition associated with Sensory Integration Dysfunction (SID), as described by Ayres (1980). Sensory integration is the hierarchical organisation of the somatic sensations which serve as the foundation of the individual's perceptions, cognitions and behaviors. According to Ayres, auditory, vestibular, proprioceptive, tactile and visual senses are progressively integrated as a *body percept* in which are rooted different functions such as the coordination of the two sides of the body, motor planning, activity level, attention span and emotional stability. Considering the sensory processing

impairments observed in PDD, the SID as described by Ayres is presently viewed as a core deficit on which treatment interventions should be focused. Her approach geared to specific sensory integration deficits does not take into account the central role of mother-infant emotional communication. We consider that mother-infant emotional communication or emotional interchanges between patient and therapist help build better integration among sensory inputs by facilitating cross-modal sensory integration.

As an intrapsychic counterpart of the sensory motor disintegration described by Ayres, dismantling was introduced by Donald Meltzer (1975) to characterize the mechanism by which perceptions are passively left aside without integration into a psychic representation while dismantled sensations do not access memorizing processes (1975). Dismantling prevents the formation of proper and stable body representations. Being bodily rooted, the primitive representional activity as well as the mental apparatus are spatial in nature. As a second major theoretical contribution, he described the spatial characteristics of mental functioning, including its corresponding temporal dimensions. Meltzer took into account Bick's major work on skin-formation and adhesive identity. Thus, in a back and forth movement between baby observation in the home environment and clinical work with severely disturbed infants, Esther Bick (1968, 1986) described how the original containing function that she called "skin" is introjected. Failure to accomplish this means that only a surface identity, which she called "adhesive identity" (i.e., sticking surface to surface in a two-dimension adhesive identity), is possible; children with autism seem to be massively fixated at a stage where this adhesive identity is pathological. Following Bick's work on two-dimension adhesive identity (1986) which is related to a two-dimensional world representation and circular time (the "back to the same" typical of some autistic rituals), Meltzer expanded these thoughts and described a prior one-dimensional stage where time is closed in on itself (closure-time). He established the correlation between the three-dimensional stage described by Esther Bick (1968, 1986) as the realization of the skin-formation, including the capacity of separation/individuation and the implementation of projective identification with an oscillatory perception of time. The notion that time is linear and non-reversible is acquired with the development of capacity for individualization. Finally, Meltzer's (1988) third major contribution relates to the importance of eye contact and of the fundamental double interpenetration of mouth/nipple and eye-to-eye during feeding.

In her monograph on John, her exemplary case study, Frances Tustin (1981, 1986), stressed that in patients with PDD it is essential «to avoid absolutely any awareness of bodily separateness». Emergence of such awareness gives rise to an unbearable feeling that parts of the body, especially the mouth and the body extremities (hands and feet), are being lost. She introduced the notion of vertical splitting which she localized on the face. Vertical splitting was later expanded to the whole body by Geneviève Haag (1985). In addition, Tustin emphasised 'sensory splitting'—hard/soft, dry/wet, heavy/light, hot/cold—of which children with

autism make considerable use. It is as though they cling alternately to the extremity of each sensory graduation without being able to pass through the whole range of available modalities. Tustin gives a description of the 'temper tantrums' that are to be expected whenever an autistic ritual or stereotyped movement is interrupted. Such tantrums also occur as the child's condition improves—in other words, when, in a somewhat more integrated state, the child becomes more aware of body separation, and consequently is more easily frustrated. Besides externalized symptoms, other psychoanalytic reports described primitive anxieties as anxieties of falling or being liquefied, first introduced by Winnicott (1958) and then applied to PDD by Tustin (1981, 1986). These anxieties can be observed in children with autism through the expression of fear of slopes (anxieties of falling) and terrors of water draining from the sink or toilet flushing (anxieties of being liquefied). These anxieties can be also reflected by the need to control them through hypertonicity of the body and stereotyped behaviors such as running water on the body incessantly or dropping the same object and picking it up repeatedly. In addition, Didier Houzel (1985, 2002) described spatial anxieties related to stereotyped spinning movements in children with autism.

This psychodynamic work is presently echoed by current research in developmental psychology and cognitive neuroscience. Studies in developmental psychology, such as Bullinger's works (2004), have stressed the pivotal role that postural control plays in the development of the child's communication capacities. For example, acquiring the appropriate balance between front and rear is the common pathway that leads the infant to gain expressive language. Empirically-based studies have confirmed that postural control is delayed in PDD (Molloy et al., 2003; Minshew et al., 2004). Moreover impairments increase when several sensory inputs are recruited confirming the lack of sensorimotor integration as a core feature in autism (Minshew et al., 2004).

Virtual-reality studies on cognitive and motor responses in conflict situations between kinesthetic, vestibular, and visual information conducted by Berthoz and collaborators (Dumontheil et al., 2006) shed light on different perceptive styles in normal development. In their studies on motion they showed that the need for contextual feedback and the dependence on proprioceptive versus visual information differ between individuals, and consequently the role of gaze control in social interaction varies among individuals. According to several authors (Berthoz, 2009; Decety and Lamm, 2006), social cognition proceeds with spatial representation. Thus, pointing depends on prior spatial recognition and empathy begins with motor and face mirroring (Leslie et al, 2006). Self-awareness and agency (the capacity to disentangle self-generated actions and actions observed from others) imply activation of cortical associative pathways involved in decoding both sensory and spatial information (temporoparietal junction) (Decety and Lamm, 2006). In sum, burgeoning forms of empathy depend on spatial information. Furthermore, Berthoz (2009) underlines the importance of

geometric forms in spatial representations. This is in line with psychoanalytic observations on the importance of geometric forms (spherical forms, axes, etc.) in the first stages of construction of body image (Haag, 1997a, 1997b, 2006).

The lack of empathy and symbolic play has been rooted in a supposedly core deficit in autism described as a lack of a 'theory of mind' (Frith, 1989) which is a cognitive theory based on the incapacity to ascribe independent thoughts to others. From a psychodynamic standpoint, this deficit seems to be related to identification disturbances. Once again, the way space is perceived is at the core of primitive, both adhesive and projective, identification impairments. The child's inability to rely on efficient projective identifications prevents him or her from identifying with another person's emotions and viewpoints. Such elaborate identifications cannot be achieved unless communication within three-dimensional space has begun. When a child fails to achieve intersubjectivity, he often fails to develop joint attention, a prerequisite for communication which allows a child to share with another person the experience of a third object or event (Bruner, 1983). From psychoanalytic experience with children with autism, joint attention seems related to some primitive forms of projective identification. Therapeutic material from some children illustrate how the development of joint attention depends on introjecting the containing function as introduced by Bick's work (1968). During sessions, children with autism might display in a theatrical manner the fantasy of being in the same envelope together with someone else and looking out at the world (Haag, 2006). Thus clinical material gathered with some children shed light on the process by which the containing function is internalized.

Taken together, neuroscience studies (cognitive neuroscience, but also neurophysiology and neurochemistry) and psychoanalytic experience with children with autism emphasize the parallel development of sensory integration, communication and psychic apparatus. This multilayer phenomenon relies on the early reciprocal interchanges between parents and infants in which emotional communication plays a key role. Its outcome depends on the quality of processes by which environment and relationships' spatial characteristics are internalized and serve as basis for both social cognition and psychic development.

Those theoretical conceptions alongside with clinical observations gathered over several decades of psychodynamic therapy with patients with autism have been integrated in a newly developed standardized psychodynamic assessment for youth with PDD whose development has been previously reported (Haag et al., 2005a). The Autism Psychodynamic Evaluation of Changes (APEC) scale is a clinician-rated scale which regroups the autistic phenomenology in seven domains: expression of emotion in relationships, eye contact, body image, graphic productions, exploration of space and objects, time perception and verbal language.

Many scales are available for assessing behaviors in PDD, especially in autistic disorder (Tordjman et al, 2002). To our best knowledge none of them have been developed from a psychodynamic perspective. In

keeping with conceptions introduced by the Bristish psychoanalytical school as well as several decades of psychoanalytic work with individuals with autism, current psychodynamic conceptions in autism offer an understanding of the inner subjective experience of the sensory integration dysfunctions. There is a need for reliable instruments to tackle this subjective experience and bring more insights on how it leads to specific and primitive spatial and body anxieties.

The present study was designed to assess the reliability and validity of the APEC scale. This original instrument was developed by Geneviève Haag and collaborators in order to assess, during a follow-up, the changes occurring in children with autism under treatment. Analyses included assessing construct validity through correspondence analyses and assessing inter-rater reliability using kappa coefficients. This study was a part of a larger research project (INSERM CRE 931009, Director: Sylvie Tordjman) that had as its overall objective the examination of evolutive associations between behavioral and biological profiles in children with autism.

## 2. Methods

### *2.1 Participants*

The study was carried out on 73 children and adolescent outpatients with autistic disorder recruited from French day care facilities. Based on direct clinical observation by two independent child psychiatrists, a diagnosis of autistic disorder was made according to DSM-IV-TR (American Psychiatric Assiciation, 2000), ICD-10 and CFTMEA (Misès and Quemada, 1993) criteria, and was confirmed by the Autism Diagnostic Interview-Revised (ADI-R). All patients were Caucasian, had no history of encephalopathy or neuro-endocrinological disease, and were determined to be physically healthy based on the examination by a pediatrician. The Tanner stage of puberty was also assessed by the pediatrician (Tanner, 1962). Demographic characteristics of the study group are provided in Table 1. A large number of children with autism were unmedicated (n=47). Of the 26 medicated patients with autism, 14 patients had a history of idiopathic epilepsy and were being treated with anticonvulsants, and 15 patients were receiving neuroleptics. The research protocol was approved by the ethics committee of Bicêtre Hospital and written informed consent was obtained from parents.

### *2.2. Cognitive and behavioral assessments*

Cognitive functioning of individuals with autistic disorder was assessed using the age-appropriate Wechsler intelligence scales (WPPSI-R, WISC-R, WAIS-R) and the Kaufman K-ABC. All patients were cognitively impaired: mean full scale IQ= 42.2, SD=3.2 (range 40-58).

The ADI-R scale , an extensive, semi-structured parental interview, was conducted by two trained psychiatrists and assessed the three major domains of autistic impairments: reciprocal social interactions, verbal and non-verbal communication, stereotyped behaviors and restricted interests. The severity of impairments in the behavioral domains of autism were scored using the subset of ADI-R items included in the ADI-R algorithm, following a procedure previously described (Tordjman et al., 2001). Taking into account that the ADI-R items are scored on an ordinal scale (from 1 to 3 according to an increased level of autism severity; the "0" coding means that the autistic behavior was not present), we took the median value of all items belonging to the same domain of autistic impairment according to the ADI-R algorithm. This gave a score of central tendency for each of the three main domains: Total Reciprocal Social Interaction (15 items), Total Verbal/non-verbal Communication (13 items; for non verbal patients the median score was based on 9 items), Total Stereotypies (8 items). It is noteworthy that 25 individuals with autism showed presence of verbal language according to the ADI-R definition (presence of verbal language is defined as the daily, functional and comprehensible use of spontaneous phrases of at least three words, including at least sometimes a verb). Behavioral characteristics of the study group are provided in Table 1.

+++ Insert Table 1 +++

### *2.3. Procedure and presentation of the APEC scale*

Behavioral assessments were performed using the APEC scale in the day care facilities where two caregivers independently gave their ratings based on their clinical observation on a daily basis during the same month. The administration of the APEC scale takes approximately 45 minutes and requires previously a brief half-day training on the presentation and the use of the scale. The APEC scale offers a standardised psychodynamic assessment. It is a clinician-report inventory to be filled out by professionals working with individuals with autism (child psychiatrist, caregivers, psychologists, therapists, teachers, etc.) on the basis of their observations. Each item is scored 0 (absent) or 1 (present). The instrument encompasses the following seven domains: expression of emotion in relationships (12 items), eye contact (11 items), body image (15 items), graphic productions (16 items), exploration of space and objects (3 items), time perception (4 items),

and verbal language (23 items). The use of the APEC scale requires a glossary (Haag et al., 2005) whose keywords have been defined in each of the seven domains by a group of 10 child psychiatrists with a psychoanalytic training (GH, ST, AD, SU, FJ, MCC, AC, CD, AMC and JT); a clear and concensual definition of each keyword was provided by this group of clinicians (concensual validity). Each keyword consists of a clinical description of the observed behaviors that have been previously pretested in different care centers in order to be understood and used by any caregivers working with individuals with autistic disorder (child psychiatrists, nurses, educational therapists, etc.) independently of their theoretical background (psychodynamic, educational, behaviorist, etc.). Thus, an effort was made to differentiate this clinical description from its interpretation . As described in previous work (Haag et al., 1995, 2005a), the APEC scale allows clinical data to be classified into four major stages of autistic functioning according to the level of severity of autistic impairment (from the most severe one to the least severe one): 1) severe autism, 2) recovery of the skin with respect to the concept introduced by Esther Bick (1968), 3) symbiotic phase subdivided into vertical splitting of the body ego which refers also to Frances Tustin's observations (1981) then horizontal splitting of the body ego with integration of the lower limbs and of anal and sexual zones, and finally 4) individuation in reference to the term used by Margaret Mahler (1980) (see the detailed description of each stage in Table 2).

+++ Insert Table 2 +++

### *2.4. Statistical analyses*

Kappa coefficients were computed to evaluate inter-rater reliability. To explore the structure of the instrument a correspondence analysis were conducted for each of the seven domains of the APEC scale. Correspondence analysis is an exploratory classification method for qualitative data which holds no validity prerequisites (Falissard, 2005).

## 3.Results

### *3.1. Inter-rater reliability*

In each domain, the Kappa coefficient was calculated for each variable. The variables with a frequency less than 5% were removed from this analysis. The median Kappa coefficient for the "Exploration of space

and objects" domain was 0.43, ranging from 0.40 to 0.84. The median Kappa coefficient for the "Time perception" domain was 0.55, ranging from 0.50 to 0.66.The median Kappa coefficient for the "Expression of emotion in relationships" domain was 0.55, ranging from 0.38 to 0.78. The median Kappa coefficient for the "Graphic productions" domain was 0.85, ranging from 0.61 to 0.94. The median Kappa coefficient for the "Verbal language" domain was 0.71, ranging from 0.46 to 1. The median Kappa coefficient for the "Eye-contact" domain was 0.65, ranging from 0.59 to 0.91. The median Kappa coefficient for the "Body image" domain was 0.63, ranging from 0.43 to 1.

### *3.2. Correspondence analyses*

A correspondence analysis was conducted for each domain. The dimensions that accounted for less than 7.5% of the total variance are not presented in this section.

#### *3.2.1. Exploration of space and objects*

The two-dimension solution accounted for 95.1% of the total variance. The coordinates for each variable in this domain are presented in the Table 3.

+++ Insert Table 3 +++

#### *3.2.2. Time perception*

The three-dimension solution accounted for 96.8% of the total variance. The coordinates for each variable in this domain are presented in the Table 4.

+++ Insert Table 4 +++

#### *3.2.3. Expression of emotion in relationships*

The five-dimension solution accounted for 62.1% of the total variance. The variables that contributed the most to each dimension were as follows:

Dimension 1 (16.1%): Skin Scratching 68.6%, Manic-Depressive mood 10.1%

Dimension 2 (13.7%): Manic-Depressive mood 50.9%, Envy 20.3%, Skin Scratching 12.2

Dimension 3 (12.8%): Guenine Exchanges 50.9%, Tantrum 17.8%

Dimension 4 (10.6%): Envy 48.0%, Seeking Sensation/Emotion 11.1%

Dimension 5 (9 %): Violent angers 32.7%, Manic state 18.1%, Rivaltry 14.4%

The coordinates for each variable in this domain are presented in the Table 5 and are summarized in Figures 1A, 1B, 1C.

+++ Insert Table 5 and Figures 1A-1C +++

*3.2.4. Graphic productions*

Correspondence analysis yielded five dimensions that accounted for 63.7% of the total variance. The variables were distributed as follows:

Dimension 1 (21.5%): Impossible traces (83.3%)

Dimension 2 (17.3%): Physical contact (52.3%), Writing (10.3%)

Dimension 3 (15.7%): Physical contact (32.5%), Prefigurative drawings (18.7%), Sweeping (13.8%)

Dimension 4 (9.2%): Spirals (76.4%), Sweeping (11.7%)

The coordinates for each variable in this domain are presented in the Table 6 and are summarized in Figures 2A and 2B.

+++ Insert Table 6 and Figures 2A-2B +++

*3.2.5. Eye contact*

Correspondence analysis yielded a four-dimension solution which accounted for 60.51% of the total variance. The main variables contributing to each dimension were as follows:

Dimension 1 (18.7%): Penetrating gaze 30.64%, Absent 24.4%, Cyclops effect 16.4%, Plunging gaze with seeking back support 14.1%

Dimension 2 (17.4%): Oral gaze 32.5%, Absent 22.5%, Sparkling 21.4%

Dimension 3 (13.1%): Avoidant 25.7%, Oral gaze 19.4%, Peripheral Sticking 15.1%, Absent 11.8%

Dimension 4 (11.3%): Sticking without penetration 24.4%, Plunging gaze with seeking back support 23.9%, Cyclops effect 23.8%, Strabism 22.3%

The coordinates for each variable in this domain are presented in the Table 8 and are summarized in Figures 4A and 4B.

+++ Insert Table 7 and Figures 3A-3B +++

*3.2.6. Verbal language*

The resulting five-dimension solution accounted for 46.3% of the total variance. The variables contributing to each main dimension were as follows:

Dimension 1 (11.1%): Lalling 45.3%, Grammatical organization 12.2%, Echolalia 10.5%

Dimension 2 (10%): Grammatical organization 21.7%, Connecting two words 18.2%, Echolalia Demutisation 11%

Dimension 3 (8.8%): « String Words » 42.1%, Echolalia 13.9%, Echolalia Demutisation 11.8%

Dimension 4 (8.5%): Piercing Screams 22.3%, Lalling 20.0%, Grammatical organization 12.1%

Dimension 5 (7.8%): Whispered voice 17.5%, Echolalia Demutisation 16.5%, Particular Rhythm 13.4%

The coordinates for each variable in this domain are presented in the Table 7 and are summarized in Figures 3A and 3B.

+++ Insert table 8 and Figures 4A-4B +++

*3.2.7. Body image*

The five-dimension solution accounted for 51.8% of the total variance. Variables distribution was as follows:

Dimension 1 (12.4%): Wrinkled face 34.6%, Smooth face 19.4%, Falling 15.8%, Claustrophobia 15.1%

Dimension 2 (11.3%): Splitting 45.2%, Liquefaction 13% et Exchanges 12.7%

Dimension 3 (10.1%): Exchanges 40.7%, Junctions 26.3%

Dimension 4 (9.4%): Claustrophobia 23.5%, Junctions 23.5% et Liquefaction 14%

Dimension 5 (8.6%): Falling 23.4%, Liquefaction 17.2%, Enclosed body in encircling containers 15.1%, Seeking back support14.6%, Wrinkled face 12%

The coordinates for each variable in this domain are presented in the Table 9 and are summarized in Figures 5A and 5B.

+++ Insert Table 9 and Figures 5A-5B +++

**4. Discussion**

The present study reports on the reliability and validity properties of the APEC scale whose content has been already described in previous work (Haag et al., 2005). Inter-rater reliability (median Kappa coefficient)

was good, with an inter-judge agreement between the two raters (Kappa coefficient) ranging from 0.38 to 1 according to the variables in the seven domains. It is noteworthy that the Kappa coefficient for a variable such as *Soft mouth with dribbling saliva* in the "body image" domain was 1. This variable is related to the absence or limited use of the area around the mouth observed in children with severe autism. This finding underlines the importance to have given a clear and concensual definition for this variable (concensual validity) and to have differentiated the clinical description from its interpretation.

Our findings from the correspondence analyses within each domain tend to confirm the likelihood of discriminating several levels of psychic organization and autistic functioning with regard to psychoanalytic work. However we found several dimensions that hinged between the four states identified from clinical material in children with autism under psychoanalytic treatment and proposed as four major stages of evolution. Further research is necessary to investigate the potential associations between the seven different domains of the APEC scale and to conduct longitudinal studies in order to assess the major stages of evolution in children with autism. The interpretation of the correspondence analyses for each of the seven domains is discussed below.

### *4.1. Exploration of space and objects*

#### *4.1.1. Dimension 1*

Dimension 1 includes the variables *Two-dimensional space* and *Three-dimensional space*, both with positive but well-differentiated coordinates. This dimension can be interpretated as the most advanced stages ranging from the symbiotic phase to the individuation stage. The coexistence of *Two-dimensional space* and *Three-dimensional space* in the same dimension confirms that as discussed previously (Haag et al., 2005), a dual-track developmental picture emerges, with resumption of normal development on one track (represented here by the *Three-dimensional space*), and maintenance or even fresh development of strictly pathological features on the other (represented here by the *Two-dimensional space*). In addition, progress is not strictly linear, but usually cyclical or, even better, spiral: thus, one often finds that the predominant stage of development coexists with the reworking of earlier stages.

#### *4.1.2. Dimension 2*

Dimension 2 concerns only the variable *One-dimensional space* and can be interpretated as the most primitive stage corresponding to the severe autistic state (see Table 2). It is noteworthy that the *Two-*

*dimensional space* is not present on this dimension. This is not in line with our previous hypothesis (see Table 2) and suggests that the severe autistic state is well and predominantly characterized by the functioning on a single sensory channel modality.

### *4.2. Time perception*

#### *4.2.1. Dimension 1*

The dimension 1 includes the variables *One-dimensional time* and *Circular time* with positive coordinates indicating that *One-dimensional time* is at the extreme pole of this axis. This dimension can be interpretated as the most primitive stage corresponding to the state of severe autism according to our hypothesis (see Table 2). In *One-dimensional time,* the child is focused on a single sensory modality. *Circular time (Two-dimensional time)* is characterized by repetition, with an insistence on maintening absolute sameness, and tends to have a minimum number of cycles. If change is imposed upon the performance of activities in ritualised time, the child may have a tantrum.

#### *4.2.2. Dimension 2*

Dimension 2 concerns only the variable *Linear time* and can be interpretated as the most advanced stage corresponding to the individuation stage with a greater acceptance of separation.

#### *4.2.3. Dimension 3*

Dimension 3 concerns only the variable *Oscillating time* and can be interpretated as an intermediate stage corresponding to the symbiotic phase (see Table 2).

### *4.3. Expression of emotion in relationships*

#### *4.3.1. Dimension 1*

For this dimension, *Skin Scratching* is opposed to *Manic Depressive Mood*. We can then consider that this dimension ranges from the stage of Recovery of the First Skin (where *Skin Scratching* reflects the experience of corporal distress due to the experience of the envelope's loss) to the Horizontal Splitting Stage (where *Manic Depressive Mood* oscillations can be observed).

#### *4.3.2. Dimension 2*

*Manic-Depressive Mood* is at the opposite pole to *Envy*. This dimension depicts the turning point between the Vertical Splitting Stage and the Horizontal Splitting Stage in the Established Symbiotic Phase. The location of *Skin Scratching* (related to the stage of Recovery of the First Skin that corresponds to the beginning of the Symbiotic Phase) by the *Manic Depressive Mood* variable (related to the Horizontal Splitting Stage that corresponds to the Established Symbiotic Phase) is difficult to explain here unless we assume that the completion of the Symbiotic Phase reactivates behavioral expressions related to the beginning of this phase.

#### *4.3.3. Dimension 3*

For this dimension, the variable *Genuine Exchanges* is opposed to the variable *Tantrum*. Thus, this dimension ranges from the most primitive stages (Severe Autistic State or Recovery of the First Skin) with *Tantrum* to the most advanced ones (Individuation Stage) with *Genuine Exchanges*.

#### *4.3.4. Dimension 4*

*Envy* is found at the positive pole whereas *Seeking Sensations/Emotions* is at the negative one. This dimension depicts the evolution of the domain "Expression of emotion in relationships" from the Vertical Splitting corresponding to the Established Symbiotic Phase (*Envy*) to the Individuation Stage (*seeking Emotions* in an attempt to share them).

#### *4.3.5. Dimension 5*

This dimension ranges from *Manic State* (Horizontal Splitting Stage) to *Violent Angers* and *Rivalry* (Individuation Stage ). It depicts then the two most advanced stages with the evolution of emotion expression related to the elaboration of the object relation.

#### *4.3.6. Dimension 6*

For this dimension, the opposition between *Seeking Sensation/Excitation* and *Tantrum* at one pole and *Frenetic Emotions* at the other pole corresponds to the most primitive stages ranging from the Severe Autistic State where *Seeking Sensation/Excitation* and *Tantrum* are observed to Vertical Splitting in the Established Symbiotic phase where *Frenetic Emotions* can appear but are still associated with excitement. It is noteworthy

that *Tantrum* can also be observed at the stage of Recovery of the First Skin corresponding to the beginning of the Symbiotic Phase, the intermediate stage between Severe Autistic State and the Verical Splitting Stage.

### *4.4. Graphic productions*

#### *4.4.1. Dimension 1*

This dimension can be interpretated as the most primitive state corresponding to the Severe Autistic State (*Impossible trace*) according to our hypothesis (see Table 2). It is noteworthy that the variable *Impossible trace* is only found on this axis.

#### *4.4.2. Dimension 2*

For this dimension, *Physical Contact* at one pole (i.e., *drawing possible only with physical contact*) is opposed to *Writing* at the other pole. This dimension is then covering all the evolution range of the "Graphic productions" domain from the stage of Recovery of the First Skin (*Physical Contact*) to the Individuation Stage (*Writing*).

#### *4.4.3. Dimension 3*

For this dimension, *Physical Contact* at one pole is opposed to *Prefigurative drawings* and *Sweeping* prefigurative traces at the other pole. This dimension ranges from the stage of Recovery of the First Skin that corresponds to the beginning of the Symbiotic Phase (*Physical Contact*) to the Vertical Splitting Stage corresponding to the Established Symbiotic Phase (*Sweeping*).

#### *4.4.4. Dimension 4*

This dimension opposes *Spirals* (related to the Recovery of the First Skin Stage) *to Sweeping* traces (related to the Vertical Splitting Stage). It is then related to the Establishment of the Symbiotic Phase in the domain of Graphic productions, ranging from the beginning of the Symbiotic Phase to the Established Symbiotic Phase.

### *4.5. Eye Contact*

*4.5.1. Dimension 1*

This dimension is depicting the gradient of various degrees of penetrating eye contact with and without Cyclops effect and back support. It is then logical to find at the two opposite poles of this axis the different types of penetrating eye contact at one pole (*Penetrating gaze*, *Cyclops effect*, *Plunging gaze with seeking back support*), and *Absent eye contact* at the other one. This dimension covers, as described in Table 2, the evolution from the Severe Autistic State, characterized by the absence of eye contact, to the stage of Recovery of the First Skin where different types of penetrating eye contact can be observed.

*4.5.2. Dimension 2*

In this dimension *Sparkling gaze* is opposed *to Absent eye contact,* as expected in our theoretical assumption whereas *Sparkling gaze* is observed in the Individuation stage and *Absent eye contact* is typical of Severe Autistic State. It is noteworthy that *Oral gaze* is located at the same pole as *Sparkling gaze*. This axis could be interpreted as the dimension of the relational distance to others through eye contact, ranging from the total absence of contact and relation (*absent eye contact*) to an excessive adhesive contact and relation (*Oral Gaze*) passing through a close but separated relation (*Sparkling gaze*).

*4.5.3. Dimension 3*

This axis shows the opposition between the *Peripheral Sticking gaze* and the *Avoidant gaze*. This dimension could correspond to the level of sticking to others through eye contact. Thus, it appears logical to find *Oral gaze* on the same pole than *Indirect Penetration* and *Peripheral Sticking* with a gradient going from *Avoidant gaze* to *Peripheral Sticking gaze* and passing by *Absent gaze*.

*4.5.4. Dimension 4*

For this dimension, *Sticking gaze without penetration* and *Cyclops effect* are opposed to *Strabism*. This dimension might be representative of the stage of the Recovery of the First Skin corresponding to the beginning of the Symbiotic Phase (see table 2).

***4.6. Verbal language***

*4.6.1. Dimension 1*

At one extremity of this dimension we find *Lalling*, and *Grammatical organization* is at the other extremity. It is noteworthy that *Echolalia* is located between the two poles and near *Grammatical*

*organization*. The interpretation of these data could be that this dimension is related either to the level of symbolization *(Lalling* corresponding to a more primitive stage of symbolization, and *Grammatical organization* corresponding to the most elaborated one) or either to the level of object relation (*Lalling* being related to auto-sensuality and *Grammatical organization* being related to a more elaborated object relation with *Echolalia* being at an intermediate stage of adhesive relation). These data confirm our previous hypothesis of a more primitive stage in the development of verbal language for lallations compared to grammatical organization that is related to the most elaborate expressive language corresponding to the stage of Individuation (see Table 2), but question the place and the role of echolalia in this development, in particular in the development of symbolization and construction of the relationship to others.

*4.6.2. Dimension 2*

This dimension opposes *Echolalia Demutization* to *Grammatical organization* with *Connecting two words* between these two variables and at the same pole than *Echolalia Demutization*. This dimension can represent the level of speech productions ranging from the least elaborated one (*Echolalia Demutization*) to the most developed one (*Grammatical organization*).

*4.6.3. Dimension 3*

For this dimension, *Echolalia Demutization*, at the positive pole, is opposed to *String Words*, at the negative pole. This axis depicts the relational non semantic function of language ranging from *Echolalia Demutization* at one extremity to *String Words* at the other one. This dimension can be interpretated as corresponding to the Established Symbiotic Phase ranging from the Vertical Splitting Stage (*Echolalia Demutization* representing the first verbal language expression through echo-expression) to the Horizontal Splitting Stage (*String Words*) according to our hypothesis (see Table 2). Our data show that *Echolalia* is located between these two poles, suggesting that different types of echolalia could be involved and should be distinguished (immediate vs. delayed, or human vs mechanical , etc.).

*4.6.4. Dimension 4*

For this dimension, *Piercing Screams*, at the extreme positive pole, is opposed to *Lalling*, at the extreme negative pole. This dimension can be interpretated as corresponding to the most primitive stages ranging from the Severe Autistic State (*Piercing Screams*) to the Stage of Recovery of the First Skin at the beginning of the Symbiotic Phase (*Lalling*) according to our hypothesis (see Table 2).

#### *4.6.5. Dimension 5*

The dimension 5 that accounted for 7.8% of the total variance ranges between Severe Autistic State and Vertical Splitting according to our previous hypothesis (see Table 2).

### ***4.7. Body image***

#### *4.7.1. Dimension 1*

In this dimension *Wrinkled Face* and *Falling* are on the two opposite poles with *Smoothed Face* and *Claustrophobia* located between these two extremities but still on the positive pole of the dimension with *Wrinkled Face*. This dimension could then be related to the level of body defenses against anxieties of falling at the turning point between the Severe Autistic State and the stage of Recovery of the First Skin (see Table 2). This hypothesis supposes that *Wrinkled Face* is more advanced than *Smoothed Face* in the defenses against this anxiety. This questions our previous assumption that *Wrinkled Face* and *Smoothed Face* are both observed in the Severe Autistic State (seeTable 2). We should then consider putting *Wrinkled Face* at a more elaborated stage, i.e. the stage of Recovery of the First Skin. This will be consistent with the finding that the location of *Claustrophobia* is between *Smoothed Face* and *Wrinkled Face* confirming our assumption that *Wrinkled Face* might be observed at the Beginning of the Symbiotic Phase (stage of Recovery of the First Skin) . We consider indeed that *Claustrophobia* is linked to the containment capacities emerging at the stage of Recovery of the First Skin, as described in Table 2.

#### *4.7.2. Dimension 2*

With *Splitting* at one pole and *Exchanges* at the other pole, this dimension depicts the evolution between the Established Symbiotic Phase (Vertical and Horizontal Splitting) and the Individuation Stage. The location of *Liquefaction* between these two poles (not fare from *Splitting* at the positive pole) suggests that anxieties of liquefaction can be observed at a more advanced stage than the Severe Autistic State. In this dimension, anxieties of liquefaction refer probably more to anxieties of leaking associated with the transcient loss of the sense of body limits than to anxieties of being liquefied observed in less advanced stages.

#### *4.7.3. Dimension 3*

This dimension opposes *Junctions* at one pole to *Exchanges* at the other pole, covering the evolution from the Vertical Splitting at the Established Symbiotic Phase (*Junctions*) to the Individuation Stage (*Exchanges*).

At the Vertical Splitting Stage, half of the child's body is stuck to half of the adult's body. The half-side body junction allows the child to feel that the two halves of his/her body are welded together. Engagement in emotionally rich exchanges does the best to knit things together internally and therefore to promote detachment of patients' half-bodies from others' half-bodies.

#### *4.7.4. Dimension 4*

*Claustrophobia*, *Liquefaction* and *Junctions* are at the same pole of the axis and this dimension can be interpretated as corresponding to the Symbiotic Phase. Their opposition to *Wrinkled Face* at the other pole, suggests that this dimension covers the evolution between the stage of Recovery of the First Skin at the Beginning of the Symbiotic Phase (*wrinkled Face* was previously observed at this stage for the *dimension 1*) and the Established Symbiotic Phase. It is noteworthy that *Claustrophobia* is observed in the stage of Horizontal Splitting at the Established Symbiotic Phase, but also in the stage of Recovery of the First Skin at the Beginning of the Symbiotic Phase (see Table 2). Here, *Claustrophobia* is more likely to be related to the Established Symbiotic Phase given its coordinates on this dimension by the variable *Junctions*.

#### *4.7.5. Dimension 5*

This dimension depicts body defenses against anxieties of falling on one pole (*Wrinkled Face*) and anxieties of being liquefied on the other pole (*Seeking back support, Enclosed body in encircling containers*). This axis corresponds to the organization of body defenses within the stage of Recovery of the First Skin (*Wrinkled Face, Seeking back support, Enclosed body in encircling containers*) against anxieties remaining from the Severe Autistic State (anxieties of falling and anxieties of being liquefied) (see Table 2). The findings confirm that *Wrinkled Face* is related to anxieties of falling. Furthermore, this dimension underlines the importance and strengthens the interest to distinguish different types of body and spatial anxieties associated with different body defenses whose coordinates are well-differentiated on the axis.

## 5. Conclusions

The APEC scale offers a reliable and validated psychodynamic assessment of interest for all professionals (such as child psychiatrists, caregivers, therapists or teachers) working with children, adolescents and adults with autistic disorder, especially in the follow-up of their evolution. The items of the scale are based on clinical description clearly defined in order to be understood and used by all clinicians, independently of their

theoretical background. Since the first publication of the APEC scale (Haag et al., 1995), many French teams of caregivers have used it in an attempt to better understand the autistic symptoms and to assess the changes observed in children and adolescents with autistic disorder under treatment.

This scale is also of interest for researchers on autism; it has been used initially within the frame of a clinico-biological research (INSERM CRE 93 10 09 "Longitudinal and comparative study of behavioral and biological profiles in children with autistic disorder") where the APEC scale was conceived and validated, and is currently used since two years as one of the main assessment tool in the "INSERM research network on psychotherapy practices". Thus, there is an increasing demand from researchers, caregivers, therapists, teachers and parents to improve practices through the use of validated tools assessing changes in children with autistic disorder under psychoanalytic treatment, behavioral therapy or educational programs.

The APEC scale provides an approach at the interface of psychoanalysis and neuroscience (cognitive neuroscience, neurochemistry and neurophysiology), but is also of interest for clinical and developmental psychology. The APEC scale can be proposed as a very early test of the construction of personality, to assess the body ego before the development of language and play allows the use in clinical psychology of validated projective tests. The rationale of the APEC scale relies on the key role of impairment in body image construction that requires cross-modal sensory integration through emotional communication with motor representations. Thus, the body image construction is associated simultaneously with spatial and temporal organization and allows the emergence of self- and others-representations. It would be of great interest to develop further work and research on the psychoanalytic concept of body ego, evoked by Freud as the first ego, and on the concept of body-self described in cognitive neuroscience but also in developemental psychology with studies on impairments in the organization of sensory perception (Meltzer et al., 1975; Berthoz, 2009), abnormalities in the tonus and psychomotor development (Bullinger, 2004; Schmitz and Forssberg, 2005), development of representations and thought, and developmental disorders of emotional regulation, language and graphic productions. The psychodynamic approach identifies relationships between different symptoms, disorders and functions. The use of the APEC scale underlines the importance in autistic disorder of anxieties related to body and spatial representations, and of impairment in the body ego construction (body ego construction that requires relational exchanges with emotional communication and is closely linked to the emergence of individuation/separation processes).

We hope that using the APEC scale in a range of different practical and research settings will reduce the distance that still separates psychoanalytic perspectives from education and training for children with autistic disorder, and will contribute to the dialogue between psychoanalysis, neuroscience and psychology.

**Table 1. Demographic and behavioral characteristics of the study group**

| Variable | Individuals with Autistic Disorder (n=73) |
|---|---|
| Sex M/F | 49 /24 |
| Pubertal status* Pre-pubertal / Pubertal / Post-pubertal | 32 /16 /25 |
| Age, Mean ± SD, y | |
| Total group | 11.7 ± 4.5 |
| Males | 11.7 ± 4.5 |
| Females | 11.6 ± 4.5 |
| Pre-pubertal | 8.1 ± 2.7 |
| Pubertal | 13.8 ± 3.4 |
| Post-pubertal | 16.9 ±3.7 |
| Behavioral domain/severity of autistic impairment (ADI-R) | |
| Total social interaction impairments Mild / Moderate / Severe | 9 /27 /37 |
| Total verbal/nonverbal communication impairments Mild / Moderate / Severe | 12 /27 /34 |
| Total stereotypies Mild / Moderate / Severe | 33 /33 /7 |

*Pre-pubertal = Tanner stage 1; Pubertal = Tanner 1, 2, 3 and 4; Post-pubertal = Tanner 5.

**Table 3. Correspondence analysis coordinates for each variable in the «Exploration of space and objects» domain**

| Variables | (frequency*) | Dimension 1 | Dimension 2 |
|---|---|---|---|
| One-dimensional space | (19.1%) | 0.002 | 0.964 |
| Two-dimensional space | (47.1%) | 0.774 | 0.170 |
| Three-dimensional space | (41.2%) | 0.816 | 0.127 |

*Data are frequency (% of group) for each variable.

**Table 4. Correspondence analysis coordinates for each variable in the «Time perception» domain**

| Variables | (frequency*) | Dimension 1 | Dimension 2 | Dimension 3 |
|---|---|---|---|---|
| One-dimensional time | (33.8%) | 0.839 | 0.101 | 0.010 |
| Circular time | (51.5%) | 0.697 | 0.056 | 0.205 |
| Oscillating time | (13.2%) | 0.101 | 0.079 | 0.809 |
| Linear time | (13.2%) | 0.000 | 0.963 | 0.013 |

*Data are frequency (% of group) for each variable.

**Table 5. Correspondence analysis coordinates for each variable in the «Expression of emotion in relationships» domain**

| Variables (frequency*) | Dimension 1 | Dimension 2 | Dimension 3 | Dimension 4 | Dimension 5 | Dimension 6 |
|---|---|---|---|---|---|---|
| Seeking Sensation/ Excitation (36.6%) | 0.1086 | -0.1044 | -0.0517 | -0.4468 | 0.2987 | 0.7327 |
| Tantrum (26.8%) | -0.2078 | 0.1409 | -0.845 | -0.3276 | -0.1319 | 0.6323 |
| Seeking Sensation/ Emotion (45.1%) | 0.2282 | -0.1846 | 0.319 | -0.4662 | 0.1401 | -0.3524 |
| Skin Scratching (8.5%) | 3.3046 | 1.2853 | 0.6303 | 0.9446 | -0.1146 | 0.2827 |
| Frenetic emotions (22.5%) | 0.0919 | -0.3825 | -0.0095 | -0.1558 | 0.1495 | -0.9683 |
| Envy (23.9%) | -0.1532 | -0.9857 | -0.329 | 1.3308 | 0.5466 | 0.2107 |
| Manic-Depressive mood (25.4%) | -0.7337 | 1.5169 | -0.4892 | 0.4444 | 0.493 | -0.3918 |
| Relational emergence (67.6%) | 0.258 | -0.1065 | -0.3786 | -0.189 | -0.2308 | -0.1419 |
| Guenine exchanges (18.3%) | -0.6656 | 0.3159 | 1.7279 | -0.0261 | 0.4636 | 0.3978 |
| Rivaltry (25.4%) | -0.2739 | -0.492 | 0.4096 | 0.5095 | -0.653 | -0.0808 |
| Violent angers (23.9%) | -0.6278 | 0.3219 | 0.3468 | 0.087 | -1.0117 | 0.0856 |
| Manic state (2.8%) | 0.1034 | -0.8733 | 0.2003 | -1.1383 | 2.1961 | -0.4423 |

*Data are frequency (% of group) for each variable.

**Table 6. Correspondence analysis coordinates for each variable in the «Graphic productions» domain**

| Variables | (frequency*) | Dimension 1 | Dimension 2 | Dimension 3 | Dimension 4 |
|---|---|---|---|---|---|
| Impossible trace | (35.6%) | -2.2361 | 0 | 0 | 0 |
| Physical contact [1] | (23.7%) | 0.4472 | -1.9449 | 1.4614 | 0.1904 |
| Hard support [2] | (3.4%) | 0.4472 | -0.1118 | 0.2766 | -0.6504 |
| Prefigurative drawings | (30.5%) | 0.4472 | -0.3275 | -0.9766 | -0.0043 |
| Sweeping | (20.3%) | 0.4472 | -0.4294 | -1.0287 | -0.7229 |
| Dots | (11.9%) | 0.4472 | -0.3358 | -0.6851 | -0.7235 |
| Spirals | (3.4%) | 0.4472 | -0.3404 | -1.7736 | 4.5277 |
| Circles | (13.6%) | 0.4472 | 0.0271 | -0.8867 | 0.2692 |
| Figurative drawings | (22%) | 0.4472 | 0.8062 | 0.4383 | -0.0609 |
| Radial shapes | (6.8%) | 0.4472 | 1.1554 | 0.6583 | 0.1096 |
| Falling-in | (22%) | 0.4472 | 0.8062 | 0.4383 | -0.0609 |
| Cross axes | (2.8%) | 0.4472 | 1.3155 | 0.8756 | 0.1188 |
| Squares/rectangles | (5.1%) | 0.4472 | 1.0355 | 0.5089 | 0.0049 |
| Duplications | (1.7%) | 0.4472 | 1.3932 | 0.9658 | 0.2712 |
| Half-space [3] | (1.7%) | 0.4472 | 1.3932 | 0.9658 | 0.2712 |
| Writing | (8.5%) | 0.4472 | 1.4416 | 1.0215 | 0.3189 |

*Data are frequency (% of group) for each variable.
[1] Drawing possible only with physical contact.
[2] Drawing possible only on a hard support (such as contours of objects or hands).
[3] Drawing on a half-space, i.e. on the half of the page.

**Table 7. Correspondence analysis coordinates for each variable in the «Eye contact» domain**

| Variables (frequency*) | Dimension 1 | Dimension 2 | Dimension 3 | Dimension 4 |
|---|---|---|---|---|
| Absent (22.4%) | -1.2231 | 1.1317 | 0.7139 | -0.0115 |
| Avoidant (51.9%) | -0.1779 | 0.1493 | -0.7296 | 0.167 |
| Sticking without penetration (12.1%) | -0.0962 | 0.1786 | -0.9858 | -1.299 |
| Peripheral sticking (3.4%) | -1.8937 | 1.5777 | 2.0588 | -0.0609 |
| Penetrating gaze (19%) | 1.4888 | 0.5649 | 0.4434 | -0.1293 |
| Cyclops effect (10.3%) | 1.4731 | 0.6632 | 0.5061 | -1.3858 |
| Plunging gaze with seeking back support (6.9%) | 1.6767 | 0.8551 | 0.0348 | 1.7009 |
| Indirect Penetration (1.7%) | 0.8321 | -1.1854 | 1.7021 | 0.089 |
| Strabism (13.8%) | 0.0802 | 0.3902 | -0.4997 | 1.1616 |
| Oral gaze (17.2%) | 0.1056 | -1.5508 | 1.0428 | 0.3219 |
| Sparkling (58.6%) | -0.2731 | -0.6821 | -0.0877 | -0.1416 |

*Data are frequency (% of group) for each variable.

**Table 8. Correspondence analysis coordinates for each variable in the «Verbal language» domain**

| Variables | (frequency*) | Dimension 1 | Dimension 2 | Dimension 3 | Dimension 4 | Dimension 5 |
|---|---|---|---|---|---|---|
| Whispered voice | (21.5%) | 0.3226 | -0.6265 | 0.4156 | -0.0255 | -1.0008 |
| Loud voice | (26.2%) | -0.1873 | -0.2875 | 0.5895 | 0.1217 | -0.0455 |
| Piercing Screams | (20%) | -0.8044 | 0.3393 | -0.2342 | 1.2267 | 0.1867 |
| Upper voice | (14.4%) | -0.1402 | 0.0352 | 0.0534 | 0.3715 | -0.7761 |
| Lower voice | (13.8%) | -0.1073 | 0.6729 | 0.4352 | -0.0807 | -0.2212 |
| Prosody | (3.1%) | 0.1861 | -0.1815 | 0.2848 | 0.211 | -0.069 |
| Echolalia | (35.4%) | 0.7238 | -0.3052 | -0.7391 | -0.0473 | -0.0878 |
| Music imitation | (23.1%) | 0.2438 | -0.2779 | -0.4836 | -0.4488 | -0.3369 |
| Connecting two words | (12.3%) | 0.8255 | -1.5286 | 0.8391 | 0.1024 | -0.1107 |
| Double syllables | (14.4%) | -0.9362 | -0.3765 | -0.1079 | -0.4439 | 0.2683 |
| Babling | (13.8%) | -0.3883 | 0.2407 | 0.0145 | 0.7755 | -0.3128 |
| Lalling | (24.6%) | -1.8003 | -0.0156 | -0.1412 | -1.0467 | 0.1958 |
| « String Words » | (7.7%) | 0.6751 | -0.7156 | -2.756 | 0.3494 | 0.9034 |
| Vowels Demutisation [1] | (1.5%) | -0.3309 | 1.4899 | 0.3777 | 2.2735 | -0.086 |
| Half-words | (4.6%) | 0.0142 | -0.2691 | -0.4576 | -0.2779 | 0.6146 |
| Echolalia Demutisation [2] | (1.5%) | 0.5855 | -3.3609 | 3.2623 | 0.8476 | 3.6415 |
| Singing Demutisation [3] | (3.1%) | 0.1431 | -1.865 | 1.314 | 0.4446 | 2.4812 |
| Grammatical organization | (16.9%) | 1.1277 | 1.4228 | 0.5059 | -0.9823 | 0.519 |
| Well-pronounced words | (3.1%) | 0.3895 | 0.5138 | -0.294 | -0.1799 | 1.3929 |
| Particular Rhythm | (3.1%) | 0.634 | 0.6169 | 0.6254 | -0.9575 | -2.3178 |
| No | (14.4%) | 0.2737 | 0.8642 | 0.2698 | 0.1344 | 0.3282 |
| Discriminant use of pronouns | (4.6%) | 0.7953 | 1.1953 | 0.2416 | -0.1926 | 0.9672 |
| Socialized gesture | (12.3%) | 0.4655 | 0.6983 | 0.1435 | 0.1907 | 0.4808 |

*Data are frequency (% of group) for each variable.
[1] Demutisation using vowels only.
[2] Demutisation using echolalic words.
[3] Demutisation when singing.

**Table 9. Correspondence analysis coordinates for each variable in the «Body image» domain**

| Variables | (frequency*) | Dimension 1 | Dimension 2 | Dimension 3 | Dimension 4 | Dimension 5 |
|---|---|---|---|---|---|---|
| Stereotypies | (64.3%) | -0.19 | -0.17 | -0.23 | -0.15 | -0.12 |
| Liquefaction | (11.4%) | 0.07 | 1.18 | -0.31 | 1.12 | 1.18 |
| Falling | (42.9%) | -0.71 | 0.06 | -0.06 | -0.02 | -0.71 |
| Soft mouth with dribbling salivar | (15.7%) | -0.22 | -0.45 | 0.76 | -0.45 | 0.11 |
| Smoothed face | (12.9%) | 1.43 | 0.41 | -0.09 | -0.46 | -0.38 |
| Wrinkled face | (5.7%) | 2.86 | 0.00 | -0.62 | -1.09 | -1.40 |
| Seeking back support | (12.9%) | 0.62 | -0.93 | 0.77 | -0.68 | 1.03 |
| Enclosed body in encircling containers | (22.9%) | 0.26 | -0.72 | 0.21 | -0.35 | 0.78 |
| Checking out contours of mouth area | (27.1%) | -0.39 | 0.37 | 0.48 | -0.35 | -0.23 |
| Sticking halfbody against other's body | (8.6%) | 0.39 | 0.14 | 0.24 | 0.50 | 0.18 |
| Junctions | (12.9%) | -0.06 | -0.95 | 1.50 | 1.36 | -0.34 |
| Splitting | (12.9%) | -0.38 | 2.08 | 0.11 | -0.19 | 0.21 |
| Claustrophobia | (8.6%) | 1.54 | 0.42 | -0.07 | 1.67 | -0.49 |
| Bowel control | (11.4%) | -0.27 | -0.13 | -0.58 | -0.53 | 0.73 |
| Exchanges | (22.9%) | -0.20 | -0.83 | -1.40 | 0.47 | 0.23 |

*Data are frequency (% of group) for each variable.

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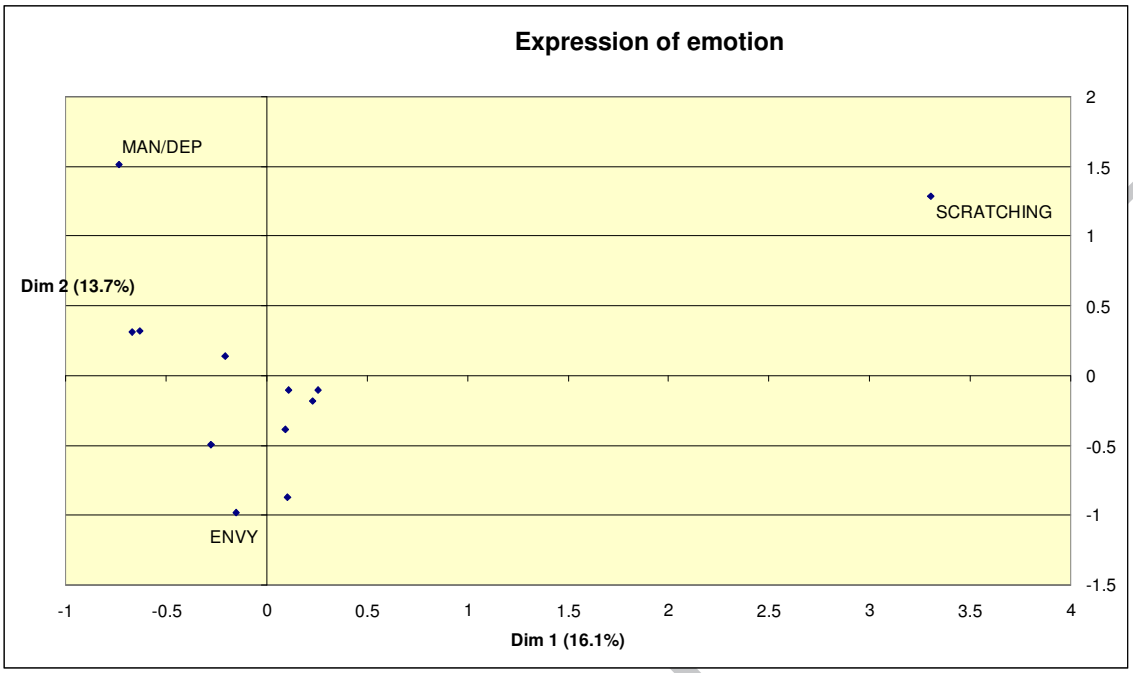


**Figure 1A. Graphic display of the "Expression of emotion in relationships" variables on correspondence analysis axes (dimensions 1 and 2)**

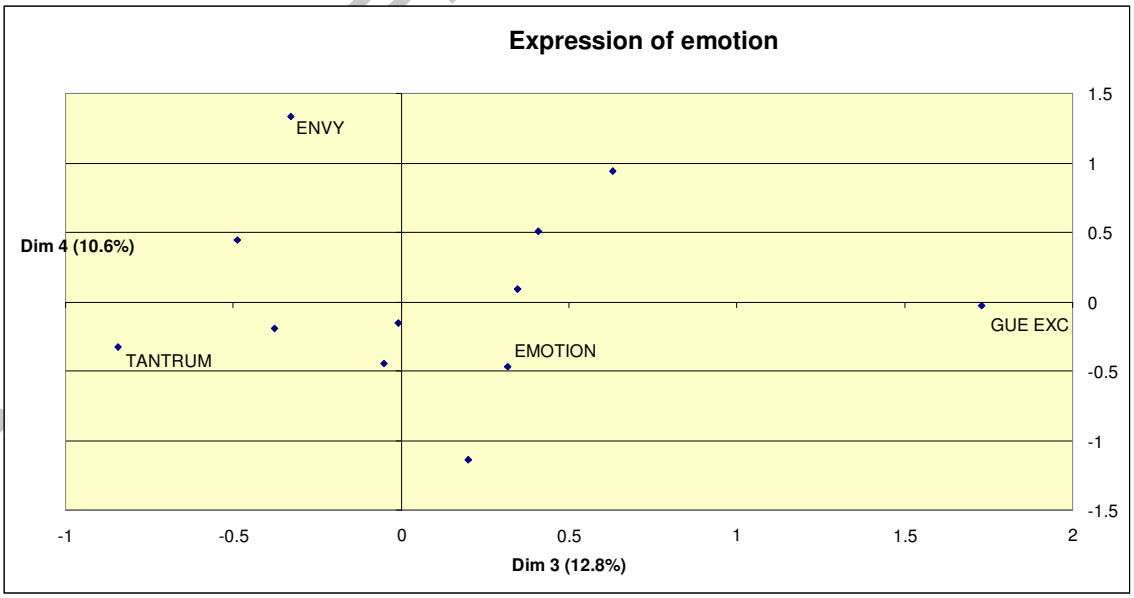


**Figure 1B. Graphic display of the "Expression of emotion in relationships" variables on correspondence analysis axes (dimensions 3 and 4)**

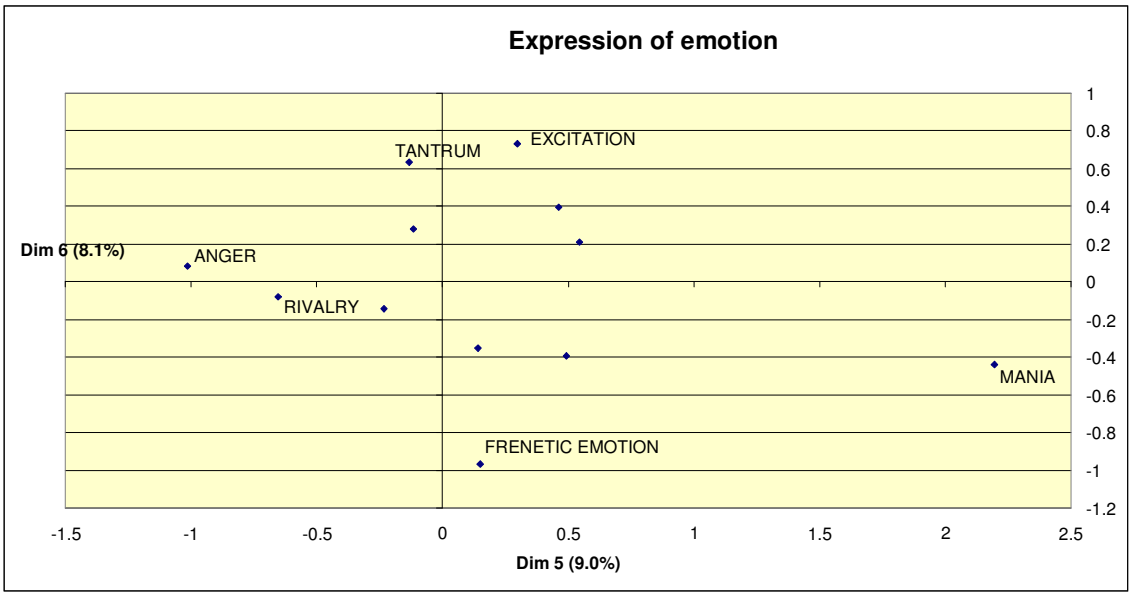


**Figure 1C. Graphic display of the "Expression of emotion in relationships" variables on correspondence analysis axes (dimensions 5 and 6)**

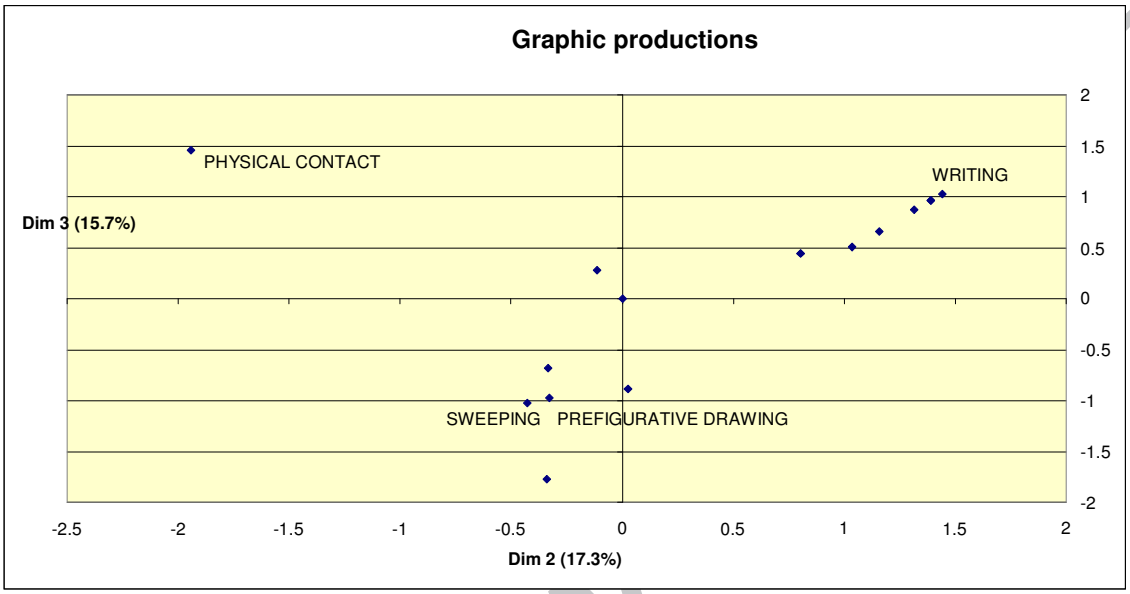


**Figure 2A. Graphic display of the "Graphic productions" variables on correspondence analysis axes (dimensions 1 and 2)**

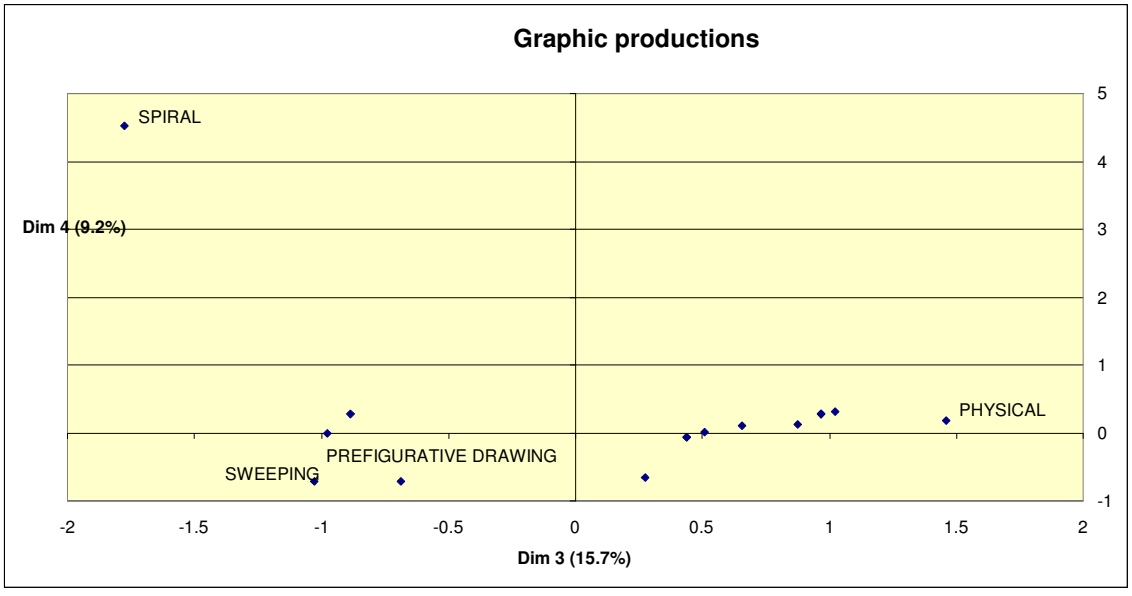


**Figure 2B. Graphic display of the "Graphic productions" variables on correspondence analysis axes (dimensions 3 and 4)**

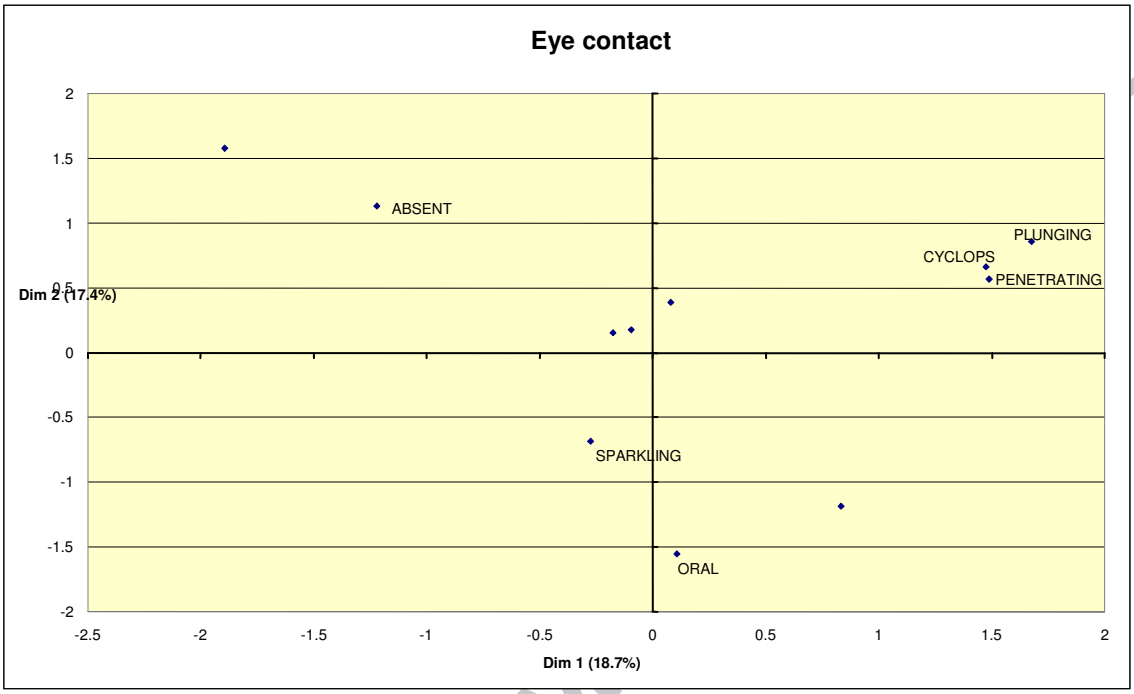


**Figure 3A. Graphic display of the "Eye contact" variables on correspondence analysis axes (dimensions 1 and 2)**

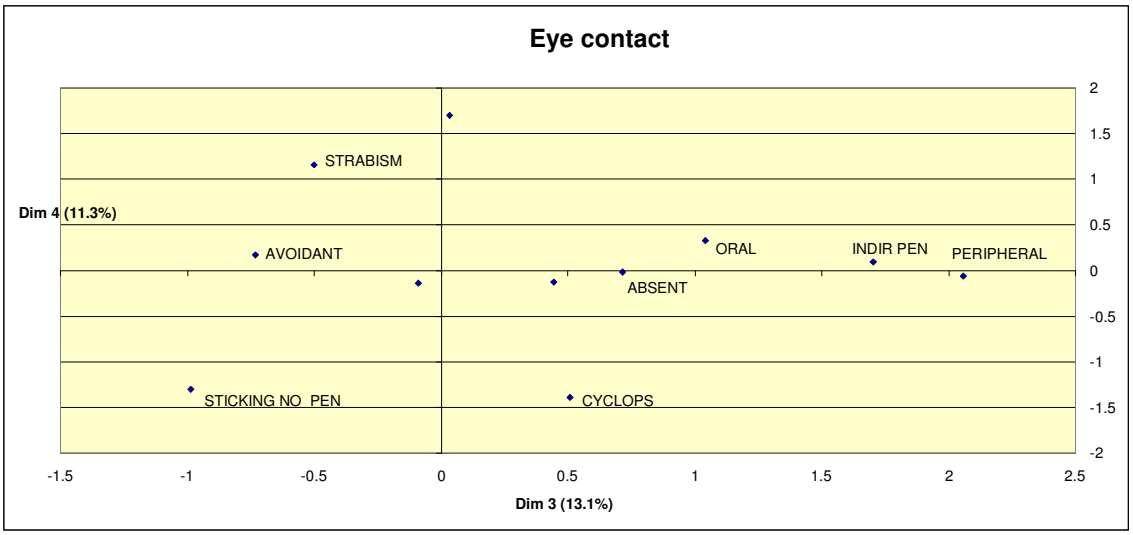


**Figure 3B. Graphic display of the "Eye contact" variables on correspondence analysis axes (dimensions 3 and 4)**

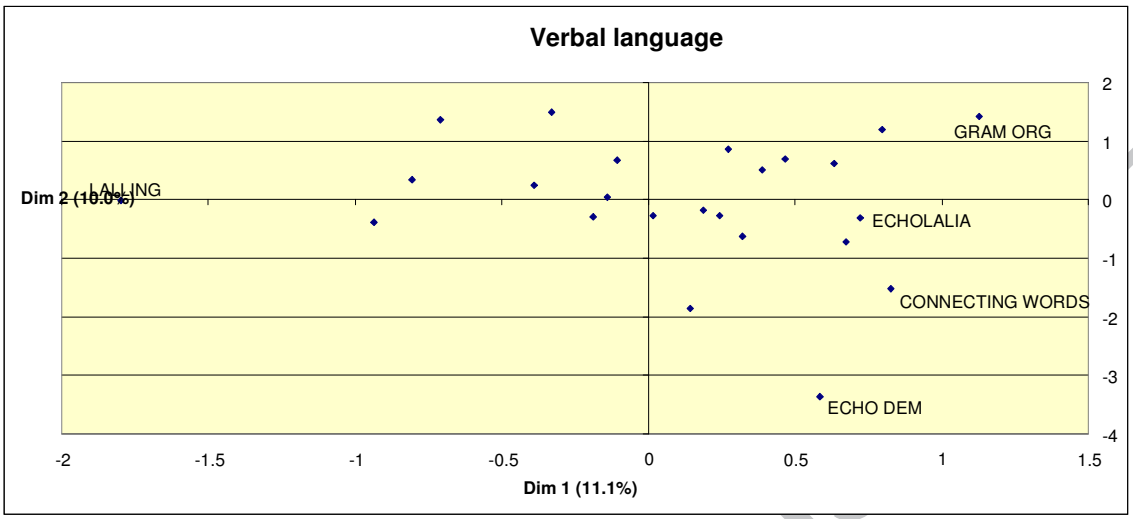


**Figure 4A. Graphic display of the "Verbal language" variables on correspondence analysis axes (dimensions 1 and 2)**

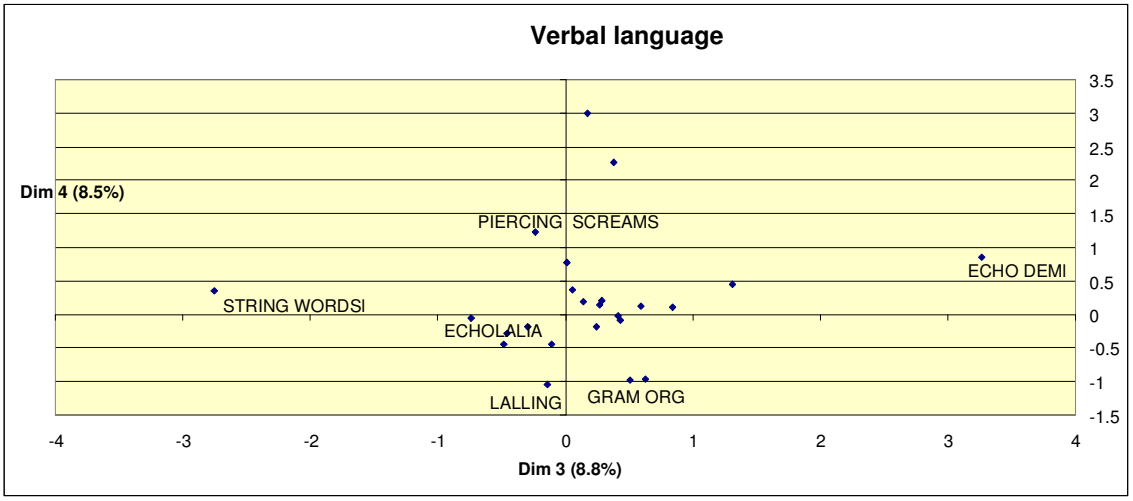


**Figure 4B. Graphic display of the "Verbal language" variables on correspondence analysis axes (dimensions 3 and 4)**

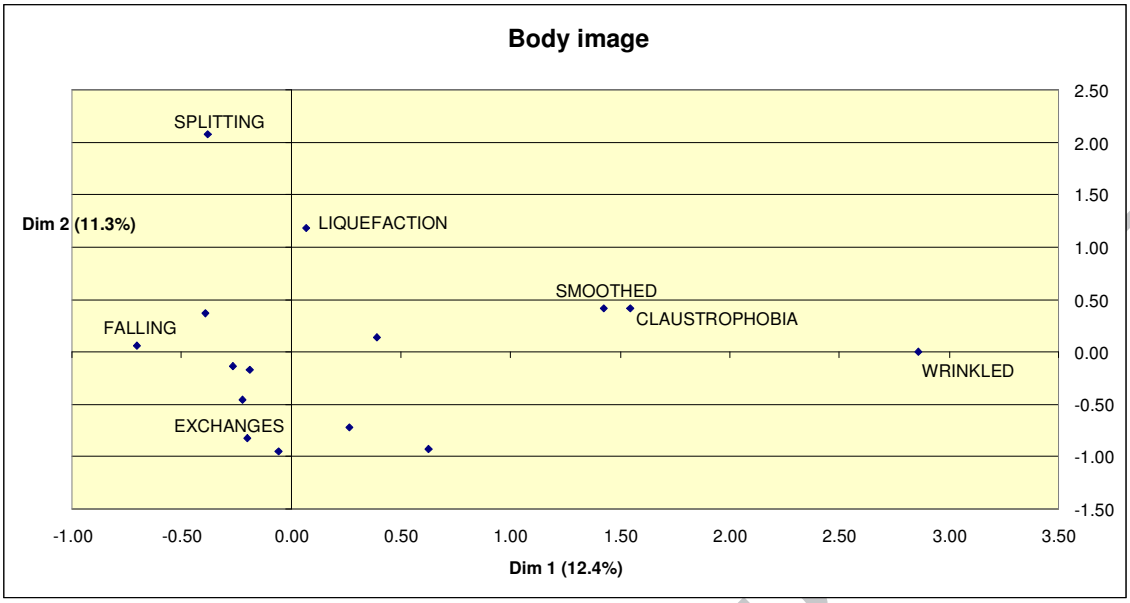


**Figure 5A. Graphic display of the "Body image" variables on correspondence analysis axes (dimensions 1 and 2)**

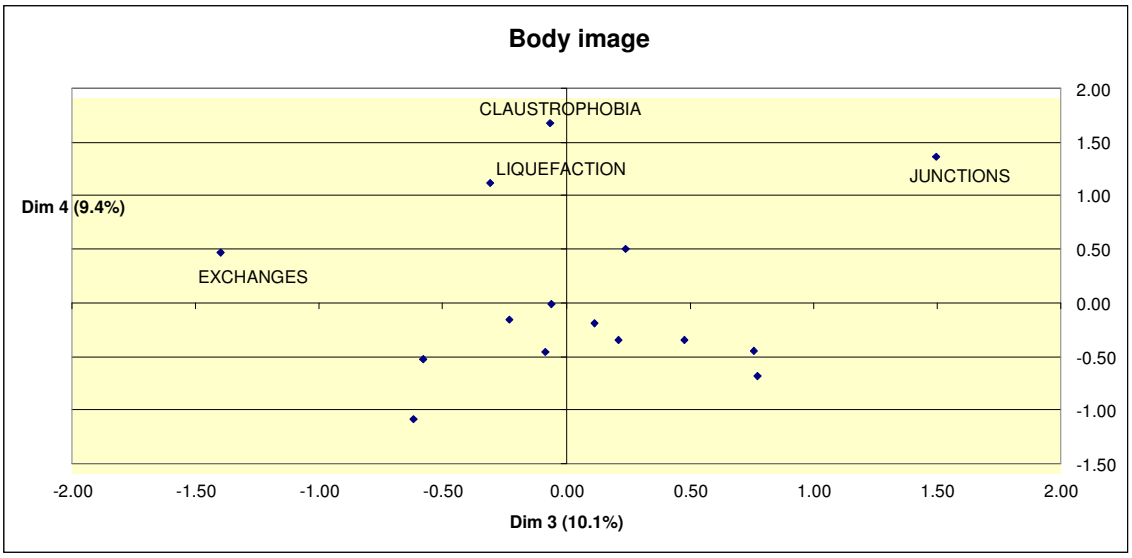


**Figure 5B. Graphic display of the "Body image" variables on correspondence analysis axes (dimensions 3 and 4)**

## Table 2. Grid of stages in children with autism under treatment

### 1) Severe Autistic State

| Expression of emotion in relationships | Eye contact | Body image |
|---|---|---|
| - seeking sensations, not emotions.<br><br>- tantrums: paroxysms of rage connected with fits of acute anxiety and body disorganization ; occur when child is forced into relationships or is interrupted in autistic manoeuvres (stereotypes).<br><br>-very primitive type of hypersensibility to ambient emotional states (indirectly shown by intensified stereotypes or rituals, even by a trantrum in the case of tension or anxieties of those around ; relaxation in opposite circumstances). | -absent<br><br>-avoidant–sticking without penetration – slipping off.<br><br>-peripheral (seeking outline for own body; wanting to stick to other people or things). Must be distinguished from paranoid watching from corners of eyes (where persecutor is behind). | -urgent need to keep stereotypes going almost incessantly, connected with fact that child has no envelope.<br><br>-self-supporting posture that may result in walking on tiptoe as though trying to levitate (struggle againt gravity, child seems "weightless").<br><br>-body excessively rigid, or slack.<br><br>-acute anxieties of falling and being liquefied associated with fears such as t fear of slopes , terror of water draining from sink or terror of toilet flushing.<br><br>-spinning to counteract these anxieties.<br><br>-absent or limited use of certain parts of the body, mainly the area around the mouth: soft or flaccid mouth, dribbling saliva as a sign of a non-shuterised mouth.<br><br>-smoothed face (or face with wrinkles). |

**1) Severe Autistic State (continued)**

| Verbal language | Graphic productions | Exploration of space and objects | Time perception |
|---|---|---|---|
| - speech nonexistent<br><br>- or echolalic (echoes tacked on immediately or follow later)<br><br>- voice generally on a single note and high pitched<br><br>- piercing screams<br><br>- whispered voice<br><br>- loud voice | -nonexistent<br><br>-lines shoot off in one direction or trickle away, usually devoid of elementary rythm. Particular opposition to drawing on a detachable surface. | -little or no exploration of objects.<br><br>-objects used as "autistic objects" (hard objects in his hand or mouth).<br><br>-one-dimensional space : child frozen, using highly specific, single-sense stereotype (e.g. gaze fixed on ceiling).<br><br>-two-dimensional space :<br>.functioning along two sensory channels (e.g. child clings to sight and sound).<br>-struggle against three-dimensional shapes: child alters anything hollow to make it flat or smooth, avoiding orifices and extremities ("holes and bumps"). | -one-dimensional time: time abolished with reduction to one sensory channel (e.g. child lost in contemplation of a spot).<br><br>-two-dimensional time: circular time with ritualization, pursuit of non-variants, noticing cycles (the same things keep coming back). |

## 2) Stage of Recovery of the «First Skin»: Beginning of the Symbiotic Phase

| Expression of emotion in relationships | Eye contact | Body image |
|---|---|---|
| -emotional links made (perhaps via colours or a sound envelope).<br><br>-impulses to tear out (demonstrations of acute anxiety about losing the primary envelope again).<br><br>-trantrums: when the child parts from an adult body or when frustation in contact or instinctual urges (no longer simply when stereotypes are interrupted).<br><br>-possessive and usually gleeful attaks on the face.<br><br>-developmental milestones corresponding to 3rd month of infancy for the feeling of envelopment.<br><br>-oscillation between jubilation and fear when eye contact is rediscovered. | -moves between hyperpenetration and withdrawal: eye contact alternately fleeting and hyperpenetating.<br><br>-indirect penetration with sometimes indirect signs of wanting to prick eyes to get through beak-eye e.g. pencil-point in doll's eye.<br><br>-often plunging straight into another person's eyes, going up to their face until Cyclops effect is obtained (impression of a third eye in the middle of the forehead).<br><br>-demonstrations of the fantasy of sticking to the bottom of the head : going round to stick behind someone's head after having "gone into their eyes". | - seeking back support combined with penetrating eye contact.<br><br>- enclosing their own bodies in encircling containers (tyres, hoops, rolling up in the curtains) which suggests they are recovering a feeling of envelopment.<br><br>- sometimes wanting to be squeezed (by being hugged, or more often by wedging themselves between chairs and tables or in narrow spaces), with simultaneous signs of claustrophobia: claustrophobic reactions to clothes, containers, groups (acute anxiety about crushing, suffocating squashing, which may later permeate their oral and anal sadism but seems primitively linked to projection of previous autistic "clinging to").<br><br>-signs of recovery of the area around the mouth with signs of acute anxiety about losing it again: checking out contours of mouth area against everywhere in environment, touching mouth with fingers; exploration of spittle, explosive mouth noises.<br><br>-play with pipes or circular wrapping. Concerns mainly the top of the body: head, hand. |

**2) Stage of Recovery of the «First Skin»: Beginning of the Symbiotic Phase (continued)**

| Verbal language | Graphic productions | Exploration of space and objects | Time perception |
|---|---|---|---|
| -spontaneous vocal exercises but with very few imitations.<br><br>-impulse of lalling.<br><br>-vocal play seems to express perception and construction of a body-ego in the context of relationships with other people. Internalization of the "return loop" of relationships in the theatre of the mouth. | -sometimes nonexistent.<br><br>-marking becomes possible on a hard support or if in physical contact (e.g. if hand or back is supported). Hand outlines possible in some more developed children.<br><br>-simple rhythmical scribbles, dots, and spirals, usually done on a solid surface. | -children find bearings in three-dimensional space:<br>. .exploration with well separated index finger of hollows, folds, bumps, and containers ; beginning to put one thing into another<br>. .exploration of architectural space: contours of rooms. | -threshold between circular and oscillating time (belief in reversibility of time with feeling of control and megalomania). |

**2) Established Symbiotic Phase: 1. Vertical Splitting**

| Expression of emotion in relationships | Eye contact | Body image |
|---|---|---|
| -hypomanic, often elated state (songs...).<br><br>-mixture of excitement / emotion / enthusiasm of ideal-object type.<br><br>-signs of envy.<br><br>-this stage begins to have features in common with the symbiotic psychoses (emotion appear). | -squinting to avoid binocular and distance vision.<br><br>-oral eye contact: eyes assimilated to mouth ("devoring eyes").<br><br>-eye contact swept into problematic of oral drives: danger of devoring with or being devored by the eyes. | - problems connected with vertical splitting of the body image:<br>(a) pathological aspects: taking other people's hand to do things, sticking one side to another person's side, possibility hemiplegic posture or excessive tightness around the vertical axis, etc...<br>(b) restorative aspects: connections between both sides, clasping hands, self-supporting posture (holding up one half of the body with the other). If already drawing on one half of a sheet of paper, encroachment into and occupation of the other half,etc |

**3) Established Symbiotic Phase: 1. Vertical Splitting (continued)**

| Verbal language | Graphic productions | Exploration of space and objects | Time perception |
|---|---|---|---|
| -speech possible, echoing or with various splits :<br><br>-mute-child uses half-words or uses vowels only in order to avoid consonants.<br><br>-play with double syllables (dada, titi...) in a normal tone of voice. | -drawing possible on a detachable surface.<br><br>-spirals or rhythmic sweeping become upright.<br><br>-representation of half an object or half-space.<br><br>-interest in duplication (photocopies, carbonpaper, etc.). | -interest in corners (child wedges oneself in vertical (corners).<br><br>-interest in verticality (vertical folding and cutting-out).<br><br>-interest in pairs of objects and in comparing and contrasting. | -possible alternation between circular and oscillating time. |

**3) Established Symbiotic Phase: 2. Horizontal Splitting**

| Expression of emotion in relationships | Eye contact | Body image |
|---|---|---|
| -hints of awareness of separation and of a separate identity, but still with a little infantile omnipotence.<br><br>-fear of being crushed, of feeling oneself good for nothing, often concealed behind a tyrannical manner.<br><br>-manic-depressive mood swings: the manic state has more and more sexual and anal imput. Increasingly strong erotization in manic moments. Euphoric possessive control with sadistic features.<br><br>-hidden depressive moments of melancholic type (child prostrate or atonic).<br><br>-risk of perversion if anal mastrubation predominates in manic fantasy.<br><br>-mutual moments emerge in relationships with tender interchanges. | -almost normal exchange of eye contact has generally been recovered.<br><br>-eye contact more luminous, responsive, sometimes perverse. | -horizontal splitting together with confirmation that investment has been made in the lower half of the body including the anal and sexual zones.<br><br>-sometimes demonstrations of a feeling that top and bottom are hinged e.g. folding body in half in different positions.<br><br>-possibly claustrophobic fear of enclosed places, especially if they feature in anal masturbation (concentration camp theme) with sadic games of possession. |

**3) Established Symbiotic Phase: 2. Horizontal Splitting (continued)**

| Verbal language | Graphic productions | Exploration of space and objects | Time perception |
|---|---|---|---|
| -imitation of the music of speech.<br><br>-possible splits: words music or horizontal splits (upper voice, lower voice).<br><br>-"string words" i.e. continuations of the sound of certain words in an effort of making the sound reach all the way to the other person (e.g. "chien...in...in...in").<br><br>-eargerness to acquire vocabulary, repetition of words. | -spiral axis becomes horizontal (control spirls in clockwise direction).<br><br>-half drawings stuck together horizontally.<br><br>-representations of body halves: lower body, upper body (horizontal section).<br><br>-continues to make dots: dots may be enclosed in outlines.<br><br>-more frequent use of colour. | -interest in top and underneath parts of spaces, objects and containers.<br><br>-horizontal folding and cutting out.<br><br>-more complex constructions with fitted parts.<br><br>-possibly repetitive alignment and agglomeration of objects with little variation. | -threshold between oscillating and linear time with reduced megalomania. |

**4) Individuation Stage**

| Expression of emotion in relationships | Eye contact | Body image |
|---|---|---|
| -confirmed capacity to experience separateness (introjection becoming more stable).<br><br>-more confidence in seeking genuine in relationships.<br><br>-signs of sibling and Oedipal rivalry.<br><br>-violent angers possible (of the two-year old type).<br><br>-moments of genuine tenderness become possible, with concern for the other person.<br><br>-developmental issues appropriate to the second year of life. | - sparkling, with lively exchanges. | -capacity for total bodily separation.<br><br>-the mirror stage is confirmed.<br><br>-investment in open space; pleasure in wandering about and climbing, now freed from earlier acute anxieties about space.<br><br>-bowel control.<br><br>-seeking "face to face" exchanges, allowing space between bodies (perception of two totally separate people). |

**4) Individuation Stage (continued)**

| Verbal language | Graphic productions | Exploration of space and objects | Time perception |
|---|---|---|---|
| - connecting two words, followed by increasing complexity in grammatical structure.<br><br>-improvement in prosody (music of speech with intonation and emphasis) and internalization of dialogue link.<br><br>-appearance of "NO!"<br><br>-language for social niceties (well done! goodbye, etc.)<br><br>-some anomalies may persist in tonality or preciosity. | -closed circles.<br><br>-appearance or radial shapes.<br><br>-figurative drawings now possible (potato men, suns, people, filling-in, cross axes, squares, rectangles, landscapes).<br><br>-lingering pathological traits: scrupulous avoidance of human figures. Predominance of abstract shapes. Exaggerated filling-in of background. | -games of hide and seek.<br><br>-games of container / contained with decanting, wrapping, and putting one thing inside another.<br><br>-opening and closing things (window, door, box).<br><br>-offers or explores the circuit of sending – getting back (putting objects in the other person's hand and taking them back).<br><br>-persistent repetitive manipulation of objects. | -linear time with awareness that time inexorably passes (it is the time of separation). |