



Theories of Autism and Autism Treatment from the DSM III Through the Present and Beyond: Impact on Research and Practice

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Abstract

The purely descriptive definition of autism introduced by the DSM III in 1980 marked a departure from previous DSM editions, which mixed phenomenological descriptions with psychoanalytic theories of etiology. This provided a blank slate upon which a variety of novel theories emerged to conceptualize autism and its treatment in the following four decades. In this article we examine the contribution of these different theoretical orientations with a focus on their impact on research and practice, areas of overlap and conflict between current theories, and their relevance in the context of the evolving landscape of scientific knowledge and societal views of autism.

Keywords Autism · Autism treatment · Social motivation · Social cognition

Autism and Autism Treatment: Putting Theory in Context

Throughout history, autism and its treatment have been subject to numerous conceptual shifts. These are best understood in the context of the different theoretical orientations and societal views that have guided the work of clinicians, researchers and policy makers across different eras. As an illustration, a note dated 1931 from the recently unveiled clinical notebooks of Lev Vygotsky describes the case of K., a child showing “autism” and “*delay of speech*” (Vygotsky 1931/2018, pp. 184–192). K. was referred to the Experimental Defectological Institute clinic in Moscow, directed by Vygotsky, because, according to his notes, he “developed the psychoaesthetic proportion which caused the autism”. Following an intervention at the clinic characterized as “remedial education to remove both causes and symptoms”, Vygotsky noted that K. now “looks at all familiar and unfamiliar people”, “behaves well”, and “became part of the collective”, although he showed “lack of attention to manual

labor”. Reflecting on K.’s case, Vygotsky noted that “the mechanism of external asociality (autism) and the disintegration of the personality (the social in us) are two sides of the same: the nature of the higher psychological functions is social”.

None of Vygotsky’s clinical notes are interpretable without taking into account the theoretical orientations, conceptual apparatus and societal views guiding his observations. The “autism” that led K. to be referred to the clinic likely denotes Bleuler’s (1908) use of the word “autistic” to characterize social withdrawal. The concept of “psychoaesthetic proportion” derives from the now-forgotten typology classification developed by Kretschmer (1921), here referring to the child being hypersensitive and apathetic at the same time. Additionally, the remarks about lack of interest in manual labor and becoming part of the collective reflect societal values relevant to the USSR in the 1930s. Notably, while the concepts guiding Vygotsky’s diagnostic and therapeutic decisions appear to be obsolete by current knowledge, his final reflection on the social nature of higher psychological functions is not. In fact, it encapsulates the core tenet of sociocultural theories of human development, which continue to be influential, including in the field of autism (Odom 2016; Vivanti and Rogers 2014).

This historical vignette illustrates how the practical work conducted in the field of autism cannot exist or be interpretable without the context of theory, and how new theories evolve from existing scientific and societal systems

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of beliefs. Additionally, it illustrates the reciprocal relation between explanations of disorders and theories of typical development (Pennington 2014), and how conceptualizations of treatment reveal core assumptions about “normal” and “desirable” behavior (Osteen 2008). In the field of autism, a complex history of evolving and at times conflicting theories of typical and atypical development has affected individuals with autism across multiple dimensions, including diagnosis, treatment, and policy. In the following, we examine how theory shaped knowledge on autism and its treatment in the four decades following the DSM III introduction. We will focus both on the evolution of formal scientific theories (i.e., theories designed to explain/predict phenomena by generating empirically testable hypotheses), and broader conceptual frameworks that guided practice and policy, including the social model of disability and the neurodiversity framework.

Theories of Autism in the DSM III Era: The Rise and Fall of “Primary Cognitive Deficit” Accounts

The DSM III conceptualization of autism, and the theories of autism that followed its introduction, were shaped by converging developments in psychology and psychiatry in the 1970s. These included the collapse of psychoanalysis’ cultural hegemony in the field, a growing emphasis on empirical data as the platform for clinical decision-making, and a shift in focus from individual cases to group and epidemiological studies as the foundations for understanding the nature of psychiatric conditions and psychological phenomena (Strand 2011).

Against this background, the growing influence of cognitive science on psychological disciplines in the 1980s paved the way for the rise of cognitive accounts of autism, i.e., theories positing that the various manifestations of autism are expressions of a ‘primary cognitive deficit’. Putative cognitive deficits theorized to explain the core symptoms and associated features of autism included impairments in theory of mind (Baron-Cohen 1990), weak “central coherence” (integration of details into coherent wholes; Frith 1989), and executive dysfunction (Ozonoff et al. 1991).

Unlike the psychoanalytic theories of autism developed in the pre-DSM III era, this new wave of theories were formulated in terms of falsifiable (i.e., empirically testable) hypotheses, thus generating experimental research that provided a wealth of empirical data. Nevertheless, such research failed to provide unequivocal support for one competing model over the other, leading to a growing disenchantment with the ‘primary cognitive deficit’ accounts of autism (Happé et al. 2006). Challenges to the notion of a central deficit as the origin of the myriad of diverse manifestations of autism arose from several lines of research that called

into question the specificity, causal role and universality of each hypothesized primary deficit. These included variable performance in tasks designed to capture the putative “primary deficits” across individuals and experimental paradigms (Pellicano et al. 2005), and data suggesting that early abnormalities observed in autism might be widespread and domain-general rather than modular and domain-specific (Elsabbagh and Johnson 2016). Further challenges arose from neuroscientific and biological research ruling out “single gene” and “focal brain lesion” causal models of autism in favor of multifactorial explanatory frameworks (Levy et al. 2009), as well as developmental research suggesting iterative and bidirectional, rather than unidirectional, causal relationships between atypical cognition and manifestations of autism (Su et al. 2020). These notions, which could not be accommodated within accounts positing a single and “static” cognitive style as the origin of all autistic features across the lifespan, paved the way to novel theoretical accounts in the following decades.

Beyond “Primary Deficit” Accounts: Autism as a dimensional and developmental construct

Autism as a Biologically-Grouped Dimensional Construct

Theories of autism in the twenty-first century increasingly conceptualized autism as a dimensional construct, involving a continuum of fractionable manifestations within and beyond the autism spectrum (Müller and Amaral 2017; Skuse et al. 2009). This shift was informed by evidence suggesting that (a) continuous quantitative measures of autism traits are heritable, thus implying that autism is one pole of a continuum characterized by the highest levels of such traits (Thapar and Rutter 2020), and (b) behavioral features that co-occur in autism might reflect separable continua with distinct genetic and biological underpinnings (Happé and Roland 2008). Accordingly, the focus shifted from grand theories focused on autism as a unitary and monolithic entity to the examination of specific phenomena and processes. Attempts to link autism-related phenomena to biological processes emerging in the fields of neuroscience and genetics increased. At the same time, theories of autism became increasingly informed by and oriented toward explaining not only characteristics of people with autism but seeking general explanations of those characteristics applicable to the population at large.

One example of these trends is the social motivation theory (Chevallier et al. 2012; Dawson et al. 2004), positing that children with autism, compared to their typical peers, experience less pleasure and interest in response to social

stimuli, possibly reflecting alterations in neuropeptide signaling via oxytocin and atypical activity in brain networks subserving social reward (Dawson et al. 2012). Although variations in social motivation are continuously distributed in the general population, a pronounced decrease in this dimension has been theorized to account for the apparent preference for solitary versus social activities, diminished social attention, and decreased expressions of pleasure during social interactions reported in children with and at risk for autism (Lambert-Brown et al. 2015; Mundy 1995; Wan et al. 2013).

Another example of a dimensional and biologically-grounded conceptualization of autism, the extreme male brain theory (Baron-Cohen 2002), characterized autism by extremes of two features which are, at a population level, more characteristic of males than females (high levels of systemizing and low levels of empathizing; Greenberg et al. 2018). This account generated testable hypotheses across both behavioral and biological metrics (including brain anatomy, brain activity and sex hormones; Baron-Cohen et al. 2019). An alternative account was provided by the “broken mirrors” theory of autism (Ramachandran and Oberman 2006; Williams et al. 2001), which posited that differences in imitation and social cognition reflect disruptions in the neurocognitive mechanisms that enables an observer to understand others’ actions as if she/he would be doing a similar action—a process thought to be implemented by the mirror neuron system (Dapretto et al. 2006).

These theories differed from the cognitive accounts of the 1980s in that they focused on a circumscribed set of phenomena, conceptualized them as dimensional constructs, and generated testable predictions on putative disruptions at the biological level. This generated a wealth of theory-driven neuroscientific and biological research examining brain regions and systems implicated by the different theories, including the social reward system, the mirror neuron system, sex hormone circulation, and others. Although this research failed to provide unequivocal support for any of the proposed account (Vivanti et al. 2019), it promoted key advances on the cognitive and neural processes underlying social behavior and development in autism and typical development. For example, research on the role of the mirror neuron system in autism contributed to the broader theoretical debate on the inferential versus automatic nature of social cognition (the “theory-theory” vs “simulation theory” debate; Gallagher and Varga 2015) and contributed to characterize the interplay of “mentalizing” and “mirroring” processes in understanding others’ actions and emotions in the typical and atypical brain (Catmur 2015).

Additionally, the conceptualization of autism as a biologically-grounded dimensionally-based condition stimulated the development of measurement tools of quantitative autism traits, such as the severity scores of the Autism Diagnostic

Observation Schedule (Gotham et al. 2009) and the Social Responsiveness Scale (Constantino et al. 2003). The latter scale revealed patterns of heritability in both neurotypical children and children with autism (Constantino 2011) and differential patterns of correlation between family members with different degrees of relatedness, thus enabling the examination of correlated levels of quantitative autism traits across typical and atypical samples (Constantino 2018). Specifically, children with autism exhibit higher levels of deficits in reciprocal social behavior than children without, but differences in social behavior are continuously distributed in the population, and are more similar in relatives with higher degrees of genetic relatedness (i.e., associations are higher among monozygotic than dizygotic twins). These and other findings pointed to the need for autism theories to account for dimensional phenomena that are relevant beyond the diagnostic boundaries of the autism spectrum—a conceptualization consistent with current trends in psychiatry, such as the Research Domain Criteria framework (Insel et al. 2010).

Autism as a Developmental Condition

A major theme across theories that followed the introduction of the DSM III is the view of autism as a developmental condition (e.g., Mundy and Sigman 1989; Rogers and Pennington 1991; Sigman et al. 1999). A key notion from developmental conceptualizations is that altered engagement with the social and physical world during early sensitive periods can change developmental trajectories, and that resulting abnormalities at the neural and behavioral level might exacerbate initial differences in an iterative fashion. Although different theories proposed different processes at the origin of this cascade of event, they converge on the importance of identifying the earliest manifestations of autism as a path to inform earlier diagnosis and intervention (Chawarska and Volkmar 2020; Vivanti et al. 2017, 2018a).

The emphasis on developmental pathways propelled the advent of baby sibling research (Szatmari et al. 2016; Zwaigenbaum et al. 2005), which we briefly illustrate here as an example of research driving and driven by developmental and dimensional conceptualizations of autism. In baby siblings research, the younger siblings of a child with autism are followed from an early age to prospectively ascertain behavioral and neurophysiological antecedents of autism symptoms and diagnosis. Theoretically, this can lead to the identification of early emerging differences associated with autism before the syndrome is fully manifest, thus clarifying developmental origins and pathways, and informing diagnosis and treatment (including the possibility of pre-emptive interventions to mitigate or even prevent autism symptoms). A relevant caveat, however, is that baby siblings with autism outcomes have an older sibling with autism, meaning that, by definition, they hail from multiplex families, in which more

than one first degree family member has autism. Autism in children from multiplex studies may differ from children with autism who are the only individuals with autism in their families (i.e., simplex families; Virkud et al. 2009).

Prospective studies of baby siblings made comparisons with infants who did not have an older sibling with autism. As such, they firmly grounded autism research in normative developmental psychology, solidifying the contention that what is typical or atypical is developmentally dependent. For example, repetitive mouthing behaviors and vocal imitation that characterize typically developing children between 3 and 9 months of age would be problematic patterns of autism-relevant behavior were they to occur between 13 and 19 months of age. Similarly, patterns of intense visual interest in a parent's face that characterize three-month-old infants would be suggestive of Williams syndrome if they were to occur at three years of age.

Baby siblings research also supported a dimensional conceptualization of autism traits. Among prospectively followed baby siblings, approximately one in five has an autism outcome (Messinger et al. 2015; Ozonoff et al. 2011). However, autism traits such as restricted and repetitive behaviors and elevated incidence of developmental delays also characterize baby siblings who do not develop autism (Charman et al. 2017; Elison et al. 2014; Messinger et al. 2015). Accordingly, baby sibling investigations often focus on explaining patterns of atypicalities in the combined class of high-risk autism siblings, including both those who do and do not have autism outcomes (e.g., Bosl et al. 2018; Iverson et al. 2019), an explicitly dimensional characterization of autism that does not map onto traditional diagnostic frameworks.

Additionally, this research, because of its prospective orientation, grappled with a fundamental—if frequently implicit—issue in conceptualizing the emergence of autism. In perhaps the prevalent view in baby sibling research, investigators conceptualize themselves as identifying antecedents of a predestined event, autism outcome. In this view, an autism outcome, whatever its mechanistic causes, cannot be influenced or changed by pre-diagnostic events. By contrast, a constructivist perspective holds that investigators are examining the development of autism. In this view, events in the first years of life—from patterns of interaction to chemical exposure—affect the ongoing likelihood of an autism outcome in at-risk individuals (Klin et al. 2020). This issue has a critical relevance in the conceptualization of autism and also of its treatment, raising the question of whether the prevention of autism in infants at risk is a realistic pursuit (Dawson 2008). As we detail in the following section, attempts in the directions have been pursued, providing new knowledge, and also new scientific and ethical debate.

Finally, developmental research has clarified that the neural basis of autism also might change with development

(Schumann et al. 2004). In infancy, for example, neuroanatomical features (increased cortical surface area and cerebral spinal fluid; Hazlett et al. 2017; Shen et al. 2018) and functional decreases in network efficiency (Lewis et al. 2017) have been associated with autism diagnosis and symptoms. However, functional evidence suggests that hyperconnectivity of brain networks in childhood is no longer evident in adolescence, and structural evidence suggests that although increased corpus callosum size in the first year of life is associated with later autism, these differences are less pronounced at two years (Nomi and Uddin 2015). Similar patterns of developmental change are evident for associations between neural activity and restricted and repetitive behaviors (Wolff et al. 2014, 2017). Levels of functional connectivity *between* networked brain areas and dimensions of restricted/repetitive behaviors change, for example, between 12 and 24 months (McKinnon et al. 2019). These *developmental* changes in the atypicality of autism brain connectivity solidify the importance of adopting a developmental framework in understanding the neural bases of autism.

Although these findings are informing the development of new conceptual frameworks for early brain and behavior development in autism (Johnson 2017; Piven et al. 2017), several concepts continue to be debated, including whether symptoms of autism originate from domain-general differences versus differences that are specific to the social domain. “Domain-general” theories of autism argue that autistic features reflect compensatory processes in response to heterogeneous and widespread abnormalities, rather than the expression of atypicalities specific to social processing. This notion is consistent with findings of intact subcortical processes controlling automatic orienting toward facial stimuli in adults with autism, and in infant siblings with later autism outcomes (Johnson 2014; Rogers 2009). Domain general conceptualizations are also consistent with general patterns of symptom elevation and delay in baby sibling research (as well as studies of simulations of synaptic pruning), which appear to suggest early emerging disruption of sensory and motor processes as a starting point for autism features (Thomas et al. 2016). Conversely, social-primacy theories posit that the starting point of autism is specific to the social domain and might reflect disruptions in the developmental transition from subcortically to cortically-governed attentional engagement with social stimuli (Klin et al. 2015; Leekam 2016). This notion is consistent with findings of early abnormalities in orienting to biological motion and patterns of declining gaze to the eyes between 2 and 6 months in baby siblings with an autism outcome (Jones and Klin 2013; Klin et al. 2009).

Different interpretations of the infant sibling literature illustrate how the complexity and heterogeneity of data in autism research does not always resolve the debate between alternative conceptualizations of autism. The same is true

for theories of autism treatment, which we discuss in the next section.

Theories Guiding Treatment: Overlaps, Controversies, and Prospects for Reconciliation of Different Frameworks

Although a comprehensive theory of autism treatment is yet to be established, in no area of the autism field have theoretical orientations impacted knowledge and practice more pervasively than in intervention. By the time the DSM III was published (1980), different schools of thought on autism treatment were established (Reichler and Schopler 1976; Lovaas et al. 1974), which, despite philosophical differences, shared a commitment to empiricism and the rejection of psychodynamic theories of autism as a foundation for treatment. The most influential theoretical orientation underlying this shift was behaviorism, a philosophy of science that focuses on the explanation of behavior through the direct observation of the relationship between environmental stimuli and resulting responses (Skinner 1953; Watson 1913). Though no longer a dominant force in mainstream academic psychology, behaviorism and its applied program of Applied Behavior Analysis (ABA; Baer et al. 1968) achieved a prominent position in the autism treatment field during in DSM III era following the growing evidence supporting behavioral treatments. This included unprecedented claims of “normalization” and “recovery” for children receiving behavioral interventions (Lovaas 1987).

Although some of these findings were later disputed, this literature proved to be immensely influential for conceptualizations of autism treatment. First, it underlined the notion that the behavior of individuals with autism obeys the same laws that shape behavior in typical development, whereby behaviors associated with a positive consequence strengthen and those followed by aversive stimuli decrease. A corollary of this notion was that individuals in the autism spectrum were not “ineducable”, as theorized by many autism scholars in the pre-DSM III era (e.g. Meltzer 1975)—rather, they were learners, whose behavior could be modified through a careful manipulation of antecedents and consequences. Additionally, ABA’s commitment to objectivity guided clinical practice towards a focus on unambiguous operational definitions of intervention targets and procedures, as well as the use of observable behavior change as the platform for decision making and evaluation of outcomes. The notion of autism manifestations as treatable, and the adoption of methodological approaches that enabled the empirical substantiation of this idea, paved the way for more optimistic scientific and societal views of treatment research and treatment outcomes. This, in turn, had striking practical consequences, including a shift from institutionalization

to intervention-oriented services for those with autism and increased methodological standards in autism treatment research.

Other concepts emerging from the ABA literature, however, generated conflict between different theoretical orientations. One example is the notion that “*stimulus selectivity may provide a parsimonious explanation of the way in which autistic children learn*”, proposed by Lovaas and colleagues (Varni et al. 1979, p. 41; Lovaas and Smith 1989). “Stimulus overselectivity” refers to situations in which individuals respond to only some stimuli presented to them, while disregarding other equally relevant stimuli. Although subsequent research did not support the hypothesis that stimulus overselectivity is overrepresented in autism (Dube et al. 2016), this notion informed various treatment procedures within ABA-based approaches. These included the highly-structured approach known as Discrete Trial Teaching (DTT; Lovaas 1981), whereby the learning environment is designed to minimize the number of stimuli presented to the learner, the target skills are broken down in “discrete” components that are taught in isolation, and a stripped-down directive instruction designed to evoke a specific behavior (e.g., “touch ball”) is repeated until a predefined criterion is met, with correct responses being systematically reinforced.

The appropriateness of these techniques became the subject of criticisms from non-behavioral scholars, offering a revealing case study on how adoption of different theoretical orientations can lead to conflicting views on appropriate practice. The main challenges came from scholars adhering to constructivist and sociocultural theories of human development, which posit that children learn best in the context of affectively rich interactions, self-driven goals, and in response to the natural contingencies of their self-initiated behavior (e.g., Bruner 1975, 1978; Saylor and Ganea 2018). As research on child development exploded during the DSM III era, an evidence base parallel to, and sometimes conflicting with, behavioral literature started to provide a scientific foundation for these critical views. For example, developmentally oriented scholars such as Tomasello (1988) and Mahoney et al. (1985) argued that a directive interactional style would hinder, rather than facilitate, the development of social communication in children, based on research showing that, as predicted by constructivist accounts, adult directiveness is negatively associated with verbal and cognitive development in typical and atypical development (Tomasello and Todd 1983; Mahoney et al. 1985). Additionally, criticisms to Lovaas’ approach from developmental scholars were directed towards the “sterile” learning environment, the repetition of the same instructional cues across trials, the use of “telegraphic” language (e.g., “touch ball”), the use of aversive stimuli to discourage maladaptive behaviors, and the limited consideration of the relational and developmental precursors of social communicative development

(Donnellan et al. 1984; Lord 1985; Mundy and Crowson 1997; Wetherby 1989).

The practical consequences of the theoretical clash included the development of non-ABA based interventions built upon developmental theories/concepts (Dawson and Adams 1984; Kasari et al. 2000; Rogers et al. 1986; Watson 1985), as well as more developmentally oriented practices *within* the ABA field (Koegel et al. 1987). Developmental concepts informing these approaches involved an emphasis on the importance of child initiative during learning episodes as well as a focus on the social-pragmatic foundations of language and cognitive development. Additionally, they highlighted the role of adult scaffolding (as opposed to directive instruction), sensitivity and responsiveness to the child's cues, the establishment of emotional engagement and positive relationship between child and adult, and the creation of learning environments that resemble the “real world” where taught behaviors would naturally be utilized (Vivanti and Zhong 2020). An additional and more recent influence from the developmental literature is the notion of sensitive periods of brain plasticity as a window of neurodevelopmental malleability, which lead to the creation of “pre-emptive” interventions for children at risk for autism. This approach is designed to mitigate or prevent the consolidation of autistic symptoms by engaging “experience-expectant” brain areas when symptoms of autism are not fully crystalized and brain development is more responsive to stimulation (Green et al. 2017; Rogers et al. 2014).

Although most, if not all, these more constructivist concepts may be orthogonal to, rather than conflicting with, principles of ABA (Carr 1985; Stahmer 2014), the debate between behavioral and non-behavioral scholars was, until recently, characterized more by antagonism than cross-fertilization between different schools of thoughts, and challenges continue to exist. This can be in part be attributed to disciplinary divides in the autism field, with scholars from behavioral and non-behavioral disciplines belonging to different (and sometimes self-referential) circles and professions, relying on different conceptual vocabularies, publishing in different journals, and engaging rarely with one another's work, despite focusing on similar phenomena (Critchfield et al. 2015; Vivanti 2017). This contributed to misunderstandings among scholars from different disciplines and also among the general public, such as equating ABA with DTT (see Leaf et al. 2020 for a review on how ABA practice has evolved since the DSM III introduction), and characterizing behavioral and developmental approaches as mutually exclusive, which stymied cross-fertilization (Ingersoll 2010; Vivanti and Stahmer 2020).

Additionally, theories guiding treatments have largely been insular pursuits, disconnected from etiological theories of autism and basic research on neurocognitive mechanisms underlying autistic symptoms. This was

particularly evident in the first two decades after the DSM III's introduction, when theory development in behavioral intervention research (e.g., Smith and Lovaas 1989) and cognitive explanations of autism (e.g., Happé 1995) proceeded in parallel, with limited connection between them. Although exceptions exist (for example, the construct of ‘social motivation’ is relevant to both treatment theories and etiological theories; Uljarevic et al. 2019), in the past two decades the conceptual apparatus underlying most intervention practices for autism has continued to be resistant to influences from basic research, and vice versa. For example, neuroscientific research on the neural underpinning of social reinforcement in autism and its distinct components (‘wanting’ and ‘liking’ circuitries; Kohls et al. 2012) had limited impact on how social reinforcement is conceptualized and operationalized in most intervention scholarship.

An even more problematic consequence of the insularity of different theoretical orientations is the consolidation of different schools of thought on what constitutes valid scientific evidence (Johnston 1988; Smith 2012, 2013). Owing to different philosophies of science, single-subject design studies are often considered to be superior to randomized controlled trials as a methodology for testing the effectiveness of interventions by ABA scholars, while the opposite is true for non-ABA scholars (Smith 2012, 2013). The main reasoning for the preference for single-subject studies in ABA scholarship is that the average change within an intervention group is less clinically relevant than the analysis of change made by each individual participant. Conversely, most non-ABA disciplines consider single-subject designs to be helpful but not sufficient to inform public health action, because of the limited inference that can be made from single participants to the population of interest, and the unclear impact of the intervention beyond the circumscribed and situation-specific changes in the behaviors that are directly targeted (Smith et al. 2007; Smith et al. 2012, 2013). Because of this divide, different autism treatment reviews and meta-analyses reach opposite conclusions on the empirical support for different interventions depending on the type of studies considered to provide legitimate evidence (French and Kennedy 2018; National Autism Center 2015; Reichow et al. 2018; Smith and Iadarola 2015). This, in turn, lead professionals in the field to have different “baseline facts” on the scientific evidence supporting different interventions.

This state of affairs, in which adherence to different theoretical orientations leads to different parameters to evaluate evidence, is the hallmark of what the philosopher of science Thomas Kuhn (1962) has defined as the “pre-paradigmatic stage” of a field—that is, a stage in which competing theoretical orientations operate according to different methods, principles, and criteria for evaluating evidence, with “frequent and deep debates over legitimate methods, problems,

and standards of solution, though these serve rather to define schools than to produce agreement” (Kuhn 1970, pp. 47–48).

Examining and addressing the areas of real versus apparent irreconcilability between theoretical orientations (e.g., Vivanti and Stahmer 2020) is crucial to advance the science of autism and autism treatment towards a paradigmatic stage—that is, a stage in which there is consensus on the data, constructs, phenomena and methods that can be legitimately used to advance knowledge in the field. Although disagreements and controversies continue to exist, the past decade has witnessed substantial progress on the cross-fertilization between different orientations (Leaf et al. 2017; Schreibman et al. 2015). This, in turn, has resulted in growth in the quantity of effective intervention options, most of which include concepts derived from both behavioral and developmental theories (Bruinsma et al. 2020; Vivanti, Bottema-Beutel and Turner-Brown 2020).

Theories of Autism in the Context of Evolving Societal Views

Finally, theories of autism and autism treatment have been increasingly examined through the lens of evolving societal perspectives on autism and disability. These perspectives, in turn, are increasingly influential in autism theory development (e.g., Jaswal and Akhtar 2019). One example is the progressive shift that occurred in the decades following the introduction of the DSM III from the medical to the social and biopsychosocial models of disability—that is, from a focus on identifying and curing deviations from normality, to one on the removal of societal barriers to self-determination, civil rights, and inclusion for individuals with special needs (United Nations Convention on the Rights of Persons with Disabilities 2006; World Health Organization 2001). The knowledge and scholarship generated by this shift has informed conceptualizations of autism and its treatment across several dimensions.

First, by framing autism in the context of socially-constructed representations of “normality” versus “pathology”, social models of disability highlight the arbitrariness of concepts such as “deviations from normality” and “positive treatment outcomes”, leading to reconsideration of what desirable intervention targets and outcomes mean to the recipient of intervention. For example, recent research informed by the biopsychosocial model of disability established by the World Health Organization’s International Classification of Functioning, Disability and Health (2001) has conceptualized positive outcomes “as living a full and decent life with dignity, self-reliance, and active participation in the community”, thus shifting away from traditional outcome measures in autism intervention research such as gaining IQ points, and highlighting the role of autonomy,

social relationships, and purpose (Georgiades and Kasari 2018; McCauley et al. 2020; Vivanti et al. 2018b).

Additionally, social models of disability emphasize the role played by societal attitudes and barriers in disabling individuals with special needs, thus centering intervention efforts on the interplay between the individual and the society. According to this perspective, individuals with autism should not be seen as passive recipients of treatments designed to “normalize” their behavior, but as participants in their community whose unique needs, goals and contributions to the society require societal accommodations, rather than an exclusive focus on modifying the behavior of the individual. Both autism research and treatment are increasingly receptive of this conceptualization. This is reflected in interventions that promote consideration of the preferences, motivations, and choices of individuals with autism, and research focused on the impact of socially-constructed representations of “normality” and “successful” outcomes for the wellbeing of individuals on the autism spectrum (e.g., Parish-Morris 2019; Hull et al. 2017; Vivanti et al. 2018b).

The related construct of “neurodiversity” has emerged in the past two decades as a major influence in the theoretical debate in the field. Both a self-advocacy movement and a conceptual framework in psychology and psychiatry (Baron-Cohen 2017; Kapp et al. 2013), the neurodiversity perspective is centered on the notion that differences associated with autism are to be recognized and respected as any other human variation (e.g., gender identity). Accordingly, they should be valued and celebrated as a central part of one’s identity, rather than being prevented, cured or treated (Robertson and Ne’eman 2008). Theories of autism and autism treatment have been challenged through the lens of neurodiversity across several dimensions. These include the “detachment” of autism theories from the lived experience of those diagnosed with autism (Hens et al. 2019; Murray 2019), as well as their role in perpetuating low expectations towards individuals on the spectrum. For example, the expectation that individuals with autism are unwilling and/or unable to participate in social events because of decreased social motivation or mentalizing deficits can lead caregivers or teachers to exclude them from social situations. This, in turn, can lead to fewer opportunities to practice social skills and enjoying social situations, thus resulting in self-fulfilling prophecies (Jaswal and Akhtar 2019). Additionally, treatments that are entirely focused on modifying the behavior of individuals with autism have been equated to “conversion therapy” designed to achieve conformity at the expenses of diversity, with treatment goals of promoting “desirable” and removing “undesirable” behaviors reflecting parameters of desirability set by a neurotypical majority and detached from the preferences and goals of the individuals receiving the intervention.

Accordingly, a shift has been advocated toward more inclusive research agendas and intervention programs that engage directly with the autism community, including considerations of their perspectives in conceptualizing desirable research goals and treatment outcomes, and a focus on societal accommodation, rather than removal of the differences that make individuals with autism unique (Fletcher-Watson et al. 2019; Shattuck et al. 2018). Importantly, the positions of some neurodiversity scholars have generated debate, including criticisms for reproducing “neuronormative exclusion” by seeking alignment with only the more able end of the autism spectrum (Rosqvist et al. 2020), as well as the risk of alienating members of the autism community whose daily experience with severe autism symptoms makes intensive intervention the highest priority (Lord et al. 2018).

Despite these challenges, the themes of appreciation of diversity, self-determination, and the acknowledgment of the unique societal contributions that those with autism can offer *by virtue of* (rather than *despite of*) their diagnosis, are increasingly influential in the conceptualization of autism. The impact of this notion extends beyond academic scholarship, as reflected in the increasingly popular view of autistic traits as an asset in the workplace (Bury et al. 2019), and the resulting growth in employment opportunities for those on the autism spectrum.

Conclusions and Future Directions

Theories—whether explicit or implicit—shape the questions that researchers ask, the methods they use to test them, and the way the resulting data are interpreted. They also guide the work of practitioners and policy-makers, and influence societal attitudes and opinions. As reviewed in this article, the forty years after the introduction of DSM III have witnessed important shifts across all these dimensions.

Although a comprehensive theory of autism and its treatment remains elusive, the value of theories does not reside solely on their being true, but rather on their utility for guiding research and practice (Smaldino 2017). In this respect, theories of autism in the past four decades have contributed to the evolution of research questions and methods, and to the growing abandonment of unethical and unsupported approaches in favor of an increasing appreciation and integration of scientific knowledge and more inclusive views on autism.

Additionally, theories shape—and are shaped by—technological and methodological advances that afford the examination of novel questions and novel angles to “old” questions. For example, digital phenotyping may be characterized as a metatheory in the making. Though in its infancy, this initiative attempts to harness machine learning techniques to automatically measure behavior. Current efforts

focus on automatic identification of patterns of attention, facial expression, and vocalization associated with autism (Campbell et al. 2019; Dawson and Sapiro 2019; Esposito et al. 2014). But a broader effort is characterizing the behavior of children with autism in multiple environments and investigating the degree to which it is or is not different from that of other children. The surmise is that vast quantities of behavior will serve to produce a new understanding of the autistic phenotype, one that is broader and more representative than that garnered by relatively brief diagnostic encounters, and less constrained by pre-existing assumptions.

Finally, translational efforts across theoretical and methodological frameworks, and the examination of conceptual boundaries and areas of overlap across schools of thought are needed to increase comprehensiveness, clarity and parsimony in the field, and guide future research on the many phenomena related to autism that remain unaccounted for by current theories and approaches (Vivanti and Stahmer 2020; Vivanti et al. 2018a, b). Such research efforts need to extend beyond the biological and behavioral features of autism, and examine the explicit and implicit theories that guide individuals, systems and institutions interfacing with autism, in the effort to creating a more autism-friendly society.

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