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Abstract

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Keywords

social, attention, joint, objects, transitional, robotics, beyond, towards, autism, interactions, triadic

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Towards Triadic Interactions in Autism and Beyond: Transitional Objects, Joint Attention, and Social Robotics

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The concept of *transitional objects* from the British *Object Relations* school of psychoanalysis may offer insight into the affective aspects of the development of dyadic and triadic interactions. Furthermore the concept may be applied to the use of social robotics in autism research and therapy, with social robots in these settings perhaps functioning as transitional objects for autistic children. Possible applications in organizational contexts are suggested as well, along with considerations of future research relating *transitional objects* to the notions of *primary* and *secondary intersubjectivity*.

INTRODUCTION

Recent use of robots for autism research and therapy has received increasing attention, both in the scholarly and popular press (Kozima et al 2009, Mone 2010). Such work may be approached from multiple disciplinary perspectives, from cognitive psychology to robotic engineering. Here we suggest that input from a relatively neglected and often maligned field, psychoanalysis, may illuminate the promise of social robotics for autistic children. Specifically, robots in these contexts may be playing the role of a *transitional object* in facilitating interactions between child, caregiver and the environment. This concept comes from D.W. Winnicott, a pediatrician and psychoanalyst associated with the British *object relations* school of psychoanalysis, and unlike other psychoanalytic ideas is generally considered theoretically and therapeutically reputable (Frankland, 2010). According to Winnicott, a transitional object is an inanimate possession, usually a toy or maybe a blanket (imagine Linus from *Charlie Brown*), that the child attaches to as it moves from direct dependence on a caregiver (usually the mother) towards understanding and navigating an independently existing world (Winnicott, 1953). This transition involves the movement from dyadic to triadic interactions, which entails the capacity for shared intentionality and joint attention. While typically developing children can manage with a strictly inanimate object as a transitional object, children with autism may need an added degree of animacy and interactivity for the transition to triadic interactions to emerge. Whether the robotic interaction helps autistic children move from the subjective toward the objective world, or from objects towards people, or both, is an open question to explore.

This rise in the role of robots in autism therapy indicates further implications and applications for human-robotic social interaction. For example, these notions may also relate to organizational settings, where groups or teams relying on robots or other technological artifacts may be viewed as developing entities onto themselves in need of transition and cohering. While a robot could serve as an object of care, almost like a child or a pet, for human team members, it may also serve as a point of joint attention, a common object that helps to enable the team as an emerging entity. In this sense, then, the robot might function as something of a transitional object for the group or team as a whole, again as a shared

point of joint attention and focus that in turn fosters interaction with the world. We conclude by considering future directions for research, particularly the relation of transitional objects to processes of *primary* and *secondary intersubjectivity*.

TRANSITIONAL OBJECTS

Winnicott, in his seminal introduction of the concept (*Transitional Objects and Transitional Phenomena: A Study of the First Not-Me Possession*, 1953), discusses a wide range of possible objects and behaviors in terms of *transitional phenomena*. Although inclusive and expansive as a category, we will venture a condensed description of the concept itself, which requires a preliminary sketch of early infant development, as detailed by certain strains of psychoanalysis. Again, despite the disrepute of psychoanalytic theory generally, it is potentially elucidating as a kind of *speculative phenomenology of early childhood*, with its investigation of the initial emergence of the sense of self in relation to others. Freud's original elaboration focused primarily on the Oedipus complex, on the dynamic between child, mother and father occurring roughly between the ages of 3 to 6 years; the project of expounding the earlier pre-Oedipal stages was taken up by the British school of object relations, with Winnicott especially expanding upon the early relationship of infant and mother (Rycroft, 1995). Winnicott speculates that a *seamless oneness* permeates the experience of early infancy. In this state, the needs of the infant are (more or less) immediately met by the mother (or primary caregiver), and so there is no experience of separation between need and gratification, desire and satisfaction; the very existence of desire guarantees its satisfaction, as the appearance of desire and the presence of its fulfillment are experienced seamlessly as one and the same. The world, for the infant, seems to exist solely and exclusively to answer desire, to meet it in immediate responsiveness. And while this phase may be something of a theoretical idealization, approximated only perhaps by prenatal union in the womb (indeed this stage of seamless oneness is precarious from the start, for presumably a newborn would not cry at all if this state of symbiotic union were perfectly preserved), such an extrapolation does hold some explanatory power, positioning subsequent conceptions of need and desire in relation to a point of comparison, however asymptotic. The phenomenon of magical thinking, for example, in which

people, in certain states of trauma, believe what they wish were the case, that the world is just so in accord with their desire, may be viewed in terms of regression to this pre-Oedipal phase of infantile oneness with the world (e.g., Subbotsky, 1994).

This undividedness, of course, cannot last, and the reality of a world existing independently of infantile desire starts to make itself felt. The infant begins to recognize that it is possible for its needs to go unmet, which involves, crucially, the recognition that the primary caregiver is a separate person. And while the infant, in non-pathological cases, feels that it may continue to depend upon the primary caregiver for nourishment and security, there is nevertheless a growing sense that the world itself does not depend on its desire. Thus external reality is first identified as that which refuses to satisfy desire: that is, reality, as *reality*, is primarily identified as painful, as an insult and injury to that infantile sense of omnipotence, of permeating oneness with, and magical control over, the world. And so by the same token the *self*, in its original, originating sense, is elementally identified by the emptying of desire, by desire divested of its object. That is, the sense of self is primarily identified by, indeed primarily appears *as*, the emptiness and independence of desire itself, torn from the world with which it once communed. The process of individuation, then, the emergence of a sense of an independently existing self inhabiting an independently existing world, is intrinsically traumatic (Trilling, 2000).

This starkly drawn sketch seeks to make clear the disillusionment inherent in the psychoanalytic picture of development. Yet part of Winnicott's project is to highlight the positive and adaptive aspects of coping during development, and emphasize the possibility of investment in the world in the face of its emotional divestment (Storr, 1989). Again, although the infant, if well cared for, feels secure in the environment provided by the primary caregiver (what Winnicott calls the *holding environment*), the move from the illusion of magical omnipotence to a sense of helpless dependence nevertheless represents a fundamental (and of course necessary) break, and the infant finds itself in a bare objective world that no longer answers to its wishes (indeed *objectivity* here is understood precisely as the refusal of wishful thinking). But the infant also begins to become aware of its ability to move its own body, and comes to see that, while the outer world itself may not directly obey its commands, its body, however haltingly, does, and may be used to move towards and to handle objects out in the world. This marks the beginning of a sense of manipulation, and hence of objects being manipulable. Another means of acting on this emerging object-directed attitude is through the gestural and vocal expression of needs and desires to physically competent grownups, marking the start of communication and the gradual process of making intelligible to others one's wants and needs, in the ongoing negotiation of desire and expectation that constitutes socialization. Thus the infant discovers, along with its own developing manipulability and physical coordination, that other people may be *addressed* to help to attain its objects and goals. This mixture or package of interpersonal interaction and the exertion of control over objects may be viewed as the move from a strictly dyadic and

dependent relationship between infant and caregiver towards triadic interactions involving infant, caregiver and the environment.

The question arises, however, of whether the infant would even be drawn towards the world, rather than withdrawn from it, given the very existence of external objective reality as *painful*, its identification as that which repudiates desire. It is here that the concept of *transitional objects* plays its central facilitating role. At this point it is worth noting that Winnicott developed his ideas through attentive observation of infants and children. And, for all of the aforementioned theoretical speculation, the phenomena of transitional objects themselves are quite open and available to everyday view, as the soft doll or toy that the child cannot do without, or the blanket or piece of fabric, and so on. Yet the theory helps explain the phenomenon, illuminating its importance in terms of the deep need it serves the child. The child's thoroughgoing attachment to the transitional object is partly accounted for by its status as a substitute for the caregiver (in the original formulation, a substitute for the mother, more specifically the mother's breast), as a symbol of the safety of that primary relation. But the object is termed *transitional* for a reason, and not only serves as a reminder of a previous state but plays a *transitive* role as well, namely to foster an affective directedness towards the world and its objects. For in order for the infant to feel *moved* towards the world, the world must be in some sense inviting, responsive to engagement. Hence, in the wake of the traumatic fissure between self and world, the child imbues objects with affect and feeling, in order to both cope with the trauma of disillusionment and dependency and to form attachments with the outside world. Winnicott takes care to emphasize the *not-me* status of the transitional object for the infant: the object itself is understood as *real*, as not under the fantasy of omnipotent control, yet it nevertheless retains an element of fantasy, as a token or memento of that once magical control. So perhaps the child can feel that at least a small part of the world of objects is still under the spell of its fantastical control. Indeed, laying claim to the transitional object is a manifestation of the child's growing capacity for physical manipulation and control, an expression of its ability to *subject* objects to its desires. The transitional object, after all, is a *possession*, something over which the child exerts exclusive rights. At the beginning of the appearance of transitional phenomena, a single possession tends to serve as *the* transitional object. However, Winnicott speaks of transitional phenomena eventually spreading out "over the whole cultural field," informing an intermediate realm between "inner psychic reality and the external world" (91). Transitional phenomena, then, come to form a space where desire and emotion are not repudiated but *interfused* into the activities themselves. This is a space of imaginative engagement and play, in which a child becomes absorbed in fantasy, where toys and objects are *magically* infused, where adults engage in art and ritual, and where culture in general allows us to make a home for ourselves in the world. In this intermediate area of creative fantasy, nevertheless subject to reality-testing, the world of objects may still be imbued with emotion, responsive to, and invested with, meaning and value.

TRANSITIONAL OBJECTS AND JOINT ATTENTION

These dynamics may be viewed as affective aspects of what is conceptualized in cognitive terms as *joint attention*, with the development of dyadic and triadic interactions comprised of parallel streams of emotion and cognition, affect and attention. As described in the cognitive literature, strictly *dyadic* relations describe mental interaction and exchange between two people, the sharing of attention from one self or *mind* to another, whereas *triadic* relations entail the introduction of a third entity, whether an object or another person, into the interaction. Again, dyadic relations tend to characterize early infant attachment with the primary caregiver, while triadic relations indicate the capacity to conceive of a world of independently existing persons and objects. The capacity for *joint attention*, in which attention concerning a third object or person is reciprocally shared between two people, is central to triadic interactions (Tomasello & Farrar, 1986). This triangulation between people and objects in the world is crucial to a sense of a shared interpersonal world, which in turn is central to the notion of an independently existing objective world (Davidson, 2001). The concept of transitional objects brings to the fore the affective aspects of these interactions, providing insight into the needs and motives driving their development. For instance, in order for the world of objects to hold an infant's attention, it must also hold the infant's *affection*. And these common objects are introduced to the infant under the eye of the caregiver, with the other person serving as gateway and guide to the objective world. Thus the interpersonal is required to relate to the world, to inhabit it, learn about it, and engage with it (Tomasello et al, 2005). To a certain extent the relation between joint attention and affect has been recognized: indeed infant smiling is used to gauge attention (Stahl & Striano, 2005); however, the theoretical relationship, we argue, may be elaborated by the notion of transitional objects.

There is the question, though, of the temporal relation of transitional objects to joint attention. On the one hand, the criterion of physical manipulability obviously places the emergence of transitional objects per se, in the sense of a single object consistently handled and carried by the child, later than joint attention. For transitional objects in their fuller manifestations are part and parcel with the ability to physically interact with objects, to exert a certain degree of control over them. However Winnicott states: "I suggest that the pattern of transitional phenomena begins to show at about 4-6-8-12 months. Purposely I leave room for wide variations." (91) Winnicott includes as early instances of transitional phenomena an infant's handling and mouthing of immediately proximate objects (e.g., the corner of its blanket), and so as nascent indications of directedness towards objects and others. This timeline matches recent infant studies of joint attention and object-directedness, in which sensitivity to triadic interactions has been detected as early as 3 months (Striano & Stahl, 2005). Thus the broader category of transitional phenomena, as delineated by Winnicott, appears to be roughly coextensive with the phenomena of triadic interactions as experimentally ascertained so far.

AUTISM, TRANSITIONAL OBJECTS, AND SOCIAL ROBOTICS

Autism Spectrum Disorder (ASD) is marked by deficits in both dyadic and, especially, triadic interactions, capacities at the core of social interaction (Baron-Cohen 1997, Charman 2003). Again, approaching these social developmental deficits via transitional objects may illuminate the emotional and affective aspects of autistic interaction with others and with the world. The preponderance of tantrums and repetitive behaviors, for instance, indicates the intensities and deep frustrations of many autistic children, and any insight into potential coping and soothing interventions may help with the difficult transition into social life. Indeed Temple Grandin's "squeeze machine" (Sacks, 1995) is a famous case of self-administered therapy that might be interpretable along the lines of Winnicott's notion of the *holding environment*. Furthermore, it appears an open question as to whether people with autism suffer from a *deficit* in social responsiveness, and hence are more comfortable interacting with comparatively predictable physical objects and systems, or whether they suffer from an *excess* of social responsiveness, to the point where they are *overwhelmed* by other people and hence find refuge in the world of objects. While both may lead to similar behavioral profiles, the difference may make a difference for therapeutic theory and intervention. For instance, dysfunction in social filtering has been hypothesized in autism (e.g., Kozima et al, 2009), resulting in difficulty in selectively filtering meaningful social information. This sense of finding the social world painful and bewildering in its complexity might be addressable in terms of transitional objects, with transitional objects functioning as possible buffers or mediators between the physical and social worlds.

Robots may be seen as such intermediate entities, and indeed social robots have been used in autism research and therapy to facilitate social interactions in children with autism, with the Aurora Project (Robins et al, 2004) and *Keepon* (Kozima et al, 2009) as representative examples. *Keepon*, a robot designed for "facilitating the exchange of attention and emotion with people" (Kozima et al. 2009), has been shown to successfully act as an interpersonal "pivot", an anchor for shared attention and interpersonal interaction between autistic children and caregivers. In therapeutic play sessions, *dyadic* and *triadic* interactions emerged between some of the autistic children, *Keepon* and the therapist or caregiver. The simple toy-like features and minimal embodied movements of *Keepon* evoke and express the basic mental capacities of *attention* and *emotion*. In other words, it can demonstrate both *external* directedness toward objects in the environment (attention) and *internal* evaluative responses to those objects (emotion). These basic functions, of appearing to attend to objects and to process them emotionally, coordinate to simulate and facilitate dyadic and triadic interactions, enabling the robot to serve as a focal point for autistic children in the emergence of joint attention. Again, difficulty with basic dyadic interactions, and the seeming impossibility of triadic relations, predominantly characterize the social cognitive deficits of autism. However, Kozima and his colleagues keenly observe that *Keepon's* promotion of mutual

interpersonal interaction between autistic children and caregivers indicates the presence of intact motivation on the part of autistic children to share and express their emotions and intentions.

Further explanations of the effects of these robotically-facilitated therapeutic situations center on the conception of social robots as intermediaries between the human world and the object world, between the social intentional world and the physical world of objects. On the one hand, the therapeutic benefits of social robotics may be explained in terms of the robots functioning as simpler and more predictable social entities, and hence as a less complex and unpredictable entry into social relations. This explanation fits with the conception of autism as involving an essential social cognitive deficiency or *lack*. However, if the social difficulties of autism have to do rather with an excess of social responsiveness, of being overwhelmed by complex social stimuli, then the benefits of social robotics become more a matter of emotional management, of containment of and coping with these overwhelming social responses, in which case the robot's status as a transitional object becomes more prominent. It might be said, somewhat simplistically, that the former explanation has a more cognitive inflection, while the latter is endowed with a more emotional dimension. But of course "cognition" and "emotion" intimately and inextricably interact, with cognitive simplicity and emotional security ultimately going hand in hand. Indeed the reduction of cognitive complexity may be seen as intrinsic to transitional objects generally, as central to their ability to foster a sense of manageability and control (Wastell, 1999). Thus the fact that these social robots simplify and distill certain salient social cues serves to ameliorate and facilitate the cognitive and affective aspects of social interactions.

The animate nature of robots also resonates with the concept of transitional objects. Again the growing child at once recognizes the object as *not-me*, as a part of the outside world, and yet imbues it with fantasy, treating it as a facet of inner psychic life. This intermediacy accounts for the child's deep affective attachment to the transitional object, for it allows room for one's inner life out in the outer world; it is the animate made animate by the imagination. As such, transitional phenomena may be seen as the entry into symbolism and metaphor, into the ability to recognize some particular thing (object, image, utterance, etc...) both as itself and as directed towards something else. To treat something in terms of something else, to move beyond concrete literality into analogy and metaphor, is a capacity that people with autism often appear to lack, and indeed an incapacity for spontaneous pretend play, for play overlaid by pretense and fantasy, is one of the early indicators of autism (Charman et al, 1997). What accounts for this difficulty with multiplicity of representation, and with *otherness* more generally, is beyond our scope here; however, the ability of robots to enable more dynamic interactions with autistic children may be seen in terms of the *literalization* of the normally symbolic function of transitional objects. That is, social robots, as animated objects responsive to children's interaction, as objects come alive as it were, may be viewed as the magical made manifest, as the actualization of the fantastical character of transitional objects.

While typically developing children can imaginatively animate inanimate objects for transitional purposes, autistic children may require this normally imaginative and symbolic animacy to be actualized in some way. And perhaps the animacy and interactivity of social robots awakens and enables the transitional impulse, offering autistic children a way into the intersubjective object world by suggesting the possibility that that world is indeed responsive to their needs and fantasies, that the outer world does yield a place for their inner lives, thus allowing space for the expression of their internal states. For again one of the key claims of Kozima et al is that the motivation to express mental states remains intact in autism: the problem resides in enabling the means of expression. Transitional objects serve precisely this purpose, as a primary bridge between the inner and outer worlds of developing children, and conceiving social robots as transitional objects for autistic children, as objects literally made animate and "brought to life", may help account for their facilitative power, and further experimental and theoretical work on the affective aspects of joint attention and triadic interactions.

TRANSITIONAL OBJECTS IN ORGANIZATIONAL SETTINGS

Wastell (1999) represents a rare study applying the notion of transitional objects to organizations. Wastell diagnoses repeated information systems failure in terms of social defenses that inhibit and paralyze learning and engagement. As a remedy, he advocates conceiving the development of information systems in terms of a *transitional space*, consisting of a supportive psychological environment providing opportunities for creative engagement and play. In cases, for instance, where different departments within an organization are caught in intractable conflict, Wastell describes the use of models and simulations as transitional objects of sorts, relieving risk and anxiety and fostering a sense of safety by simplifying aspects of the development process. Furthermore modeling may serve as a means of facilitating joint attention, offering a common object and goal in the form of a transformable object. And while models and simulations are more explicitly goal-oriented than traditional transitional objects, they are nonetheless *transitional* in the sense of supplying malleable and manipulable objects in the course of development. Indeed the increasing use of simulations in medical training, where emergency scenarios involving mannequins are invested with a sense of urgency and reality (Gordon et al, 2001), speaks perhaps to their *transitional* status, both in the conferral of lifelikeness upon the mannequins and as an early transitional stage in medical education.

Robotic transitional objects, we speculatively suggest, may also play a role in organizational settings, in that the robot may serve, if not quite as a full-fledged transitional object per se, then as a common object of attention, an *attentional anchor* as it were, around which a group of people may organize and cohere. Such a group may also be viewed as a kind of developing or emerging entity, in which case the development role of transitional objects comes to the fore. For

instance, human-robot teams may be understood as (macro)cognitive systems onto themselves, and hence as developing entities in need of facilitation and transition. In these situations, an interactive robot might serve as joint-attentional pivot that keeps the team members focused on the same goals, especially if the robot itself is a primary vehicle for achieving those goals.

CONCLUSIONS AND CONSIDERATIONS

We thus propose that the concept of transitional objects illuminates the affective aspects of the development of dyadic and triadic interactions. We plan future research relating transitional objects to notions of *primary* and *secondary intersubjectivity*, which describe the development of our embodied interactions with others within shared pragmatic contexts and situations (Trevvarthen 1979, Gallagher & Hutto 2008). Additionally the concept may be applied to the emerging use of social robots in autism research and therapy, with the robots themselves functioning potentially as transitional objects in the facilitation of joint attention and triadic interactions. Furthermore social robotics generally may be informed by theories that emphasize the affective and interactive qualities of objects; indeed, this proposal may be seen as among those advocating for the inherently emotional and affective aspects of social robotic design and human-robotic interaction (Breazeal 2003, Picard et al 2004). Again, it is precisely because autism provides a window into certain social deficiencies that it is a catalyst for exploration of the role of robotics in human interaction. And while we make no causal claims connecting transitional objects, or the failure thereof, to the etiology of autism, the concept may nevertheless provide insight into aspects of its manifestation and treatment. Indeed, insofar as human development demonstrates the sensitivity to initial conditions that characterizes complex systems, cautious attention to early pivotal interactions may well prove revealing.

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