**Item-to-Construct Voting Instructions**

Please rate each item on a scale of 0-3 in terms of its relevance to a given construct, with 3 being essential to the construct, 2 being related, 1 as maybe related, and 0 as being unrelated. Below, you will find a brief passage on how each theory describes their core constructs, with minimal editorializing. Constructs from M&E are in green, R&P in red, and O&R in yellow.

**Mostofsky & Ewen, 2011**

***Motor Skills (emphasis as in original)***

*“Of greater relevance, clinical histories of children with autism reveal a particular difficulty with learning skilled motor tasks (Gidley Larson and Mostofsky 2006) in which internal action models are implicated. Although it is common for children with autism to have intact acquisition of early motor milestones that involve innate reflexive capacities (e.g., sitting up and walking), nearly all children with autism show delays and abnormalities in the acquisition of a wide range of learned skilled gestures, including those necessary for motor/adaptive functioning (e.g., peddling, pumping legs on a swing, various dressing skills and handwriting; Fuentes and others 2009), as well as social/ communicative function (e.g., waving goodbye).”*

*Given that autism is a uniquely* ***developmental disorder****, it follows that investigation of differences in the* ***acquisition*** *or* ***learning*** *of skilled actions may be particularly relevant to autism. A model of anomalous skill-based (“procedural”) learning may therefore be a key component to mapping the neural basis of autism and for identifying effective therapies. Examination of procedural learning at the level of motor behavior, rather than “more complex” social/communicative behavior, is advantageous.*

***Social Skills***

*Although it is common for children with autism to have intact acquisition of early motor milestones that involve innate reflexive capacities (e.g., sitting up and walking), nearly all children with autism show delays and abnormalities in the acquisition of a wide range of learned skilled gestures, including those necessary for motor/adaptive functioning (e.g., peddling, pumping legs on a swing, various dressing skills and handwriting; Fuentes and others 2009), as well as social/ communicative function (e.g., waving goodbye).*

*“This strongly suggests that similar mechanisms (i.e., internal action models) may underlie impaired development and execution of both motor skills and social / communicative skills in autism. In this sense, it is plausible to consider that autism reflects a developmental dyspraxia of social/communicative skills.”*

*“Given that much of the sensory feedback for social interaction comes from the visual modality, the consequence of a weaker than normal association between motor commands and visual feedback is that children with autism may develop a “dyspraxia” for social (in addition to motor) skills. The conceptualization of the role of internal action models in both social as well as motor skill development is strongly supported by our published findings that reveal that the degree of bias toward proprioceptive feedback (and away from visual) during motor learning robustly predicts social and communicative deficits in autism, in addition to praxis and imitation impairment.”*

**Rogers & Pennington, 1991**

We have included verbal language, imaginative play, and nonverbal communication under the umbrella supra-construct “symbolism.” Therefore, the lower-level constructs should be focused on the symbolic features of verbal language, for example, rather than other aspects (RRB-like aspects of language).

***Nonverbal Communication***

*Without some knowledge of other minds, the autistic child cannot develop with the mother a nonverbal repertoire of sharing meanings and so has no communicative foundation to help interpret symbolic verbal behavior. This view would explain the common history in autistic children of early words that drop out or do not progress. We would suggest that in such cases, the biologic readiness for speech demonstrates itself, but without a nonverbal communication system already in place, the early words cannot be incorporated into an already existing communicative framework, meaning cannot be inferred, and, serving no function for the child, words drop out of the child's repertoire.*

***Imaginative Play***

*“In normal children, symbolic play is believed to evolve out of three capacities: the capacity for deferred imitation; the capacity for referential communication; and the capacity for representational thought that children demonstrate in the second year of life (Piaget, 1962; Werner & Kaplan, 1963).”*

***Affect Sharing (with respect to Hobson & Hobson, 1989)***

*“Hobson (1989, 1990) suggested that the autistic child's deficits in cognition, language, and symbolic play stem from a primary affective disorder involving the child's constitutional emotional reactivity, including deficits in emotional expression and perception, on the one hand, and the child's inability to develop reciprocal, affectively based relationships with others, on the other. These deficits prevent the autistic child from developing intersubjective awareness of self or others, resulting in the autistic child's "failure to recognize other people as people with their own feelings, thoughts, wishes, intentions" (1989, p. 23), as well as in a severe impairment in the capacity to think abstractly or symbolically.”*

*“Other laboratories have reported evidence of specific deficits in affective expression and affect sharing in autistic children when compared with control groups. These include less positive affect, more negative affect, and more unreadable or mixed affective expressions, less direction of affect displays to a social partner, less use of gaze to communicate affect, and less mirroring of partner's social smiles (Dawson, Hill, Spencer, Galpert, & Watson, 1990; Hertzig et al., 1989; Kasari, Sigman, Mundy, & Yirmiya, 1990; MacDonald et al., 1989; Mundy, Sigman, Ungerer, & Sherman, 1986; Snow, Hertzig, & Shapiro, 1987; Tantam et al., 1989; Yirmiya, Kasari, Sigman, & Mundy, 1989).”*

***Verbal Language***

*“… common history in autistic children of early words that drop out or do not progress. We would suggest that in such cases, the biologic readiness for speech demonstrates itself, but without a nonverbal communication system already in place, the early words cannot be incorporated into an already existing communicative framework, meaning cannot be inferred, and, serving no function for the child, words drop out of the child's repertoire. However, as social knowledge and early communicative behaviors slowly increase, autistic children develop some shared meanings and many eventually develop verbal language.”*

***Social Engagement (Joint Attention)***

*“… the earliest behaviors that clearly indicate the infant's growing awareness of others' minds are joint-attention behaviors, behaviors that direct another person's attention to an object of interest in the environment: pointing, reaching, showing an object, looking back and forth between the object of interest and the adult's face, following another's gaze or point, first seen in the 9-12-month period. It is widely accepted that young autistic children are deficient in the use of joint attention behaviors (Curcio, 1978; Loveland & Landry, 1986; Mundy & Sigman, 1989a; Mundy, Sigman, Ungerer, & Sherman, 1986; Wetherby & Prutting, 1984).”*

**O&R 1968**

***Distinguishing Self from Nonself***

*Failure to Distinguish Between Self and Nonself: Lack of interest in eye contact, Absent social smile, Failure to play "peek-a-boo", Let objects fall out of hand, Use others as extension of self, Pronoun reversal*

***Verbal Language***

*Disturbances of Language.—Frequently, there is a complete failure of speech to develop. When and if speech does develop, it is often poorly modulated, atonal, arhythmic, and hollow sounding without communicative or affective content. The most prominent specific type of pathologic language is called echolalia. Also, characteristic is pronoun reversal.*

*In the language area he may use a few words at 10 months and fail to use words again until 2 years old, or the early use of words may be followed by a long delay in joining them into phrases. Further, he may successfully perform some skill such as crawling and then may not ever do it again. Some of the children have been described on the one hand as slow and on the other hand as showing precocious motor and language development.*

**Capacity to Relate**

***Relationship to the Environment and Language.*** *Disturbances of relating and disturbances of language are best considered together; as with increasing age, the capacity to relate depends markedly on the capacity to communicate with others. It has been observed that speech may not develop by the age of 5, in which case the autistic child becomes less and less distinguishable from the large group of severely retarded children. Absence of speech has been correlated with low intelligence. Those autistic children who develop noncommunicative speech and progress no further, when seen again at 10 to 15 years of age, tend to look much as they did when younger. If they develop communicative speech by 5 years of age, then several possible courses of development are open. First, language capacity may be quite rudimentary. Communications are literal and concrete, with minimal capacity for abstract thought. Affect tends to be flat, and they do not become emotionally involved with others.*

***Disturbances of Relating:*** *Deviant eye contact, Absent social smile, Delayed anticipatory response, Limpness or stiffness when held, Bizarre or stereotyped use of toys, Failure to play "peek-aboo," etc., Use others as extension of self, Lack of emotional responsiveness*

***Perceptual Inconstancy***

*The symptoms suggest that [autism] is characterized by dissociated, uncoupled, and alternating states of excitation and inhibition. It is this pathophysiology which interferes with the adequate homeostatic regulation of perception and leads to a state of perceptual inconstancy.*

***Disturbances of Perception.****—Heightened awareness, hyperirritability, and obliviousness to external stimulation all may occur in the same child. All modalities of sensation may be involved. While auditory changes are most often noted, unusual perceptual aberrations may be seen in the visual, tactile, gustatory, olfactory, proprioceptive, and vestibular senses.*

***Heightened Awareness of Sensory Stimuli****.*

***Auditory****. - Attention to self-induced sounds (eg, scratching of surfaces), attention to background stimuli, ear-banging, ear-rubbing, and flicking of the ear are observed.*

***Visual****. Prolonged regarding of writhing movements of the hands and fingers, brief but intense staring, and scrutiny of visual detail are noted.*

***Tactile****. The auditory and visual scrutiny is paralleled by passing the hands over surfaces of varying textures.*

***Olfactory and Gustatory****. Specific food preferences, according to taste and smell, and repetitive sniffing occur.*

***Vestibular****. The children are unusually aware of things that spin and can become preoccupied with car wheels, phonograph records, or washing machines—far beyond the interest expressed transiently by normal children.*

***Heightened Sensitivity and Irritability.***

***Auditory****.—Unusual fearfulness of sirens, vacuum cleaners, barking dogs, and the tendency to cover the ears in anticipation of such sounds are observed.*

***Visual****.—Change in illumination will occasionally precipitate fearful reactions.*

***Tactile****.—There may be intolerance for certain fabrics. The children often do not accept wool blankets or clothing against the skin, and show a preference for smooth surfaces.*

***Gustatory****.—A specific intolerance toward rough textured "junior" or table foods is observed.* ***Vestibular****.—A marked aversion to being tossed in the air or to ride in elevators occurs. Intense interest and pleasure in spinning objects may alternate with fearful, disturbed, and excited reactions to them.*

***Nonresponsiveness.***

***Auditory****.—Most notable is the disregard of speech and the lack of detectable behavioral response to loud sounds.*

***Visual****.—These children ignore new per¬ sons or features in their environment. They may walk into or through things or people as if they did not exist.*

***Tactile****.—Early in the first year of life, they may let objects placed in the hand fall away, as if they had no tactile representation.*

***Pain****.—These children may not react with evidence of pain to bumps, falls, or cuts.*