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Social Justice and Autism: Links to Personality and Advocacy

A dissertation submitted in partial satisfaction of the requirements for the degree of Doctor of Philosophy in Education

by

Steven Kenneth Kapp

2016
Social Justice and Autism:
Links to Personality and Advocacy

by

Steven Kenneth Kapp
Doctor of Philosophy in Education
University of California, Los Angeles, 2016
Professor Connie L. Kasari, Chair

Autism’s history as an independent condition may originate from “autistic psychopathy”, but autism and psychopathy may entail opposite patterns of personality. Autism may incline people toward moral intuitions in the dimensions of care, loyalty, authority, sanctity, and especially fairness. Yet these may play an unconscious and visceral role that in combination with difficulties with moral reasoning and the understanding of one’s own and others’ emotional and mental states, reduces self- and other awareness of autistic people’s moral drives. Conversely, psychopathic people may have low moral values (particularly for care and fairness), yet usually strong moral reasoning skills, cognitive empathy, and mentalizing abilities. This contrast adds to the literature in part through emphasizing basic sensory and motor differences, in transaction with the social environment and life experience, as underlying these personality-relevant
distinctions between autism and psychopathy. It thus attempts to embody both conditions, with the understanding that all behavior involves motor activity, and to think of both conditions as neurodevelopmental in their origins and early trajectories. Such an analysis raises the importance of strengths, as a matter of individual differences as well as influences from the environment, that can help to distinguish and even cause the conditions. For example, sensory hypersensitivities in autism may both give rise to talent but also overload individuals and interfere with language and cognitive development for some. Early abilities in imitation may help to explain why individuals biologically vulnerable to psychopathy may have such strong influence to adverse home environments, as they mimic the harshness and lack of warmth they witness by caregivers. Indeed, individuals with putative “social disorders” may have particular susceptibility to their social environments, particularly parenting practices. They also suffer from unfair social norms that often in effect reward psychopathic individuals and punish well-intentioned autistic people. Both conditions challenge the notion of social dysfunction as an individual problem rather than reflecting lack of reciprocity or injustice experienced interpersonally or societally. Supportive environments that meet the needs of people prone to autism and psychopathy may avoid pain and punishment that possibly plays central roles for both conditions, with starkly different effects, perpetuating social injustice.
The dissertation of Steven Kenneth Kapp is approved.

Jeffrey J. Wood

Sheryl H. Kataoka

Connie L. Kasari, Committee Chair

University of California, Los Angeles

2016
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**Fellowships/Awards/Honors**

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Chapter 1

**Autism as Opposite Psychopathy: Unmasking the Complexity of Personality and Morality**

“The good and bad in a person, their potential for success or failure, their aptitudes and deficits—they are mutually conditional, arising from the same source. Our therapeutic goal must be to teach the person how to bear their difficulties. Not to eliminate them for him, but to train the person to cope with special challenges with special strategies; to make the person aware not that they are ill, but that they are responsible for their lives.” (Asperger, 1938, in Silberman, 2015, pp. 128-129)

These above remarks stem from the first public presentation on autism as an independent condition identified as a personality disorder called *autistic psychopathy* by Viennese pediatrician Hans Asperger, but this dissertation positions autism as generally opposite psychopathy. The arguments this dissertation advances include that Asperger described his patients as autistic psychopaths and later included “maliciousness” and “spite” among its examples (1944/1991), out of a sense of moral obligation to save lives in the context of Nazi-occupied Austria. Asperger’s lecture spoke out against the new eugenic “health code” requiring the “mercy deaths” of people with a variety of disabilities and illnesses and for the inherent value and dignity of human life (Silberman, 2015). Nevertheless, the Nazis retained an Austrian law on forced institutionalization of those with “psychopathy”, which then referred to a diverse group of personality disorders (since it literally means simply “mental disease”) but that generally indicated risk of danger to society (Feinstein, 2010). A psychopathy diagnosis facilitated access to support that Asperger articulated in his delicate argument: the need for institutionalized but individualized care from professionals like nurses and teachers at clinics like his, providing education that helps them to maximize their gifts and manage their difficulties toward positive
contributions to society. Asperger had noticed high variability in his hundreds of patients (many of them nonverbal) in his clinic (Silberman, 2015) and never clarified core criteria (Feinstein, 2010). Yet he may have perceived the need to emphasize deliberate harm, intelligence, and strong logical abilities in his postgraduate thesis written at the height of World War II in 1943, because of the Nazis’ targeting people with such neurological differences as intellectual disability (“feeblemindness”), schizophrenia, and epilepsy for innumerable murders (c.f. Silberman, 2015). That year Leo Kanner (1943) described “infantile autism” as a distinct condition, but quickly changed to view it as the earliest manifestation of childhood schizophrenia, caused by withdrawal from “refrigerator” parents (frigid parenting), and this view destroyed families and dominated autism’s early history in the West. English psychiatrist and parent of an autistic individual Lorna Wing introduced Asperger’s account to the English-speaking world in 1981, building on her description of an “autism spectrum” in 1979. She viewed autism as involving a triad of impairments in social communication, social interaction, and social imagination, arguing that autistic people lack a social instinct. An autism assessment she helped develop recently added “fascination with violence” as a core symptom of autism, without subjecting the item to empirical peer review. This history contributes to lingering perceptions among some in the autism field and general public of autistic people as extremely asocial or antisocial. The media’s reporting and much-publicized research on the relationship between autism and mass murder that relied mostly on speculations and unscientific sources like newspaper articles and popular websites, have amplified perceptions of autistic people as at risk of violence. Yet this dissertation argues for a conception of autism that includes a strong orientation toward social justice, moral instinct, and aversion to violence, based largely on
autism’s current criteria in the DSM-5 that incline autistic people toward a highly sensitive, rigid disinterest in unfair social norms.

**Personality Traits**

**Psychopathy**

Aside from how the paths of autism and psychopathy have crossed in history, a contrast between autism and psychopathy in particular may shed light on why autistic people have atypical communication and behavior, especially from their own perspective, and even on social justice itself. Given lack of consensus on the psychopathy construct, this thesis will generally apply the triarchic model of psychopathy. It defines psychopathy as a constellation of personality traits that in its full form involves dimensions called meanness, boldness, and disinhibition. Meanness involves “callousness, cruelty, predatory aggression, and excitement seeking…deficient empathy, disdain for and lack of close attachments with others, rebelliousness, excitement seeking, exploitativeness, and empowerment through cruelty” or destructiveness (Patrick, 2010). Boldness entails the “nexus of high dominance, low anxiousness, and venturesomeness”, with “a capacity to remain calm under pressure and recover quickly from stressors, high social efficacy, and a tolerance for unfamiliarity and danger” (Patrick, 2010). Disinhibition reflects “tendencies toward impulsiveness, irresponsibility, oppositionality, and anger/hostility” – “poor planfulness, impaired regulation of affect, and deficient behavioral restraint” (Patrick, 2010).

The original and quintessential personality disorder, psychopathy features a constellation of traits that form an exceptionally egosyntonic and disinhibited lifestyle: action in line with one’s idealized self-image (that matches the self-perceived true self); elements of disinhibition appear to form part of all major historic conceptions of psychopathy. Its traits more or less have a
continuous distribution into the general population, accounted for mostly by generic personality traits, and create a pattern that enables what Levenson and colleagues (1995) described as an unconstrained self. More specifically, psychopathy arguably reflects how most people would think and act if not restrained by a combination of personality and temperamental factors including caring about social ties and others’ feelings (as opposed to callousness), modesty (as opposed to a grandiose sense of self-worth), straightforwardness (as opposed to dishonesty and manipulativeness), conscientiousness about rules and order (as opposed to irresponsibility and lack of conscience), fear (of harming others, of punishment, of the consequences of one’s actions) as opposed to sadism and high excitement-seeking, anxiety (as opposed to feelings of guiltlessness and remorselessness), deliberation or cautiousness (as opposed to enjoyment of risk-taking), and anhedonia (as opposed to hedonism). Psychopathic traits have high biological predispositions, although they tend to interact with experiences that socialize antisocial behavior through negative reinforcement (such as parental abuse including harsh punishment) or positive reinforcement (such as popularity from schoolyard bullying). The most distinctive psychopathic individuals who may present the greatest validity for the idea of a personality disorder in terms of feelings, values, and behaviors in harmony with both one’s “true” and ideal “selves” tend to have a more genetically rooted, emotionally stable, outgoing temperament that helps them enjoy high energy and positive emotions, adventurousness toward new experiences, a high sense of competence, and high achievement-striving. Thus they tend to have a higher sense of self-esteem (a more self-assured rather than vulnerable sense of superiority and entitlement), high sense of and actual control over their actions rather than proneness to impulsive reactions even as they may act quickly and with little forethought, high emotional clarity and resiliency, and greater socio-economic success.
Autism

These patterns (especially for the more well-regulated and extraverted psychopathic individuals) contrast with the self-reported traits of adults with confirmed autism diagnoses. Such results include opposite patterns of low extraversion (especially for inclination toward large social gatherings, assertiveness, and excitement-seeking); novelty and stimulus seeking; openness to new experiences; reward dependence; addiction potential and alcoholism; competence; self-directedness; disconstraint; dominance; and aggressiveness, along with high neuroticism (except average emotional impulsiveness as a mirror opposite of emotionally stable psychopathic individuals), harm avoidance (fatigability and muscle weakness, anticipatory worry, fear of uncertainty, and shyness with strangers), inhibitedness, suppression, deliberation, compulsivity, orderliness, social responsibility, and straightforwardness. These findings provide insight into many autistic adults’ perspectives related to why they manifest atypical responses to sensory input, “insistence on sameness” and resistance to change or difficulty with transitions, perseverative or restricted interests, difficulties with the verbal and nonverbal fluidity and unpredictability of social conversations and interactions (especially in person), and challenges with developmentally normative relationships or adapting to new social contexts. They indicate high punishment sensitivity such as fear of failure and pain sensitivity (which typically extends to autistic adults with ADHD unlike many others with that disability); emotion dysregulation; emotional exhaustion and need to decompress especially from too much social stimuli such as crowds (which related research suggests stems in part from sensory overload of low sensory thresholds and ease of excitation) and feeling overwhelmed from new people and situations; related feelings of insecurity or incompetence in social situations such as making friends; desire for planning and need to think more cautiously and consciously before making decisions; desire
for rules, structure, and familiarity; intention to inhibit difficult emotions and behavior; and high honesty.

**Moral Intuitions**

Nevertheless, moral drives and personality do not simply reflect subjective attitudes and self-concepts within conscious awareness, and using a variety of methods especially has particular importance for autistic people. Reasons for this may include such issues as the inability of some autistic people to self-report on questionnaires, difficulties with self- and social awareness that can lead to underreporting strengths especially in terms of feelings and self-image rather than abilities, problems with items that do not disentangle constructs well or refer to other people’s perceptions of oneself, and greater tendencies toward social desirability bias in typical people. Similarly, autistic people show less susceptibility to an audience effect (performing better when observed) in assessments and experiments. Paradoxically, this greater honesty that can complicate both the study and accurate perception of autistic people may itself reflect a moral value. Moral Foundations Theory (Graham et al., 2013) has identified five moral dimensions based on research across disciplines, methods, and cultures, such as evolution, history, anthropology (including diverse human societies and non-human primates), and psychology (including young children and implicit and explicit report): Care (versus Harm), Fairness (versus Cheating), Loyalty (versus Betrayal), Authority (versus Subversion), and Purity (versus Degradation). It suggests that people typically engage in more intuitive than strategic reasoning about these concerns: reason serves passion (the cognitive distortion of motivated reasoning (Haidt, 2012).

**Care**
**Autism.** Autistic people tend to report more caring and prosociality than other raters attribute to them, along with their tendency toward low self-awareness and ability to express their emotions, people may generally under-recognize strengths in this area. Such issues as the inability of some autistic people to self-report on questionnaires, difficulties with self- and social awareness that can lead to *underreporting* strengths especially in terms of feelings and self-image rather than abilities, items that do not differentiate constructs like emotional and cognitive empathy well or refer to other people’s perceptions of oneself, and the likelihood of greater tendencies toward social desirability bias in typical people, may bias reliance on self-report against understanding of autistic people’s competencies in care and concern for others. A profile of high investment in the romantic but low interest in sexual aspects of courtship associated with subclinical autistic traits may extend to autistic adults in the clinical range who manage to attain intimate relationships. Autism traits in subclinical and diagnosed adults across genders do not appear to lower the partner’s relationship satisfaction (Bostock-Ling, Cumming, & Bundy, 2012; Lau & Peterson, 2011; Pollmann, Finkenauer, & Begeer, 2010), even when men with high autistic traits feel unsatisfied (Pollmann et al., 2010). Autism also may not lower one’s parental satisfaction (Lau & Peterson, 2011), and mothers with high autistic traits by self-report and observation have demonstrated parenting high in warmth and low in punishment (Boonen et al., 2015). Both such responsive parenting and less interest in sex may draw from tactile defensiveness and ultimately may further indicate greater relative importance to the emotional bond of the relationship. Autistic adults in intimate relationships have also described regular practices of explicit communication about boundaries and consent, which may reflect caring about the risk of harm to both parties, high experience of sexual victimization, and reliance on explicit social cognition because of poor ability to read social cues. Conversely, many relatively
typical adults may overestimate their ability to read body language in these situations, sometimes with severe consequences for their sexual partner.

**Fairness**

**Autism.** Aforementioned research from autistic people’s perspective begins to converge on a profile of rigidity toward moralistic concerns such as rules, truth, and aversion to harm related to the hypersensitivities, cognitive inflexibility and emotional difficulties with reappraisal, intrinsically motivating but atypical interests, and difficulties with social awareness and engagement of autism. Similarly, autistic people show less susceptibility to an audience effect (performing better when observed) in assessments and experiments. Paradoxically, this greater honesty that can complicate both the study and accurate perception of autistic people may itself reflect a moral value, but may hamper social functioning.

**Psychopathy.** Manipulativeness (e.g. dishonesty, exploitativeness), long a core feature of psychopathy, also challenges its assessment and detection (if for opposite reasons and social outcomes).

**Loyalty**

**Autism.** Data may indicate high value of loyalty and sensitivity to betrayal in autistic people. Research has shown infidelity in close friendships as especially depressing for autistic adolescents (Whitehouse, Durkin, Jaquet, & Ziatas, 2009) and feeling lonely from low friendship security in particular in autistic children (Bauminger & Kasari, 2000). Evidence in this small body of literature suggests stability of and high commitment to romantic relationships in autistic adults and adults with high autistic traits in attention to detail (Del Guicide, Angeleri, Brizio, & Elena, 2010) or difficulties with disengaging attention (Jobe & White, 2007). Thus autistic people may have potential strengths in hyperfocusing on specific partners that can serve them
well when they have the skills, the relationship has enough mutual interest, and it has enough intensity as in a romantic partnership, but challenges adjusting when someone (for example, a peer at school) loses interest.

**Psychopathy.** Conversely, psychopathic individuals tend to lead highly promiscuous, unfaithful (to both their partners and others they “poach” from exclusive relationships) sex lives, including strategic use of manipulative tactics.

**Authority**

**Autism.** Various studies also find autistic children and adolescents with atypically or relatively close relationships with adults such as parents, teachers, and aides, which may relate both to challenges with peers and a desire for direction from adults, associated with the passive-dependent tendencies identified in autistic adults and other challenges with independence growing up, including separation anxiety from a low sense of self-efficacy.

**Psychopathy.** These patterns in autistic people contrast with the disloyalty and defiance against authority in psychopathy, a rebelliousness that relates to psychopathic disinhibition.

**Sanctity**

**Autism.** Autism may illustrate how the notion of the body as a temple relates to personality. Moral values may typically have a visceral role in the body, including raw, primitive emotions and sensations to guide people in an uncertain and dangerous world. For example, Ekman’s research indicates six universal human emotions: anger, disgust, fear, joy, sadness, and surprise. All these emotions but joy may appear negative but instead serve purposes such as protecting people from harm, including core disgust sensitivity in the mouth (the gustatory sense) that has an evolved function of warning people about toxic, foreign substances that may damage the body’s immune system if swallowed. Chapter 2 will discuss how this basic disgust sensitivity
has positively related to trait moral disgust, and how interrelated smell-taste sensitivities relate to autistic people’s distinctive sensitivities to foul smells and strong flavors that may have much farther-reaching effects than eating. Furthermore, Chapter 4 will connect autistic people’s obsessions with rituals and objects and punishment sensitivity to spiritual intuitions.

Psychopathy. Similarly, Chapter 2 will explain the link between basic hyposensitivities and low bodily defensiveness, in connection with the emotional detachment and risk-taking of psychopathy. While sensory-based studies have produced sensational headlines in the popular media, such as whether you might be a psychopath if you like your coffee black, and whether a sniff test might serve as a diagnosis of autism, they seem indicative of broader overactive automatic defense systems in autistic people and an offensive strategy in psychopathic people.

Emotional Responsiveness

Psychopathy

Returning to the universal emotions, the most classically and distinctively psychopathic individuals (those with the relatively even, especially egosyntonic temperament and emotions) tend to steer their goals through joy. With hyposensitivity to their sensations in their body, flares of selfish (rather than empathic or moral) anger when things do not go their way, but otherwise low experience of the other “negative” emotions, low-anxious psychopaths experience the world as relatively unthreatening and have relative immunity to stress. This liberates (disinhibits) them to act in the self-advancement of their interests; if psychopathy involves a moral philosophy, an Objectivist form of libertarianism about valuing one’s happiness through reason above all else seems fitting. If psychopathy involves a specific approach to life, viewing it as a fun game to win (to game the system) also seems appropriate. Indeed, classical economic game theory and the Enlightenment philosophy that guided the development of the U.S.’s free-market economic
system assumed that people act in rational self-interest; most do not, choosing costly acts of helping their group members or other passionate decisions, leaving room for psychopaths to dominate. Legal enforcers (police officers, security guards), creators or signers (such as U.S. presidents), prosecutors or advocates (lawyers), and interpreters (judges) overrepresent individuals with high psychopathic traits. Militarized security in schools and police brutality on the streets of inner cities, overly punitive laws, and lying and manipulation as a routine part of the justice system may attract people comfortable with those job responsibilities, although of course the practices of these occupations and the personalities of the professionals vary.

According to resource control theory, people who combine prosocial and antisocial tactics tend to gain more access to resources, popularity, and social success. This applies to psychopaths, who use a flexible array of tactics for influence (for example, charm, hardball, and coercion); flattery may relate as strongly to the different dimensions of psychopathy. The core callous-manipulativeness traits of psychopathy often contribute to high socio-economic status.

Psychopaths fit the profile of school bullies, who tend to enjoy high social status (popularity) through strong social cognitive and emotional self-regulation skills, to have fun humiliating the vulnerable (and peers may also like them highly depending on feelings about their targets). They tend to continue to have sound mental health, while their victims still often suffer from lingering effects of trauma, decades later.

**Autism**

In contrast, while autistic people often have involuntary reactions to their sensations and emotions and autism brings particular vulnerability to trauma. Small, unexpected changes in the environment others might not notice sometimes induce an involuntary physiological stress response such as flight (withdrawal), fight (meltdown), or freeze (shutdown); changes like
earthquakes produce heightened traumatic responses in autistic people (Kerns, Newschaffer, & Berkowitz, 2015). Meltdowns can appear like manipulative tantrums, and failure to distinguish between them can amplify the distress. Similarly, parents’ well-meaning own expressed emotions often transact with autistic people’s at difficult moments because of the emotional strength of the relationship and emotional fusion due to poor self-other awareness. Furthermore, autistic people experience high frequency of and poor responses to bullying. Many behaviors and experiences associated with trauma or abuse overlap with symptoms of autism; Chapter 4 will discuss further.

**Social (In)justice, Autism, and Psychopathy**

This dissertation will also expand on previous contrasts between empathy for autistics and psychopaths, which help to illuminate the complexity of the empathy construct. Psychopaths tend to have a strong ability to read emotions and body language (especially vulnerability cues) that they exploit in seeking thrills from others’ pain, talent for feigning emotional empathy and superficial charm that facilitate an impression as charismatic and trustworthy, and a high understanding of but disregard for social and moral rules that they use to avoid responsibility for their acts. Such callousness, feelings of guiltlessness, and failure to accept responsibility, alongside high moral understanding but disregard for moral values (most distinctively of care for others and fairness or justice) distinguish psychopaths even among violent offenders. Conversely, autistic people often highly share the pain and distress of others, especially those emotionally closer and more familiar to them, without fully recognizing the source of distress (high emotional empathy with low cognitive empathy), and feel so overloaded that they may turn away and seem indifferent or even callous. They have difficulties with reading nonverbal cues especially for unfamiliar people, and with expressing empathy in a way others recognize. The
analysis will suggest the importance of emotional empathy and caring for social and moral values and of cognitive empathy and moral reasoning for socioemotional success.

Autistic and psychopathic people also, although for contrasting reasons, do not conform to social norms, some of which risk harm for social justice. Thus the dissertation will explain that both psychopathic and autistic traits align with neurodiversity: the understanding that everyone has unique brains and personalities, and our various traits may function as strengths or weaknesses depending on factors like context, degree, and combination with other aspects of ourselves (e.g. Kapp, 2013ab). This philosophy carries the implication that society should empower people even with significant disabilities to take control over their lives in part by valuing their complex differences and potential to channel them in functional ways. Autism and psychopathy challenge norms of social justice to serve their role of a more fair society.
Chapter 2 Sensing Needs: Unmasking the Pain of Autistics and Psychopaths

“Autism isn't something a person has, or a "shell" that a person is trapped inside. There's no normal child hidden behind the autism. Autism is a way of being. It is pervasive; it colors every experience, every sensation, perception, thought, emotion, and encounter, every aspect of existence. It is not possible to separate the autism from the person--and if it were possible, the person you'd have left would not be the same person you started with.” (Sinclair, 1993)

The above quote stems from an essay by the founder of the autism rights movement that has served as a manifesto for self-advocates seeking “neurodiversity”; perhaps understanding of psychopathy as broadly affecting information processing may similarly help to address the needs of affected individuals. Sinclair’s argument for autism as inseparable from oneself overlaps with notions of “personality,” one that privileges internal experience and difference rather than the condition’s diagnostic basis in behavioral dysfunction defined and observed primarily by non-autistic professionals. Indeed, autism may promote an empirical perspective that grounds perception in sensory experience, in contrast to the sentimental bias of typical people and processing relative to one’s ego in psychopathy. The most documented cognitive strength of autism involves visual detection of patterns in objects (Mottron et al., 2013), which in highly verbal adults has related to reduced susceptibility to optical illusions (Bolte et al., 2007), suggesting a literally more objective perspective. People with depression and schizophrenia may also tend to resist visual illusions (Bolte et al., 2007), which may indicate more realistic thinking in the former case (Armstrong, 2010) and altogether suggest that self-enhancement biases and other cognitive distortions promote normal “hallucinations” and “delusions” that promote well-being (c.f. Taylor, Lerner, Sherman, Sage, & McDowell, 2003). These positive distortions appear to increase susceptibility to the “illusion” of an agreeable facade masking psychopathic
personality that may “blind” observed and self-perceptions alike. Egoistic biases in unrealistically positive self-deception overlap with psychopathy personality traits such as social dominance, emotional stability, and fearlessness (Paulhus & John, 1998). Indeed, criminal offenders’ psychopathic “fearless dominance” and callousness may relate more closely to the more maladaptive constellations of the condition than their distorted self-report suggests (Watts et al., 2016). Men in the general population who endorse high traits across psychopathy dimensions (“primary” psychopaths) may experience more negative outcomes such as arrests for violence than those who self-report more traits of the clearly maladaptive dimension of disinhibition and an average level of the putatively adaptive dimension of boldness (“secondary” psychopathic individuals), despite or because of the inherent advantage of the low distress of people with “primary” psychopathy opposite the internalizing problems of those with “secondary” psychopathy (Drislane et al., 2014). These studies support the classic notion that a “true” psychopath may endanger others and themselves (Cleckley, 1976), through thrill-seeking yet inflated views of their self-control. Indeed, sensation seeking may uniquely positively relate to all psychopathic dimensions among facets of extraversion (Donnellan & Burt, 2016) and only enjoyment or little experience of fear may unite dimensions among indices of low neuroticism (Drislane, Patrick, & Arsal, 2014; Hosker-Field, Gauthier, & Book, 2016). Considering fear’s basis in actual and immediate stimuli as opposed to abstract or anticipated concerns in anxiety (Sylvers, Lilienfeld, & LaPrarie, 2011) and theorized relationships between emotional insensitivity in psychopathy and a high sensory threshold that leads to seeking stimuli to satisfy needs for arousal (Rotenberg, 1975; Zuckerman, 1984), psychopathy may involve hyposensitivity across sensory modalities. Conversely, a low sensory threshold (hypersensitivity) relates to introversion and neuroticism in the general population, as do autistic traits in diagnosed
and subclinical adults especially for sensation seeking and emotional impulsivity. Autistic traits and sensory hypersensitivity may intertwine especially through need to withdraw from panic-inducing overload. Indeed, while official diagnostic criteria describe behavioral hyper- or hyporeactivity to sensory input and parental report may suggest sensory “subtypes”, neurological evidence finds extreme within-person variability in unreliable responses to same information over time specific to the primary sensory regions. Verbal adults likewise describe inconsistent processing contingent on various factors, such as their energy, conscious awareness, and the particulars of the stimuli. Thus autistic perception based in sensory surroundings may create “blooming, buzzing, confusion” because of the unpredictable, unavoidable, and dynamic nature of stimuli, promoting a preference for routine over risk (orderliness) opposite the reckless excitement-seeking of psychopaths. Failure to understand and meet sensory and social needs may bring life-altering pain that psychopathic individuals deflect and autistic people absorb.

**Developmental Trajectories: Sensory and Social Environmental Transactions**

**Autism**

Sensory, motor, and general attentional differences (arguably themselves related to visual or eye-movement differences) consistently emerge as the earliest manifestations of autism (Gallagher & Varga, 2015; Gliga, Jones, Bedford, Charman, & Johnson, 2014; Rogers, 2009; Sacrey, Bennett, & Zwaigenbaum, 2015). Parental report of the emergence of relevant behavioral problems in infancy often bears little relationship to evidence from home videos, reflecting under-recognition of early signs (Ozonoff et al., 2010), while parental report of atypical sensory and motor behaviors appears to mark the earliest accurate caregiver-recognized sign in the autism literature (Sacrey et al., 2015). The addition of sensory regulatory behavior to screening among children who meet preliminary criteria for autism at twelve months predicts more specific
identification (fewer early false positives) of autism in children at age 30 months, identifying children with greater and more persistent developmental problems, particularly in social communication (Ben-Sasson & Carter, 2013). Autistic toddlers’ parent-reported sensory over-responsivity predicts growth in the child’s anxiety a year later (Green, Ben-Sasson, Soto, & Carter, 2012) and greater and more stable parenting stress and impaired family routine functioning over the following few years (Ben-Sasson, Soto, Martínez-Pedraza, & Carter, 2013), beyond the influence of other child symptoms and developmental factors. Despite the importance of understanding the functions of sensory-based behaviors for the child’s self-regulation and potentially the parent-child relationship, parents have reported sensory responsive behaviors from six months to three years of their child with unacceptable internal consistency (as opposed to more reliable report for other domains: Del Rosario, Gillespie-Lynch, Johnson, Sigman, & Hutman, 2014), and parents’ report of their autistic toddlers’ sensory modulation behaviors has failed to relate to clinical observation (Ben-Sasson, Cermak, Orsmond, & Tager-Flusberg, 2007). Parents tend to report increasing sensory over-responsivity and activity until ages about six to nine, and decreases thereafter (Ben-Sasson et al., 2009), but autistic boys without intellectual disability ages six to 18 reported greater sensory difficulties with increasing age even as their mothers showed the opposite trend, with higher scores by self-report overall (Bitsika, Sharpley, & Mills, 2016). Studies have consistently found persistence of self-reported sensory symptoms within adulthood (Kent, 2014; Crane, Goddard, & Pring, 2009), whereas declining parental report by age continues into adulthood (Kern et al., 2006). In contrast to parental report of a relationship between sensory behaviors and autism severity in children but not adolescents or adults (Kern et al., 2007), autistic adults have reported sensory and motor behaviors as most interrelated with the rest of the domains of autism symptoms (Andersen et al., 2011). By
adulthood such trends do not seem to simply reflect higher self-awareness, as adults with lower nonverbal IQ reported higher sensory symptoms (Crane et al., 2009), and parent report becomes relatively stable by age from early childhood through adulthood when facilitated by clinical interview for current symptoms rather than completing a questionnaire (Kent, 2014; Leekam, Nieto, Wing, & Gould, 2007).

**Psychopathy**

Callousness of psychopaths develops through adversity that may literally desensitize individuals, with limited perceptual capacity that blunts and blocks out intense sensations. The triarchic model proposes that the meanness dimension constitutes disaffiliation from others that arises by a failure to form an attachment bond in infancy, through an “easy” (adaptable, low fear, uninhibited) or a “difficult” (irritable, inattentive, hyperactive) temperament linked respectively to the boldness and disinhibition dimensions in the development of psychopathy (Patrick et al., 2009; c.f. dual-temperament model). Longitudinal studies of observed parenting that began in infancy found that the responsiveness of caregiving mediated whether individuals developed callousness or internalized prosocial values, often in a for-better-or-worse manner such that positive support influenced high emotional empathy and moral internalization, for distinct temperaments linked to the hypothesized pathways and with diverse child assessment methods (Beaver, Hartman, & Belsky, 2015; Kochanska, Kim, Barry, & Philbert, 2011). These individual differences in parenting do not necessarily indicate abuse but at least ineffectiveness in response to their child’s needs, and likely often reflect parents’ own psychopathic traits, such as unemotionality in response to a psychopathically fearless father (Beaver et al., 2015) and detachment in children whose mothers devalue their emotions (Pasalich, Waschbusch, Dadds, & Hawes, 2014). Self-reported psychopathic traits across genders robustly relate to interest in
fellow psychopathic people for long-term sexual relationships (Blanchard, Lyons, & Centifanti, 2016; Jonason, Lyons, & Blanchard, 2015; Smith et al., 2014), use of coercive and controlling tactics to one’s partner (Hamel, Jones, Dutton, & Graham-Keyan, 2015), and feeling less attached to and invested in their child (Beaver et al., 2014), so the strong genetic susceptibility of psychopathic traits heavily increases the probability of this condition for those with high-trait caregivers. By children’s report, callousness has a bidirectional relationship with adverse experiences, growing from and creating them (Kimonis, Centifanti, Allen, & Frick, 2014). Callous children feel confident in their antisocial conduct and ability to control their parents and teachers even when they lack self-esteem (Schneider, Cavell, & Hughes, 2003; Haas, Waschbusch, King, & Walsh, 2015), and as adolescents often become further empowered through leading a group of bullies or violent offenders, through followers who have lower self-esteem (Kerr, Van Zalk, & Stattin, 2012; Kimonis et al., 2014; Van Zalk & Van Zalk, 2015). Callousness also poses exceptional susceptibility to criminal identity through the length of prison sentences (Boduszek, Dingra, & Debowska, 2016) and the formation of a social network with fellow inmates while in prison (Sherretts, Boduszek, & Debowska, 2016), and to violence through exposure in the media (Fanti, Hadjicharalambous, & Katsimicha, 2013) or witnessing in their life (Howard, Kimonis, Munoz, & Frick, 2012), which may explain the genetic susceptibility of callousness to low socio-economic status in youth. Late-onset callousness in adolescence grows from traumatic experiences such as feeling betrayed by a trusted adult (Kerig, Bennett, Thompson, & Becker, 2012) or immigration from a hostile situation that leads to time in refugee camps (Latzman, Malikina, Hecht, Lilienfeld, & Chan, 2016), which numb their emotions.

**Distal Sensory Processing**
Autistic people have robustly demonstrated enhanced perceptual capacity and intake of information within diverse visual and auditory stimuli, in contrast to the perception of typical people narrowed by inference from prior experiences and expectations (Hohway, Paton, & Palmer, 2015; Mottron et al., 2006; Swettenham et al., 2014; Van de Crys et al., 2014), and growing evidence of information processing in psychopathy that further filters out stimuli beyond one’s goals and focus of attention. Neurological differences associated with autism may usually emerge ahead of behavioral symptoms (e.g. Webb, Jones, Kelly, & Dawson, 2014), and a growing body of neural evidence supports visual and auditory brain hyperactivity and hyper-connectivity in young infants that precedes an autism diagnosis (Heffler & Oestreicher, 2016). The latter dovetails with broader evidence of neural hyperconnectivity around six months of age in infants later diagnosed with autism that precedes reduced brain connections in those areas in toddlers (Wolff et al., 2015, 2012), possibly indicating greater sensory overload as their primary sensory and motor cortical regions’ growth outpaces those of typically developing peers, whose processing may more efficiently adapt to the stimuli they experience. Visual and auditory hypersensitivity in autistic individuals relates to heightened sensory and emotional brain reactivity that habituates less over time (Green et al., 2013), which may suggest processing familiar sensations as “new” if not threatening when they have slight fluctuations. Callous individuals conversely show less visual neurological activity when observing violence (Yoder, Porges, & Decety, 2015), which parallels evidence of both their heightened susceptibility to desensitization from exposure to violence and reduced novelty or fear processing of various stimuli (Seara-Cardoso & Viding, 2015).

Visual
**Perceptual and attentional mechanisms of visual processing.** Evidence from the visual modality most clearly supports a pattern for “bottom-up” hypersensitivity in autistic people (greater perception “grounded” in the surrounding optical field through largely natural and automatic mechanisms), in contrast to “top-down” hyposensitivity in psychopathic people (limited perception filtered by attention through goals and prior experience).

**Autism.** Visual hypersensitivity relates extensively to social cognition and other aspects of autism. An autonomic pattern of heightened visual processing distinguishes four-month-old infants later diagnosed with autism from their preterm and medically fragile peers (Karmel et al., 2010; Cohen et al., 2013). Research on infant siblings of autistic children also suggests that autonomic hyperarousal from enhanced visual input foreshadows the clinical emergence of autism: 10-month-old infants exhibit a prolonged pupillary light reflex (Nyström, Gredebäck, Bölte, & Falck-Ytter, 2015), greater pupil size in response to emotional faces at nine months predicts lower socio-communicative behavioral functioning at 18 months (Wagner, Luyster, Tager-Flusberg, & Nelson, 2016), and enhanced visual search at nine months predicts higher autism symptoms at 15 months and two years of age (Gliga et al., 2015). These domains in autistic children relate to within-group severity of core symptoms or function as diagnostic markers: prolonged pupillary reflex to light (Fan, Miles, Takahashi, & Yao, 2009) related to a faster heart rate unlike in other neurodevelopmental conditions (Daluwatte et al., 2013), dysregulated pupil dilation (Anderson, Colombo, & Unruh, 2013; Martineau et al., 2011), and enhanced visual search of targets with absent goals (Keeln & Joseph, 2016). Autistic adults demonstrate enhanced perceptual capacity: higher levels of visual load helps them to avoid processing irrelevant distractors, unlike its adverse effects on typical adults (Remington et al., 2012). Higher capacity has unclear extension beyond a clinical threshold: adults diagnosed with
autism show reduced modulation by higher levels of perceptual load at the level of visual cortex, related to higher autistic traits among them but no effect of autistic traits (using the same measure) among non-autistic peers (Ohta et al., 2012).

**Psychopathy.** In contrast, psychopathic offenders appear to demonstrate reduced perceptual capacity related to their callousness and exploitativeness: higher visual complexity demands greater attentional allocation and constrains emotional reactivity (Sadeh & Verona, 2012). At lower levels of visual load, autistic people process more irrelevant stimuli than typical peers (Adams & Jarrold, 2012; Keehn, Nair, Lincoln, Townsend, & Müller, 2016; Ohta et al., 2012; Murphy et al., 2014; Remington et al., 2012, 2009), related to within-group severity of autism symptoms (e.g. Keehn et al., 2016). Conversely, psychopathic adults demonstrate reduced perception of distractors (Sadeh & Verona, 2008), and their ability to filter out stimuli irrelevant to their goals occurs across genders (Anton et al., 2012), levels of anxiety (Lake, Baskin-Sommers, Li, Curtin, & Newman, 2011), criminal and community samples (Hoppenbrouwers et al., 2016, 2015), and social and nonsocial stimuli (Dawel et al., 2015). Such selective attention mainly relates to the callousness aspect of psychopathy (Veit et al., 2013), and extends to blocking out stimuli relevant to both investigators’ tasks and sometimes their own goals among mean violent offenders, based on prior experience (Hoppenbrouwers et al., 2015). These studies may further explain how overwhelm from basic (visual) stimuli may cascade into broader struggles with unpredictability like change and social interactions in autistic individuals, and the great susceptibility to directly exposed and witnessed influences in individuals who develop psychopathy.

**Objects and faces.** Enhanced “bottom-up” perception associated with autism may help to explain why it may assist with processing visual stimuli with stable features that individuals can
control (e.g. objects) but reduce accuracy for dynamic and unpredictable stimuli (e.g. faces), while “top-down” processing in psychopathy manipulates what an individual perceives based on subjective focus of attention.

**Autism.** Eye contact may not benefit memory for faces in autistic children (Falck-Ytter, Carlström, & Johansson, 2015) in contrast to their strengths remembering static objects (Blair, Frith, Smith, Abell, & Ciplotti, 2002), and indeed their traits positively relate to impairments in identifying familiar faces but enhanced recall of objects (Cook, Shah, Gaule, Brewer, & Bird, 2015). Autistic toddlers and children perceive physical details in the environment peers and adults do not notice (Asperger, 1944/1991; Kanner, 1943; Klin, Lin, Gorrindo, Ramsay, & Jones, 2009; Losh & Capps, 2006). This “bottom-up” perception relates to difficulties understanding language in young children (Amso, Haas, Tenenbaum, Markant, & Sheinkopf, 2014), likely in part because caregivers may struggle to “see through their child’s eyes” for joint attention.

Perception more realistically based in surroundings with less filtering by preconceptions may relate to autistic individuals’ reduced susceptibility to a variety of optical illusions (Simmons et al., 2009), most directly “inattention blindness” of failing to see something in their visual field (Swettenham et al., 2014). Autistic adults’ strengths in manipulating visual patterns and seeing figures embedded within them relate to their reduced susceptibility to visual illusions, unlike peers with psychiatric disabilities who also show more realistic processing (Bölte, Holtmann, Poustka, Scheurich, & Schmidt, 2007). Similarly, autistic adults tend to show a visual processing style of processing the environment on a case-by-case basis (Johnson et al., 2010; Solomon et al., 2014, Yechiam et al., 2010), and a discrepancy for shaper performance for nearby stimuli related to the degree of autistic traits (Robertson, Kravitz, Freyberg, Baron-Cohen, & Baker, 2013).

Such tendency toward visual details does not necessarily impair holistic processing, but
integration may require conscious attention (Happé & Frith, 2006, Koldewyn, Jiang, Weigelt, & Kanwisher, 2013; Mottron, Dawson, Soulieres, Hubert, & Burack, 2006), time (Van der Hallen, Evers, Breuwaes, Van den Noortgate, & Wagemans, 2015), or the presence of global and local cues (Johnson et al., 2010). Autistic children, adolescents, and adults likewise process faces over a large window of time (Stevenson et al., 2015), including reduced habituation in the amygdala (Kleinhans et al., 2009; Swartz, Wiggins, Carrasco, Lord, & Monk, 2013; Wiggins et al., 2014). The latter means less calming over time despite repeated exposure in the brain’s novelty and emotional salience center, which suggests processing familiar faces as “new” and intense, and occurs for distinct genotypes linked to all the psychopathy dimensions (Sadeh et al., 2010; Wiggins et al., 2014). Indeed, autistic adults show face processing difficulties such as requiring extended time to encode them (McPartland, Dawson, Webb, Panagiotides, & Carver, 2004) or lack of benefit from visual attention (Churches, Wheelwright, Baron-Cohen, & Ring, 2010).

Psychopathy. Callous individuals’ enhanced processing of faces when motivated, if not also their unsentimentality toward objects, may suggest opposite tendencies from autism in visual attention and memory. Adults with psychopathic fearless dominance traits show faster processing and adults with callous traits show enhanced processing when they focus visual attention toward faces (Almeida et al., 2014). Strong recognition of such emotions occurs for tasks in psychopathic individuals occurs more often for tasks that make facial expressions more visually salient or simple (see Almeida et al., 2014), such as relatively enhanced recognition of fear related to meanness among criminal offenders, and an atypical increase from low to high awareness when the presentation of faces becomes flipped among adults with callous traits (Oliver, Mao, & Mitchell, 2015). Various purported deficits of psychopathy such as in processing (Larson et al., 2013) or recognition of emotions vanish when callous individuals
simply look at (Oliver et al., 2015), or follow instructions to attend to (Dawel et al., 2015),
stimuli like eyes.

**Prejudice.** Visual processing may extend to more popularly conceived forms of
personality like prejudice, at least on a perceptual level that does not preclude extensive other
factors. Complex stimuli that do not present consistently such as faces and nonverbal
interpersonal cues change quickly and in daily life occur simultaneously with other demands on
attention, so perceptual narrowing in infancy typically begins the development of efficient
encoding of faces based on exposure, including biases toward processing into socialized
categories like race and gender.

**Autism.** Precision- and present-based visual perception in autism can thus simultaneously
reduce the accuracy of processing of unpredictable (e.g. facial) stimuli generally, but help to
explain reduced visual prejudice toward ethnically and racially diverse faces evident in several
studies of autistic people (Birmingham, Stanley, Nair, & Adolphs, 2015; Chien, Wang, Chen,
Chen, & Chen, 2014; Kirchner, Schmitz, & Dziobek, 2012; Wilson, Palermo, Burton, & Brock,
2011), associated with greater severity of observed social communication symptoms in highly
verbal adults (Birmingham et al., 2015). This may transfer to other visually salient social
categories such as gender, as typically developing individuals reached adult levels of processing
relatively unusual faces, whereas highly verbal autistics never reached that competence (Strauss
et al., 2012). Moreover, autistic boys reported more acceptance of homosexuality than did
typically developing peers (Dewinter, Vermeiren, Vanwesenbeeck, Lobbestael, & Van
Nieuwenhuizen, 2015). More generally, a case-by-case processing style could relate to autistic
individuals’ reduced tendency toward stereotypes (Da Fonseca, Santos, Rosset, & Deruelle,
2011; Ewing, Caulfield, Read, & Rhodes, 2015; Hirschfeld, Bartness, White, & Frith, 2007; Zalla et al., 2015).

**Psychopathy.** Although psychopathic individuals report more ethnic prejudice related to not wanting disadvantaged groups to threaten their social position (Hodson, Hogg, & MacInnis, 2009), and men behaviorally express more aggression toward gay men (Parrott & Zeichner, 2006), their goals may bias their perception beyond group-based dynamics. Findings for meanness traits suggest a bias toward seeing others as potential victims that filters their processing toward weaknesses to exploit: enhanced memory in men for vulnerable female faces but weaker memory of other faces (Wilson, Demetrioff, & Porter, 2008), and enhanced recognition of vulnerability from facial expressions and gait especially among criminal offenders who poorly process perpetrator cues (Book, Costello, & Camilleri, 2013; Book, Quinsey, & Langford, 2007; Decety, Chen, Harenski, & Kiehl, 2015; Wheeler, Book, & Costello, 2009).

**Egocentricity**

Similarly, elements of personality like self-centeredness may relate in part to divergent visual processing in autistic and psychopathic individuals.

**Autism.** Autistic children and adults evidence a lack or reduction of the typical bias for remembering self-over other-relevant information such as words even among highly verbal individuals, which relate to greater core interpersonal difficulties. In typical children, enhanced self-referenced memory relates to a higher self-positivity bias, suggesting a phenomenon on the path to narcissism. In contrast, autistic children show lower self-referenced memory and self-positivity biases, which relate to their low theory of mind scores unlike in typical development (Burrows, Usher, & Henderson, 2016). Weak self-memory related to greater autistic traits and lower ability to infer emotional states from others’ eye region across autistic adults and the
broader population, as did the autism-related poor ability to recognize and verbalize one’s own emotions. Autistic adults also demonstrated lower self-focused attention in association with higher autism symptoms, while greater self-focus and private self-consciousness related to better ability to recognize others’ emotions. Conversely, non-autistic adults’ self-rated traits had the opposite relationships with self-focus and a lack of effect for private self-consciousness, which may suggest that looking within themselves (introspection) provides autistic people atypically beneficial insight into others’ minds. Realistic visual perception may mark an alternative path to self-awareness and perspective-taking for those autistic people who “think in pictures” (Kunda, & Goel, 2011). Highly verbal autistic adults showed difficulties with applying personal goals to specific rather than general autobiographical memories (Crane, Goddard, & Pring, 2009), and lack of the typical spontaneous bias for self-over other-events except an atypical enhancement when cued (Hare, Mellor, & Azmi, 2007), which may suggest that intuitive proneness to visualizing particular lived experiences can especially help autistic people’s cognitive and social functioning. Yet insight into these experiences may backfire for those who “see” themselves as undesirably atypical, as greater self-endorsement of autism symptoms and perception of difference relates to greater depression, and highly verbal autistic youth and adults often suffer from low social self-esteem. Thus the relatively robust effects of average to high modesty reported by adults with autism diagnoses or self-reported autism symptoms may result from humbling experiences beyond more natural influences against narcissism; they may also report more honestly and those who identify with autism may overestimate egotism if they internalize stereotypes of this condition that even by name assumes self-absorption.

Perceptual strengths in autistic children help them to engage in perspective-taking based on another’s line of sight (Conson et al., 2015; Pearson, Marsh, Ropar, & Hamilton, 2016), an
area that often challenges them because of its links to reasoning about others’ mental states more broadly (Hamilton, Brindley, & Frith, 2009), using an embodied visuospatial strategy. In contrast, “typical” children and adults generally use an egocentric strategy of imaging themselves in the other’s position for perspective-taking (e.g. Pearson et al., 2016), but become better over time at not appearing self-focused (Epley, Morewedge, & Keysar, 2004).

**Psychopathy.** Research on youth and diagnosed criminal offenders finds that psychopathic individuals’ well-replicated lack of neural processing in regions of affective perspective taking disappears when explicitly told to imagine themselves in another’s situation or share someone else’s feelings (Decety, Chen, Hareniski, & Kiehl, 2013; Marsh et al., 2013; Meffert, Gazzola, den Boer, Bartels, & Keyers, 2013), illustrating a highly egocentric mechanism for empathy that reflects lack of vicarious inclination rather than ability.

**Auditory**

*Autism.* Enhanced perception of basic auditory stimuli in autistic people often comes at the expense of speech and social development, but may confer potential in nonsocial areas such as music. Only for newborns with elevated autonomic brain response to sound did higher preference visual stimulation at four months predict autism behaviors (especially low social competence) and difficulty with speech at age three, and these findings across the three time points predicted an autism diagnosis and more severe autism symptoms (Cohen et al., 2013). This prolonged auditory response in the brainstem to nonsocial sounds also occurs in autistic children (Rosenhall, Nordin, Brantberg, & Gillberg, 2003) and extends to speech (Russo, Nicol, Trommer, Zecker, & Kraus, 2009). Enhanced perceptual processing of speech in autistic children may interfere with processing the linguistic components (e.g. Järvinen-Pasley, Pasley, & Heaton, 2008; Norbury, Griffiths, & Nation, 2010), which occurs even in tonal languages, as children
may experience enhanced simple perception of melodies but poor processing of spoken language (Jiang, Liu, Wan, & Jiang, 2015). Autistic people’s tendency toward exaggerated prosody (high within-person variability in the music-like aspects of speech) resembles the high pitch range of “baby talk” (Sharda et al., 2010), but non-autistic people’s “top-down” auditory processing often leads them to misperceive it (e.g. as monotone) because its out-of-sync or inconsistent rhythm violates their expectations (De Pape et al, 2012; Filipe et al., 2014, Nadig & Shaw, 2012). As with the visual modality, enhanced perceptual capacity grounded in the surrounding stimuli rather than prior knowledge typifies autistic children and adults. This tendency appears to develop from reduced habituation to frequently heard sounds (Guiraud et al., 2011) that interferes with lexical stress as a mechanism for word learning (Ferencej & Curtin, 2013), processing familiar words on a more case-by-case basis as relatively “new”, as supported further by evidence that at one year of age infants later diagnosed with autism showed a greater understanding and production of unexpected words when controlling for their low receptive and expressive language skills (Lazenby et al, 2016). Thus exaggerated prosody directed to autistic children may interfere with their linguistic understanding if they process the tone at the expense of the meaning, explaining the association between heightened pitch sensitivity and language delay history (but not necessarily current skills) in autistic individuals, and the developmental risks of such speech toward autistic children despite its frequency in Western therapeutic practices (Solomon, 2011). Children show strong processing of sung language across the autism spectrum but reduced processing of spoken language as a function of verbal abilities (Sharda, Midha, Malik, Mukerji, & Singh, 2015), and heightened processing of song or musical abilities relative to their IQ (Bhatara, Quintin, Fombonne, & Levin, 2012), verbal skills (Lai, Pantazatos, Scheider, & Hirsch, 2012), and experience (DePape, Hall, Tillmann, & Trainor, 2012).
Heightened brain activity for sung language processing in a region typically associated with perception of speech, yet low processing of spoken language, in autistic children with low verbal skills described as “low-functioning” relative to typically developing peers (Lai et al., 2012), provides further support for the risks of extreme auditory sensitivity to musical aspects of speech like vocal inflection on autistic children’s language development. Intertwined perception and production of prosody in highly verbal autistic adults (Hesling et al., 2010), provides evidence in support of developmental continuity of these dynamics. Superior processing of synchronous but difficulty processing competing sounds (Bouvet, Mottron, Valdois, & Donnadieu, 2016), persistent hypersensitivity to the timing of sounds at the level of primary auditory cortex (Samson et al., 2011), and greater interest in classical music (DePape et al., 2012) in verbal autistic people suggests enhanced processing of pure forms of sound like that produced by finely tuned musical instruments but difficulty with inconsistent sounds like those created by vocal chords. Music thus can benefit autistic individuals regardless of whether they have savant abilities like perfect pitch to adapt to the imperfect flow of interpersonal cues and conversations, and many adults credit their autism for their musical success (e.g. Boerebach, 2012, McMurray, 2012; Williams, 2011).

Autistic people show a pattern of “knowing the music but not the words”, with persistent difficulties with understanding semantics across the spectrum (Arunachalam & Luyster, 2015; Boucher, 2012) in contrast to over-processing of the musical qualities of speech and natural strengths toward music. Difficulties with understanding figurative speech reflect general difficulties with receptive language in autistic individuals, whereas among autistic individuals enhanced auditory hypersensitivity relates to greater severity (Brandwein et al., 2015; Cohen et al., 2013) and stability (Eigsti & Fein, 2013; Troyb et al., 2014) of core symptoms as well as a
history of speech delay and lower verbal skills (Brandwein et al., 2015; Cohen et al., 2013; Samson, Zeffiro, Doyon, Benali, & Mottron, 2015; Yau, McArthur, Badcock, & Brock, 2015) across ages and developmental levels. A distinctive pattern of elevated within-person variability in responses to pure tones in the auditory cortex among highly verbal autistic adults (Dinstein et al., 2012; Haigh et al., 2016, 2014) further illustrates the continued susceptibility of their processing to variations in tones of voice that may challenge their ability to understand them (Rutherford, Baron-Cohen, & Wheelwright, 2002), mirroring the inconsistent tones of their own speech. From the vocalizations of infants later diagnosed with autism to the speech of highly verbal autistic adults, autistic people tend to produce high within-person variability in vocal pitch and tones across the speech trajectory (DePape, Chen, Hall, & Trainor, 2012; Diehl, Watson, Bennetto, McDonough, & Gunlogson, 2009; Nadig & Shaw, 2012; Paul, Fuerst, Ramsay, Charwarska, & Klin, 2011), cries (Esposito, del Carmen, Rostagno, Venuti, Haltigan, & Messinger, 2014; Esposito & Venuti, 2009; Sheinkopf, Iverson, Rinaldi, & Lester, 2012), and cultural-lingual contexts (Bonneh, Levanon, Dean-Pardo, Lossos, & Adini, 2011; Filipe, Frota, Castro, & Vicente, 2014; Sharda et al., 2010). Considering the typical intersection between the development of oppositional-defiant behavior (ordinary noncompliance and tantrums ahead of the “terrible twos”) and speech (Cole, Armstrong, & Pemberton, 2010), responsive parenting’s atypically strong effects on increasing autistic toddlers’ language and challenging behavior (Baker, Messinger, Lyons, & Grantz, 2010), might suggest the intersection of auditory hypersensitivities and tendencies against assertiveness (if not manipulativeness) that can delay speech and self-help skills without sufficient support.

Psychopathy. In contrast, auditory hyposensitivity that tunes out sound beyond one’s attention appears to characterize psychopathic individuals, which may facilitate language and
antisocial development. Psychopathic offenders show reduced or delayed physiological reactivity to sounds of different emotionality across trait dimensions (Verona, Patrick, Curtin, Bradeley, & Lang, 2004). Reduced defensive reactivity in the auditory modality especially relates to the core callous-exploitative dimension in differentiation from antisocial personality disorder (Drislane, Vaidyanathan, & Patrick, 2013), and has long distinguished psychopathic delinquents from other offenders (Borkovec, 1970). This apparent ability to block out sound may help psychopathic individuals to avoid distraction from the phonology and prosody of speech and to focus on the focus on the basic meaning; they experimentally show good semantic priming but reduced affective priming to words (Blair et al., 2006), which connects to classic description of “the psychopath” as “one who knows the words but not music” (Johns & Quay, 1962 p. 217). The developmental implications of a profile opposite autism in early auditory hypersensitivity that filters out details from the prosody of speech to focus on the core meaning would likely suggest that psychopathy individuals may tend to enjoy strong language and vocal development.

**Proximal Sensory Processing**

The senses of near (smell) and especially direct (taste and touch) contact may more closely relate to the severity of autism’s social symptoms than the distal senses of sight and sound (Hilton et al., 2010), and play a larger role in socioemotional development. Asperger (1944/1991) emphasized hyper-responsiveness in these senses in his genetically based description of “autistic psychopathy,” as did Bettelheim (1967) for smell and touch in his most notorious description of caregiver-caused autism. Kanner (1943) emphasized from the beginning of life problems with processing food to the point of vomiting and lack of anticipatory posture to their mother’s hold as the feature that most distinguished autism from schizophrenia. Those problems may stem from the same sensory system: taste (gustatory sensitivity) arguably
constitutes a form of tactile processing mediated through the tongue rather than skin (e.g. Hilton et al., 2010), while other oral processing also involves touch as part of the somatosensory system (Cascio, 2010). Indeed, autistic children’s much-documented problems with food selectivity may most frequently stem from sensitivity to texture (Cermak, Curtin, & Bandini, 2010). Problems with feeding help to accurately identify autism in toddlers (e.g. Tomchek, Sears, & Sears, 2012), and parent-reported smell and taste sensitivities (often toward food) across ages most robustly distinguishes autism from other conditions in addition to typical development: ADHD, language impairment, Fragile X, other intellectual disabilities, other developmental delays, and even sensory modulation disorder (Ermer & Dunn, 1998; Leekam, Nieto, Libby, Wing, & Gould, 2007; Miller, Reisman, McIntosh, & Simon, 2001; Rogers, Hepburn, & Wehner, 2003). Similarly, by parent questionnaire report taste/smell sensitivity emerges most in putative “subtyping” of sensitivities, with the strongest relationship to maladaptive behavior and developmental delays (Lane, Young, Baker, & Angley, 2010; Lane, Molloy, & Bishop, 2014). This appears to reflect salience of these problems with these sensitivities to caregivers from impressions when filling out questions, whereas they show comparable robustness across age and IQ by parents when facilitated by an interview (Leekem et al., 2007) and by self-report (e.g. Kent, 2015). Self-reported taste and smell avoidance in autistic adolescents and young adults relates to thicker cortices in relevant brain regions (Wallace et al., 2016), providing the first neurological evidence of these hypersensitivities, adding to a literature base that lacks direct assessment in infancy. In contrast, tactile processing develops first among sensory systems and differences in it relates to diverse neurodevelopmental conditions (Cascio et al., 2010), with exceptional (among the traditional five modalities) near-universal frequency in infant siblings of autistic children reported by parents from three months (Bhat, Van Etten, Kaur, Srinivasan, &
Dobkins, 2016), and the earliest hypersensitivity by this age in perhaps the only case study to compare across senses that young (Dawson, Osterling, Meltzoff, & Kuhl, 2000). Aversion to social touch, whether naturally in the home (Baranek et al., 1999) or experimentally tested through parent-administered painting using their child’s hands and feet (Mammen et al., 2015), in infants late in the first year predicts autism symptoms and diagnosis. Both olfactory (smell) and tactile systems may factor critically in autism: a randomized controlled trial (RCT) based on maternal bonding with her newborn in the Neonatal Intensive Care Unit (NICU) through her touch and scent may have prevented social and reduced sensorimotor symptoms of autism in toddlers (Welch et al., 2015), and another parent-administered RCT emphasizing smell and touch claimed to have produced dramatic developmental gains for autistic children that for some included substantial decreases in core behaviors (Woo, Donnelly, Steinberg-Epstein, & Leon, 2015). Understanding of smell and touch sensitivities thus has the potential to better place the role of caregiving in the emergence of autism and likely psychopathy, and to understand the origins and nature of these conditions more broadly.

**Olfactory**

**Autism.** The sense of smell plays a key role in emotional processing that provides vigilance against perceived threat (Li, 2014; Lübke & Pause, 2015), such as “friend and foe” judgments from body odor (Pazzaglia, 2015), and may serve a critical role in relationships for autistic and psychopathic individuals. Autistic children’s increased sniffing of unpleasant (as opposed to pleasant) smells positively corresponded with the severity of observed social communication (but not motor) symptoms and helped to distinguish them from typically developing children (Rosenkrantz et al., 2015), perhaps indicating heightened (but not necessarily correct) orientation to signs of danger. Similarly, highly verbal autistic adults rated
odors as intense at a high rate due to false alarms from difficulty with judgment when uncertain, and they had more difficulty distinguishing between odors and determining their pleasantness (Wicker, Monfardini, & Royet, 2016). When blindfolded they expressed the ability to detect a smell at a closer difference than typical adults, related to higher autistic traits (Ashwin et al., 2014), a relatively “pure” test result that may suggest unisensory hypersensitivity as a function of autism in real time and space (as opposed to questionnaire report in the previous study) that might struggle to compete with other senses (e.g. sight) and processing demands in daily life (if not anticipatory judgment from intolerance for uncertainty). Similarly, autistic children’s fear of new foods relates to more consistent reactions to their odor regardless of emotional valence, an association not found for typically developing children (Luisier et al., 2015). Furthermore, the odor of their own mother but not a stranger’s mother promoted autistic children’s automatic imitation (Parma, Bulgheroni, Tirindelli, & Castiello, 2013), and their mother’s scent also counteracted their difficulties with action planning (Parma, Bulgheroni, Tirindelli, & Castiello, 2014). The relationship between poor identification of smells and less ability to engage in conversations in autistic adolescents similar to that in individuals with schizophrenia (Bennetto, Kuschner, & Hyman, 2007) may further suggest that an overly reactive olfaction system contributes to fear or discomfort toward interacting with (especially unknown) people. Parallel evidence in autistic children includes low levels at most times but typical levels when interacting with their parents of oxytocin (Feldman, Golan, Hirschler-Guttenberg, Ostfeld-Etzion, & Zagoory-Sharon, 2014), given this brain hormone’s links to recognition of social odors (Wacker & Ludwig, 2012).

**Psychopathy.** Conversely, psychopathy links to olfactory hyposensitivity, which relates to their low sense or enjoyment of danger and in more classically affected individuals may grow
from low fear of and affection for authority and attachment figures. Genetic susceptibility to psychopathy may transact with the environment of the womb of a potentially psychopathic mother (with psychopathology, criminal behaviors, or substance use): youth with low anxiety and early-onset, persistent conduct problems experienced environmental influence on the expression of the oxytocin receptor gene at birth that remained stable over childhood, related to such maternal risks and the development of callous-unemotional traits despite low reported early victimization (Cecil et al., 2014). Oxytocin may affect approach-avoidance decisions (Harari-Dahan & Bernstein, 2014) and social salience (Shamay-Tsoory & Abu-Akel, 2016), and potentially an epigenetic mechanisms such as those described above blunts olfactory-based detection of (interpersonal and general) threat through a failure of attachment (e.g. Wacker & Ludwig, 2012). In the general population psychopathic traits across dimensions relate to impaired olfactory abilities, associated with risk-taking (Mahmut & Stevenson, 2012), a connection that suggests hyposensitivity or under-reactivity to cues of danger. Diagnosed criminal psychopaths similarly test as having a blunted sense of smell (dysnosmia), which may relate to their risk-taking in common with impulsive performance on tasks associated with a brain region involved in conscious perception of smell and decision-making (the orbitofrontal cortex) implicated in the condition (Lapierre, Braun, & Hodgins, 1995).

**Gustatory**

**Autism.** Distaste sensitivity may relate to moral disgust more than physically disgusting stimuli external to individuals’ bodies (Chapman & Anderson, 2014). Autistic children show hyper-responsive reward processing of sweet foods (Cascio et al., 2012), adolescents show typical levels of ability to identify sweet tastes (Bennetto, Kuschner, & Hyman, 2007), and adults report such sensation as less sweet (related to greater autism severity) despite regarding it as
comparably pleasurable (Damiano et al., 2014), which all could indicate strong tolerance of or orientation to sweet tastes. In contrast, autistic youth have difficulty identifying more bitter tastes (Bennetto et al., 2007), and autistic individuals often have adverse reactions to healthier, less sweet tastes despite regular exposure at family mealtimes (e.g. Chistol, Must, Phillips, Curtin, & Bandini, 2016). Highly verbal autistic adults tend to report greater reactivity to tastes, as with other sensory domains, related to greater autism severity (Tavassoli, Miller, Schoen, Nielsen, & Baron-Cohen, 2013).

**Psychopathy.** In contrast, all psychopathic dimensions relate to low defensiveness toward tastes or stimuli that may enter the mouth typically processed as repulsive (Almeida et al., 2015; Glenn, Iver, Graham, Koleva, & Haidt, 2009), but not necessarily areas of disgust that might intuitively seem more relevant to morality such as physical contamination and animal harm (Glenn et al., 2009). Similarly, psychopathic and sadistic traits related to greater enjoyment of bitter tastes, with the strength of the relationship a function of the malevolence of the traits, including significant but weaker effects for Machiavellian and narcissistic traits (Sagioglou & Greitemeyer, 2016). These tendencies may indicate gustatory hyposensitivity and a willingness to risk one’s safety in dangerous situations given the mouth’s entry to the immune system and self-defense instincts, as illustrated by the positive relationships between all psychopathy dimensions and lower perception (Hosker-Field, Molnar, & Book, 2016) and greater enjoyment of risk (Drislane et al., 2014). Conversely, in autistic people hypersensitivities predict and eating problems relate to gastrointestinal distress (Mazurek, Keefer, Shui, & Vasa, 2014; Visserker, Latzer, & Gal, 2015), and they tend to engage in less risk-taking and toward atypical anxious motivations of avoiding failure rather than seeking reward (as in psychopathic individuals) when they do take risks (South, Dana, White, & Crowley, 2011).
Tactile

**Autism.** Autism’s first description as an independent condition in the West emphasized it as a disorder of affective contact (Kanner, 1943), but less adjustment to touch could indicate problems with motor anticipation or tactile defensiveness to physical contact beyond social contexts. Early tactile and maternal deprivation theories together dominated early scientific and clinical thinking on autism (Raz, 2013). “Father of child psychology” Michael Rutter helped shift the autism field from viewing the condition as an emotional disturbance in response caused by “refrigerator” parents to a genetically based neurodevelopmental disorder, and while Romanian orphans institutionally deprived of a caregiving relationship meet criteria for autism at an extremely high rate using leading methods he helped develop, their atypical clinical presentation and developmental course (from history to remediation post-adoption) led him to describe them as having “quasi-autism” hypothesized as due to lack of touch (Feinstein, 2010; Rutter, 1999). Other researchers have replicated “post-institutionalized autistic syndrome” that improves following adoption (Hoksbergen, ter Laak, Rijk, van Dijkum, & Stoutjesdijk, 2005), which might resemble the RCTs finding significant prevention or reductions in autism symptoms from daily parent-administered tactile interventions (Silva et al., 2015; Welch et al. 2015; Woo & Leon, 2013), although ties between these findings and the investigators’ treatment programs raise the risk of conflict of interest. The case of congenitally blind children may illustrate that the prediction of autism through avoidance of social touch in infancy (Baranek, 1999; Mammen et al., 2015) usually has origins in the children’s ineffective tactile processing. Blindness usually enhances tactile functioning (e.g. Goldreich & Kanics, 2003) through cortical reorganization as an adaptation to more reliance on that sense, and congenitally blind autistic children with intellectual disability likewise show benefits for social participation through tactile symbols.
rather than verbal requests (Aasen & Nærland, 2014). Thus that separate research teams have found a relatively high frequency, but also atypical or milder presentation that often substantially disappears over time beyond clinical significance, of autism in congenitally blind children (Hobson & Lee, 2010; Jure, Pogonza, & Rapin, 2016) may illustrate both the importance of visual processing in typical social interactions but also more relevantly the role of ineffective tactile functioning in autism. Biologically rooted tactile hypersensitivities likely transact with individual differences in parenting practices, as the particular benefit of responsive as opposed to directive parenting on positive social engagement in infant siblings of autistic children (Harker, Ibañez, Nguyen, Messinger, & Stone, 2016) on language development in autistic toddlers as opposed to typically developing peers (Baker et al., 2010) may partially occur through particularly adverse consequences for young children sensitive to touch whose parents excessively physically prompt them. Parents of infants in families with autistic children often display these overly directive behaviors (Harker et al., 2016; Wan et al., 2012), but training them to adopt a more responsive and less physical style helps to reduce social communication symptoms of autism in within the first year (Green et al., 2015). Other research may similarly indicate the developmental consequences of increasing tactile hypersensitivity, including a study of infant siblings of autistic children that followed them from seven months to two years found a distinctive parent-reported pattern of enjoyment of joint enjoyment of rocking (among initially typical levels of positive social affect alongside high perceptual sensitivity to slight stimulation), followed by low “cuddliness” that emerged around the first birthday and drove higher negative affect and low soothability among infants later diagnosed with autism (Clifford et al., 2013). This could reflect the child’s adaptation to tactile defensiveness at a time when distinctively high repetitive sensorimotor behaviors commonly arise in autistic children (Wolff et al., 2014), which
altogether may indicate a shift from co- to self-regulation (e.g. through rocking) as children become more hypersensitive and develop the motor skills for physical independence. Similarly, reduced parental affectionate touch toward later-diagnosed infants in the second half of the first year (Apicella et al., 2013) and a more vocal and less tactile (e.g. holding, rocking) response to crying in mothers of twelve-month-old infants later diagnosed with autism compared with mothers of developmentally delayed and typically peers (Esposito & Venuti, 2009), may indicate caregivers’ adaptation to the child’s hypersensitivity to gentle touch. Evidence altogether suggests that excessive, insufficient, or inappropriately attuned touch may contribute to the development of autism, especially social communication difficulties in children with predispositions toward unreliable or uncomfortable tactile processing.

Although tactile processing may most directly intertwine with social interactions, hypersensitivities associated with autism occur across various contexts. Similar to the visual and auditory modalities, autistic children show more realistic (less susceptible to illusion) tactile processing over extended time, related to greater difficulty with responsive communication and autistic traits (Cascio, Foss-Feig, Burnette, Heacock, & Cosby, 2012; Wada et al., 2014). Also similar to the other senses, autistic children and youth have shown reduced habituation to diverse tactile sensations (Green et al., 2015; Puts, Wodka, Tommerdahl, Mostofsky, & Edden, 2014), as a function of hypersensitivity beyond anxiety with greater neural reactivity even for those whose parents do not report elevated behavioral response (Green et al., 2015). In adults heightened processing of touch as a function of distance mirrors other senses like vision (Poole, Gowen, Warren, & Poliakoff, 2015) and smell (Ashwin et al., 2014), and greater reactivity to touch produced by another rather than oneself follows the same pattern as in the general population despite hypersensitivity (Blakemore et al., 2006). Yet tactile sensitivities in autistic people have
shown exceptional stability across ages by parent report, whether assessed by questionnaire in a sample of individuals aged three to 56 (Kern et al., 2006), or by interview in a cohort of adults followed from childhood (Billstedt, Gillberg, & Gillberg, 2007). In the general population genetically influenced, persistent tactile defensiveness relates to a fearful and less soothable temperament (Van Hulle, Lemery, Chalfant, & Goldsmith, 2015), so hypersensitive autistic individuals may particularly have difficulty coping with others’ touch when afraid. Relative to parents of typically developing children, parents often use physical strategies to engage with their young autistic children in general and to calm them when dysregulated (Doussard-Roosevelt, Joe, Bazhenova, & Porges, 2003; Gulsrud, Jahromi, & Kasari, 2010; Hirschler-Guttenberg, Golan, Ostfeld-Etzion, & Feldman, 2015; Kasari, Sigman, Mundy, & Yirmiya, 1988), but the children may more often use self-regulatory strategies especially when fearful and in response to “authoritative” parenting (Hirschler-Guttenberg, Feldman, Ostfeld-Etzion, Laor, & Golan, 2015; Hirschler-Guttenberg, Golan, Ostfeld-Etzion, & Feldman, 2015). While this parenting style typically helps with co-regulation of children’s emotions (Hirschler-Guttenberg et al., 2015a), perhaps its physical comforting strategies (Robinson, Madleco, Olsen, & Hart, 1995) overwhelsms many tactile defensive autistic children especially when they feel panicked. Similarly, the apparently greater effectiveness of adults’ responsive over directive interaction styles toward autistic children across relationship context (parent, teacher, or therapist: Goods, Ishijima, Chang, & Kasaril, 2013; Mohammadzaheri, Koegel, Rezaee, & Rafiee, 2014; Patterson, Elder, Gulsrud, & Kasari, 2014; Pellechia et al., 2015) may partially stem from less invasive touch. Yet while autistic children have demonstrated tactile hypersensitivity on bodily sites associated with social touch (Riquelme, Hatem, & Montoya, 2016), and a defensive behavioral reaction has related to greater social symptoms (Cascio, Lorenzi, & Baranek, 2016),
these effects occur regardless of whether a person does the touching (Cascio et al., 2016; Riquelme et al., 2016). Indeed, difficulty processing static touch relates to the severity of autism, and challenges inhibiting tactile sensations relates to greater severity of observed repetitive behaviors (Tavassoli et al., 2015). Discrepancy between reduced neural response to social touch on a typically enjoyable area in contrast to a hypersensitive response to a neutral area in autistic youth (Kaiser et al. 2015), and a heightened neural response to unpleasant nonsocial touch in autistic adults (Cascio et al., 2012), both related to greater social symptoms and might have suggested less pleasant affective responses than indicated by participants’ self-report. Staff report of hyper-responsiveness to touch mediated the social impairment in an institutionalized sample of autistic adults with intellectual disability (Lundqvist, 2015), which also may suggest particular tactile defensiveness when in a restrictive and adverse social environment. Overall, tactile processing may have less differences between autistic individuals than many studies or observations may suggest, because high variability within the same individuals in perception to same basic stimuli over time in even highly verbal autistic adults (Haigh, Minshew, Heeger, Dinstein, & Behrmann, 2015) may typify the condition.

Autistic children’s and adult’s touch processing shows chaotic patterns within the same individuals that likely overwhelm or confuse them and others, as indicated by simultaneous or quickly changing behavioral and neural indications of both tactile hyper- and hyposensitivity, which might overall mean over-reactivity. Autistic and typically developing children’s early neural response to pressure-related touch (a puff of air on the fingertip) associated with parent-reported tactile hyper-responsiveness in both groups, while autistic children’s later neural response correlated with parented-reported tactile hypo-responsiveness, yet neural responses at both stages related negatively to observed severity of their core symptoms (Cascio, Gu,
Schauder, Key, & Yoder, 2015). In line with the typical dominance of core tactile brain activity in early processing of painful stimuli administered to the skin followed by later brain processing in the anterior insula associated with awareness (Valentini et al., 2012), Cascio et al.’s (2015) findings may provide evidence in support of the notion that avoidance of or struggles with mild tactile stimuli often contributes substantially to the behavioral presentation of autism, because individuals experience them as uncomfortable or hurtful at a sensory level. Similarly, air puffs directed to the back of the hand elicit more trial-to-trial variability within the primary somatosensory cortex of tactile processing within the same individuals of highly verbal autistic adults even when they show no difference in behavioral response or overall neurological amplitudes, which differentiates them from typical adults and adults with schizophrenia (Dinstein et al., 2012; Haigh et al., 2016, 2014). In response to pulses applied to fingers despite engaged in another activity (watching a movie) and instructed not to pay attention, simultaneously and atypically increased and decreased functional connectivity in different streams of and between the somatosensory cortices related to autistic children and adolescents’ reported tactile and integrative behavioral sensory processing scores and autism severity, differentiating them from typically developing peers with strong accuracy (Khan et al., 2015). Similarly, atypical intrinsic functional connectivity of autistic children’s primary somatosensory cortex at rest most differentiated them from typically developing peers among brain regions (Chen et al., 2015). Thus a default setting of literally reduced resiliency to pressure may feature significantly in a rigorous definition of autism; indeed, autistic children (Riquelme, Hatem, & Montoya, 2016) and adults (Fan, Chen, Chen, Decety, & Cheng, 2014) demonstrate low pressure pain thresholds.
Tactile hypersensitivities in autistic people include perceiving both innocuous and noxious stimuli against the skin as painful, even though the official criteria lists apparent indifference to pain or temperature as an example of symptoms (APA, 2013). Silva and Schalock (2013) found that young autistic children had distinctively severe tactile sensitivities that related directly to self-regulatory difficulties, and nearly all parents and teachers reported the children show painful responses to non-injurious touch on multiple areas of the skin; most parents also reported mixed signs of pain and numbness to touch. In another study, the research team found distinctive mixed pain and numbness on multiple areas of the skin that related to the severity of autism and developmental delay, and for the face and mouth the severity of this tactile problem distinctly interfered with the children’s orienting response (Silva, Schalock, & Gabrielsen, 2015). Yet even more verbal autistic children have difficulty talking about their pain so they prefer to avoid the topic, and may need parents’ support to help interpret (Ely, Chen-Lim, Carpenter, Wallhauser, & Friedlaender, 2016), which shows consistency with autistic children’s reduced verbalization of their emotions in general (e.g. Hallet et al., 2013; Ozsivadijan, Knott, & Magiati, 2012). Research has found under-recognition of one’s own thermal pain in autistic adolescents with average intellectual ability to lower IQ and higher observed social symptoms even within an sample of adolescents with average cognitive abilities (Taylor et al., 2015), suggesting lower awareness of one’s pain reflects poorer abilities to understand and impacts core challenges with communication. Similarly, parents may report lower expressions of pain in their autistic child in association with higher core symptoms (Courtemanche & Black, 2016). They may also struggle to look for nonverbal cues, such as underreporting pain (to venipuncture in this case) more than do parents of typically developing children, even when their children have more observable facial reactions (Nader, Oberlander, Chambers, & Craig, 2004). Similarly, a team of
researchers found that autistic children sustain facial reactions suggesting pain to such vein-based blood draw for a longer period of time than typically developing peers and peers with developmental delays (Rattaz et al., 2013). Yet another set of researchers found that greater physiological and biological stress responses to pain (again to venipuncture) positively relate to severity of core symptoms in autistic children and adolescents, but they may not show a clear or elevated behavioral reaction (Tordjiman et al., 2009). Highly verbal autistic adults likewise show high sensitivity to thermal pain in their palm and forearm among more direct tactile hypersensitivities (Cascio et al., 2008). Self-injurious behaviors in autistic people robustly link to greater pain sensitivities according to behavioral (Courtemanche, Black, & Reese, 2016), sensory, autonomic, and immunological measures (Bodfish, Garrett, Wendelschafer-Crabb, Kennedy, & Symons, 2016) by different research teams, especially in those with intellectual disability. Similarly, neurological evidence in verbal autistic adults who engage in self-injurious behaviors suggests they pay attention to their pain (from heat against the skin) over an extended period of time and process it as more salient, in contrast to their subjective report of typical pain levels (Failla et al., 2016). Indeed, self-injurious behaviors usually indicate hypersensitivity to pain (hyperalgesia) across developmental conditions and species (Bodfish et al., 2016; Courtemanche et al., 2016). Overall, autism’s acute pain literature suggests under-recognition by questionnaire reports and observation but a tendency toward hypersensitivity when assessed directly by experimental manipulation and in ecological contexts such as in response to medical procedures (Moore, 2015), while the individuals who appear hyposensitive to pain may tend toward the extreme opposite yet inflict the most pain upon themselves.

**Psychopathy.** In contrast, psychopathic callousness may literally thicken the skin against pressure, in line with the literature on its emergence in response to adverse experiences and
shared linguistic root with *callus*. Experimental evidence shows that callousness alone among elements of psychopathy consistently relates to a higher pain threshold (for pressure and even electric shock), across developmental periods (adolescence and adulthood), samples (undergraduate, community, criminal), and measures and informants of affective meanness (Brislin, Buchman-Schmitt, Joiner, & Patrick, 2016; Cheng, Hung, & Decety, 2012; Miller, Rausher, Hyatt, Maples, & Zeichner, 2014; Northover, Thapar, Langley, & van Goozen, 2015). Reduced pain from electric shock links back to results from classic experiments that suggested low anxiety or fear as a core element of the syndrome (Hare, 1965), yet while only meanness relates to a high pain tolerance, all dimensions of psychopathy relate to low fear of pain (Brislin et al., 2016). Meanness includes extraverted excitement seeking and empowerment from cruelty opposite social withdrawal, and this agentic disaffiliation thus may resemble the thicker skin of extraverts who have a higher threshold for stimuli and literally maintain more coolness under pressure, although they go beyond outgoing people through inflicting pain onto others.

Tactile hyposensitivity in psychopathic individuals beyond pain appears to lack empirical assessment, but reduced bodily defensiveness suggest its existence. Psychopathic traits across dimensions relate to hypersexuality such as promiscuity and risky behavior with one-time partners, while meanness also relates to physical coercion. Conversely, sexually active autistic adults report more need for explicit consent for various activities to feel comfortable at sensory and social levels, and requiring accommodations like latex gloves to address barriers (Barnett & Maticka-Tyndale, 2015).

**Painful Realities: Seeing through the Noise**

Processing of the external five senses may provide the most basic “inside-out” and *empirical* approach to studying people, and while this area of research reveals many
complexities, those such as (autonomic) inconsistencies within the same person in autism may represent the core of the issue rather than “noise”. Indeed, aversive hypersensitivity to sound has shown the largest adverse effect on classroom learning among sensory modalities in autistic children and adolescents (Ashburner, Ziviani, & Rodger, 2013; Howe & Stagg, 2016). In light of research that almost all (27 of 30) autistic children “over”- or “under”-perform in relation to their IQ score in academic achievement (Estes et al., 2011), pain from sound and failure to filter out background noise may interfere with learning for many autistic people (see Stiegler & Davis, 2010; O’Connor, 2012). An odd pattern of downregulation of the auditory cortex and upregulation of the visual cortex when listening to (social or nonsocial) sounds in association with greater autism symptoms (Hubbard et al., 2012; Keehn et al., 2016), and neural evidence of auditory hypersensitivity related to greater autism severity even when clinical assessment misses it (Brandwein et al., 2015), may point to robust difficulties with trying to down aversive noise that interferes with flexibility and interactions. Auditory defensiveness shows a genetic association with a fearful temperament (Goldsmith, Van Hulle, Arenson, Schreiber, & Gernsbacher, 2006), and autonomic hyperarousal to sound relates to restricted and ritualistic behaviors in newborns both with and without later autism diagnoses (Cohen et al., 2013), yet parent-reported sensory sensitivities relate to anxiety in both autistic and non-autistic children but have more interrelationship with intolerance of uncertainty in autistic children (Neil, Olsson, & Pellicano, 2016). Indeed, reduced habituation to sensory input relate may contribute to autism as a disorder of biological and behavioral rhythms, as individuals seek familiarity amid a bombardment of sensations processed as relatively “new” (c.f. Amos, 2013; Tordjman et al., 2015). Neurologically, this dovetails with evidence of inhibition/excitation imbalance (Rubenstein & Merzenich, 2003; Uzunova, Pallanti, & Hollander, 2015) and atypical processing
of signals (Ghanbari, Bloy, Edgar, Blaskey, Verma, & Roberts, 2015) or oscillatory activity even at rest (Cornew, Roberts, Blaskey, & Edgar, 2012), as individuals may become overly aroused by sensations they want to suppress. Moreover, the salience brain network integrates external sensory stimuli with one’s own bodily, emotional, and mental states, and may best distinguish autism (Uddin et al., 2013). It switches between other brain networks involving activity at rest and active executive functioning (Golden et al., 2014), which aligns with evidence of a link between poor differentiation between brain states and behavioral inflexibility in autistic children (Uddin et al., 2015), and further suggests a complex relationship of sensory processing in autism and self-awareness. Attempts to inhibit sensory and related emotional and cognitive overarousal in noisier, potentially less accepting or predictable environments like school may help to explain evidence of a greater link between sensory behaviors at home than in the classroom and only a (positive) relationship between sensory responsiveness and ADHD at home (Sanz-Cervera, Pastor-Cerezuela, Fernández-Andrés, & Tárraga-Mínguez, & 2015). Behavioral sensory hyper-responsiveness may limit participation in environments outside the home but not parent-child activities (Little, Ausderau, Sideris, & Baranek, 2015), as the home and parents must adjust to the dysregulation. Greater behavioral inconsistency to the same stimuli across time in autistic children than peers with ADHD, at the level of the movement disorder of Tourette’s (Geurts et al., 2008), may further reflect chaotic internal processing that invalidates the validity of sensory types. Sensory-based meltdowns may overlap with data indicating greater oppositional (Chiang & Gau, 2016) or externalizing (Myles et al., 2007; Kapp, 2013) behaviors at home or as reported by parents, and greater maternally reported angry and irritable mood or explosive outbursts in autistic children than peers with ADHD (Mayes et al., 2015). Further evidence indications include that autistic children’s exceptionally common angry and irritable
symptoms of oppositional defiant disorder have not related to conduct problems as in the general literature (Mandy, Roughan, & Skuse, 2014), and autistic children and youth have shown an unusual overall pattern of high rates of oppositional defiant disorder but average conduct disorder manifestations (Gadow, DeVincent, & Drabick, 2008; Kaat & Lecavalier, 2013). A link between severe mood dysregulation in autism and lack of recognition of expressions of surprise, and related externalizing behaviors related to autism severity but parent report but not clinical assessment (Simonoff et al., 2012), further hints at unintentional meltdowns reflecting loss of control such as due to unexpected changes that may lead parents to underestimate their child (c.f. Kapp, 2013).
“[A]s somebody who's been trying to measure social behavior for a long time, I don't think there's even one thing that is social behavior. I think social behavior is actually many different things. We do much less well quantifying social behavior than we do lots of other things, even repetitive behavior.” (Catherine Lord, in Insel, Lord, & Targer-Flusberg, 2013)

Autistics and psychopaths may have brain-based differences that widely, deeply, and complexly affect their development and experience of the world in opposite patterns. Specific social disorders may not exist as scientifically valid constructs, whether (like autism) defined as a neurodevelopmental disorder (e.g. social communication disorder: Norbury, 2014; “specific” language impairment: Norbury & Sparks, 2013) or (like psychopathy) as a personality disorder (e.g. callous-unemotional traits: Herpes, Rommelse, Bons, Buitellar, & Scheepers, 2012; avoidant personality: Herbert, Hope, & Bellack, 1992; Marques et al., 2012). Schizoid personality may have inspired Asperger’s “autistic psychopathy”, which in turn appears to have inspired Kanner’s “infantile autism” (Silberman, 2015), but this aloofness construct may have exceptionally poor validity and uselessness (Mullins-Sweatt, Bernstein, & Widiger, 2012).

Perhaps schizoid personality’s inclusion of reduced pleasure from sensory stimulation (APA, 2013, 1994) hints at withdrawal or overwhelm from sensory overload that others may misinterpret as antisocial (c.f. Southard, Noser, Pollock, Mercer, & Zeigler-Hill, 2015), and maybe further exploration of sensory issues as they relate to one another and motor movement can help to validate autism and psychopathy. All behavior involves motor activity (Adolph & Robinson, 2015), so a clinical designation of atypical movement may not reveal much as a
general matter, but particular sensorimotor mechanisms may excessively and insufficiently control autistic and psychopathic people respectively despite both often presenting with poor motor or behavioral control (MacNeil & Mostofsky, 2012; Robinson & Bresin, 2014). Basic social interaction behaviors such as eye contact, facial expressions, and gestures show relative independence from age, gender, and nonverbal IQ for autistic individuals (Bishop, Havdahl, Huerta, & Lord, 2016), which may stem from excessive sensory and motor information yet poor integration, whereas more complex behaviors of “social interaction” quality such as approach (Bishop et al., 2016) may reflect more factors more dependent in social experience such as interpersonal expectations and anxiety. Such measurement stems from the Autism Diagnostic Observation Schedule (ADOS), which in accordance with main author Catherine Lord’s (2012) observation above has shown greater stability and arguably validity through its inclusion of nonsocial or general behaviors, as analysis will summarize. Only the ADOS has shown the ability to reliably identify autism in adults (Brugha et al., 2012, Sizoo et al., 2015), which may partially reflect that common self-report questionnaires often lack coverage of sensorimotor differences or (mis)construct autism as including low emotional empathy, in addition to having a perspective on their own lives that tends to differ from other informants’. Indeed, independent validation studies of the ADOS find it to distinguish autism from psychopathic and typical adults comparably well (Bastiaansen et al., 2011; del Bildt, Sytema, Meffert, & Bastiaansen, 2016), and apparently when otherwise investigated no study has diagnosed autism using the ADOS and psychopathy together (Meffert et al., 2013). Without limiting either construct to a particular measure, analysis between autism and psychopathy may benefit from embodiment (mapping them onto people’s movements instead of abstract symptoms), as the ADOS has demonstrated the ability to reliably designate individuals as autistic across clinics based on elicited behaviors
in real space and time (if through training that forces “objective” agreement on their coding: Lord et al., 2012; Zander et al., 2015), which suggests certain constellations of sensorimotor mechanisms as core to autism. In contrast to the triarchic model of psychopathy that allows an individual to receive a diagnosis of psychopathy without cruel exploitativeness through people who achieve interpersonal success through the bold action of warm people with low stress (Gaughan, Miller, Pryor, & Lynam, 2009; Patrick, Fowles, & Krueger, 2009), this analysis emphasizes mean callous-manipulativeness without assuming items of low anxiety or prosocial skills as key to antisocial dominance, and finds support for ruthlessness and reactivity to stress as usually helpful to psychopathic people’s deception. Whereas autism in the DSM-IV had 2,027 symptom combinations for autistic disorder alone (McPartland, Reichow, & Volkmar, 2012), let alone the much more permissive criteria for Asperger’s and pervasive disorder – not otherwise specified that both allowed lack of adaptive delays in contrast to Asperger’s “autistic psychopaths” (Leekam, Libby, Wing, Gould, & Gillberg, 2000; Miller & Ozonoff, 1997), perhaps attempt to embody autism and psychopathy through the earliest and most persistent developmental trajectories can help to validate them as coherent constructs with meaningful patterns between their dimensions.

Developmental Trajectories:

Autism

Motor. In contrast to Kanner’s (1943) description of relatively strong motor skills and typical relations to objects but in support of Asperger’s (1944/1991) report of difficulties and differences in these areas, movements delays especially affecting the ability to fluidly grab and control object may underlie the development of autism. Atypical visual tracking alongside weak arm motor tone at one month (Karmel et al., 2010), less advanced visual reception and
gross motor skills at six months (Estes et al., 2015), and throwing toys to the floor or little grabbing at them in addition to lacking the postural ability to sit on a lap with a straight back also at six months (Lemcke et al., 2013) marked the earliest predictors of autism in studies that followed up over multiple time points. Those data dovetail with greater observation of but less oral and manual engagement with objects in six-month-old infants within this age and population (Kaur, Srinivasan, & Bhat, 2015), as well as that fine motor delays particularly in grasping and exploring objects extend to non-autistic younger siblings of autistic children (Libertus, Shephard, Ross, & Landa, 2014). Weak muscle tone (Dawson, Osterling, Meltzoff, & Kuhl, 2000; Samango-Sprouse et al., 2015) and atypical (Zappella et al., 2015), reduced (Del Rosario, Gillespie-Lynch, Johnson, Sigman, & Hutman, 2014), and more passive (Zwaigenbaum et al., 2005) movements also suggest constrained motor ability to explore the environment infants at this age later diagnosed with autism. So does less symmetrical and more basic postures (Esposito, Venuti, Maestro, Muratori, 2009) or delays in the development and spontaneous initiation of new postures (Nickel, Thatcher, Keller, Wozniak, & Iverson, 2013), as well head lags when pulled to sit (Flanagan et al., 2012), in later-diagnosed six-month-old infants (c.f. Soska & Adolph, 2014). Lack of oral-motor anticipation (Brisson, Warreyn, Serres, Foussier, & Adrien, 2012) and coordination (Dawson et al., 2000; Gernsbacher et al., 2008a) at this age, and especially impaired volitional stopping in sucking in newborns (Lucas & Cutler, 2015), likely impact the ability of these later-diagnosed infants to mouth objects. Suspected vision problems such as squinting alongside decreased motor activity in later-diagnosed six-month-old infants (Bolton, Golding, Emond, & Steer, 2012) may indicate or predict enhanced covert attention often found among autistic individuals: the ability to see with little eye or head movement (Gernsbacher, Stevenson, Khandakar, & Godldsmith, 2008. Heightened visual input may
likewise grow from atypically sustained visual attention often observed in autistic individuals in early infancy (e.g. Bryson et al., 2007) and through adulthood (Keehn, Müller, & Townsend, 2013; Sacrey, Armstrong, Bryson, & Zwaigenbaum, 2014). Visual attention to geometric patterns, particularly when fixated on them as opposed to typical social stimuli, distinguished young autistic children from peers with developmental delay, other developmental problems, and typical development, as well as from fellow autistic toddlers with better cognitive, language, and interactive skills with 98 to 100 percent specificity (Pierce, Conant, Hazin, Stoner, & Desmond, 2011; Pierce et al., 2015). Such lack of attentional disengagement may also reflect poor oculomotor (eye movement) control that relates to language-impaired status and lower IQ among autistic and non-autistic children (Kelly, Walker, & Norbury, 2013), whereas better oculomotor skills in autistic adolescents with a history of speech delay than IQ-matched peers with typical age of onset (Takarae, Minshew, Luna, & Sweeney, 2004) may suggest developmental catchup in part through flexible visual scanning. Whereas autistic subgroups defined this way by a separate research team similarly differed by better bimanual coordination in the adolescents with a history of speech delay, which may suggest stronger communication across the brain’s hemispheres (Gooijers & Swinnen, 2014), both had poor goal-directed dexterity for movements using one hand or arm (Barbeau, Meilleur, Zeffiro, & Mottron, 2015). Furthermore, those with a history of speech delay had slower execution of those challenging movements (Barbeau et al., 2015). Such findings support poor manual dexterity to command (e.g. gesture), use tools (e.g. control and share objects as in playing with toys), and consciously imitate as a function of higher social communication and motor difficulties in autistic children (Dziuk et al., 2007), and a body of literature suggesting dyspraxia of skilled goal-directed movement as a core feature of autism. Indeed, volitional fine motor difficulties most consistently and centrally relate to autism among
movement difficulties. While sensory hypersensitivity (Jasmin et al., 2009) and gross motor problems (MacDonald, Lord, & Ulrich, 2013) associate with the ability to participate in daily activities, fine motor skills especially consistently relate to adaptive functioning including daily living skills in autistic people across the lifespan (evident 14 months through 40 years: Jasmin et al., 2009; McDonald, Lord, & Ulrich, 2013; Sutera et al., 2007; Travers et al., 2016). Beyond its association with lower present and prediction of future daily living skills (Travers et al., 2016), weak handgrip relates to more severe social communication impairments in autistic people across age, IQ, and developmental onset of autism symptoms (Kern et al., 2011; Travers et al., 2015). In parallel, strong fine motor skills affecting adaptive function in daily living in toddlers diagnosed with autism amid comparable developmental delays in other areas at age two predicts no longer meeting behavioral criteria at age four (Sutera et al., 2007). Likewise, strength in specifically this domain associates with false positive screenings for autism between ages 16 and 35 months (Tomchek, Sears, & Sears, 2012). Gestures that point at objects or hold them up play a particularly important role in building vocabulary in both autistic and typical development (Özçalışkan, Adamson, & Dimitrova, 2015), yet gestural delay uniquely distinguished autistic children from language-impaired and developmentally delayed peers at ages one and two (Veness et al., 2012). It may reflect motor impairments in arm movements often demonstrated in autistic people (Fournier et al., 2010), such as weaker manual dexterity than language-impaired children who share motor impairments (McPhillips, Finlay, Bejerot, & Hanley, 2014). For autistic children with strong receptive vocabulary, fine motor skills positively related to generalizing words through the typical shape bias (Potrzeba et al., 2015), an exceptional finding in the developmental literature that contrasts with how autistic children typically learn words (Arunachalam & Luyster, 2015). In parallel with that object control and tool use skills relate to
both motor impairment and the degree of diagnostic atypical social communication behaviors even in highly verbal autistic children (Dziuk et al., 2007; McDonald, Lord, & Ulrich, 2013), and the relatively stable problems in reach-to-grasp skills typical of autistic people (Mari, Castiello, Mark, Marraffa, & Prior, 2003; Sacrey, Germani, Bryson, & Zwaigenbaum, 2014), manual difficulties may have particularly robust effects on autistic individuals’ developmental pathways.

Fine and gross motor skills in autistic children usually fall further behind age expectations between ages one and three (Lloyd, MacDonald, & Lord, 2013), but and in toddlers whole-body may signal general developmental disability through overall language development (Bedford, Pickles, & Lord, 2015). In contrast, fine and oral-motor delays in infancy through early childhood particularly relate to expressive language such as speech, often alongside relative strengths in understanding language (Belmonte et al., 2013; Gernsbacher, Sauer, Geye, Schweigert, & Goldsmith, 2008; Iverson & Wozniak, 2007; LeBarton and Iversen, 2013). Difficulties with spoken language in young autistic children may likewise often indicate movement difficulties: in a sample of children ages two through four referred for concerns about speech, language, and autism, nearly two-thirds (seven of 11) of children diagnosed with autism met criteria for apraxia of speech, a condition of impaired oral-motor planning for coordinating use of the tongue, lips, mouth, and jaw to accurately produce speech sounds (Tierney et al., 2015). Many minimally verbal school-aged autistic children likely have marked fine motor impairment and speech apraxia (or dyspraxia) yet have relatively strong general cognitive capacity, such as the inability to point of many children in a sample of children who showed strengths in visual perception and nonverbal IQ (Courchesne, Meilleur, Poulin-Lord, Dawson, & Soulières, 2015) and the rare or absent use of gestures despite frequent (often unreciprocated) attempts to communicate among a sample of children who tested with relatively good nonverbal
cognitive ability (Krueger, 2013). Whereas low scores on visual reception and fine motor skills predicted remaining minimally verbal at age five, speech-generating devices enhance language and spontaneous interpersonal engagement for this such children at least that age (Kasari et al., 2014), which likely occurs in significant part through empowering control over the autistic children’s arm movements via their strong visual design that may compensate for the child’s motor weaknesses and build on perceptual strengths. Neural evidence of difficulty with oral-motor planning in highly verbal autistic youth and atypical prosody across the spectrum and lifespan show developmental continuity, as do case studies of highly verbal autistic individuals who lack reliable speech due to dyspraxia.

While motor problems in autistic children of preschool or early school age show more stability than in children with ADHD and other children over the following few years (Van Waelvelde, Oostra, Dewitte, Van den Broeck, & Jongman, 2010), and motor impairment in autistic children relates to the degree of autism severity (Green et al., 2009; Hilton et al., 2007; Hilton, Zhang, White, Klohr, & Constantino, 2011; Hirata et al., 2015), low manual dexterity particularly relate to core social communication symptoms (Hirata et al., 2014; Miyachi et al., 2014). Verbal autistic children of elementary school age have demonstrated challenges across research teams particularly in the use of visual and temporal feedback to guide and adjust their movement as in static balance and catching a ball (Ament et al., 2015; Whyatt & Craig, 2012), which differentiates them from children with ADHD (Ament et al., 2015). Such motor difficulties apparently often have high salience to autistic children and adolescents who have sufficient verbal skills to report them, as they have consistently reported low athletic in tandem with social competencies across research teams and cultures (Bauminger, Shulman, & Agam, 2004; Capps, Sigman, & Yirmiya, 1995; Williamson, Craig, & Slinger, 2008). Autistic
adolescents and adults’ physical quality of life (e.g. as applied to exercise or sports, energy, and daily living skills) similarly has higher or equal scores by self- than parent report, with other domains in the opposite direction, especially for social relationships (Hong, Bishop-Fitzpatrick, Smith, Greenberg, & Mailick, 2014; Sheldrick, Neger, Shipman, & Perrin, 2012; Shipman, Sheldrick, & Perrin, 2011). While the only statistically significant difference in lower rating of physical quality of life by self-report came from adolescence as parents reported significantly lower scores in all others areas (Shipman et al., 2011), autistic adults reported low social and especially physical (including sensory) pleasure (Berthoz, Lalanne, Crane & Hill, 2013), suggesting developmental continuity of sensorimotor challenges. Highly verbal autistic male adolescents and young adults’ demonstrated poor motor abilities related to the severity of their observed autism symptoms across all domains, and lower motor skills related to parent-reported social withdrawal for both autistic and “typical” participants (Freitag, Kleser, Schneider, & von Gontard, 2007), which further attests to the extensive impact of movement difficulties.

**Repetitive behavior.** Despite individual differences in “symptom” presentation or severity and developmental trajectories as well as assessments’ emphasis on social communication behaviors, evidence supports that sensorimotor and differences in general domains underlie autism. Among repetitive behaviors stereotyped motor mannerisms particularly distinguish infants at 12 months later diagnosed with autism amid other manifestations such as highly repetitive use of objects (Elison et al., 2014), and repetitive behaviors at 12 months predict lower adaptive behavior and socialization at two years of age (Wolff et al., 2014). From age two to nine, repetitive sensorimotor behaviors showed relatively high, consistent severity while rigid “insistence on sameness” behaviors started low and worsened over time (Richler, Huerta, Bishop, & Lord, 2010). Restricted behavior worsened from toddlerhood to adolescence
while social communication improved in another study (Gotham, Pickles, & Lord, 2012).

Similarly, repetitive behaviors show relative stability while social behaviors improved across different developmental trajectories in autistic toddlers (Norbert Soke et al., 2011) and children (Fountain, Winter, & Bearman, 2012). Greater improvement in social than repetitive behavior occurs for autistic people in children (Fecteau, Mottron, Berthiaume, & Burack, 2003; Pellicano, 2012), adolescents (Fecteau et al., 2003; Piven, Harper, Palmer, & Arndt, 1996; Seltzer et al., 2003), and adults (Piven et al., 1996) with various intellectual and language abilities. Similarly, a cohort showed greater improvement in reciprocal social interaction in adolescence followed by restricted and behavior and interests in adulthood (Seltzer et al., 2003). These studies generally use the ADOS for current assessment, and its prediction of no longer meeting criteria on it at age 19 by reduction in repetitive behaviors between ages two and three (Anderson, Liang, & Lord, 2014), further shows the relatively important role of this domain for people with stable diagnoses and the value of developmental history.

While developmental skills tend to generally improve throughout life in autistic people, infancy and adolescence may offer the most naturally challenging periods (as opposed to setbacks from the societally normative transitions such as to adulthood often with accompanying loss of services). The phenomenon of “regression” into autism that parents often describe in infancy or toddlerhood may reflect biased perception that misses early signs (Ozonoff et al., 2011), in part because brain changes may occur largely before clear behavioral manifestations. An example includes enlargement in the frontal (home of primary motor regions) and occipital (visual) lobes within the first few months of life that precede obvious challenges by preschool age (Nordahl et al., 2011), which may reflect reduced perceptual narrowing, as infants typically learn to specialize in processing the stimuli they frequently encounter through vision
and movement (Schwarzer, 2014). Yet autistic infants’ connections between brain regions may become overwhelmed through enhanced perceptual capacity and less efficient integration of information (c.f. Markram & Markram, 2010; Wolff et al., 2015, 2012). Dynamic, multifaceted discontinuity rather than linear progression and thus elements of “regression” may characterize early typical development (Smith & Thelen, 2003), while over-regulation may have cascading effects in the emergence of autism (Cashin & Water, 2006). Parents of infant siblings of autistic children and in the general population have reported a consistent trend of low activity levels at six months that become high by two years as negative affect (e.g. distress to small changes) or intensity rises and social approach declines (Bolton et al., 2012; Del Rosario et al., 2014; Garon et al., 2009; Zwaigenbaum et al., 2005) in autistic children, which may substantially reflect growing sensory reactivity (Del Rosario et al., 2014). Of course, across populations development takes place in transaction with one’s environments (Sameroff, 2010; Karmiloff-Smith, 2009; Lewkowicz, 2011; Rutter, Moffit, & Caspi, 2006).

Adolescence may mark a “second hit” as a major period of adversity for autistic individuals through greater external demands on conversational skills and risk-taking in transaction with internal dynamics of puberty and neural reorganization (Picci & Sherf, 2015). Those with fewer cognitive or intellectual resources may resist these changes, as manifest through an increase in repetitive behaviors that “insist on sameness” (Lord, Bishop, & Anderson, 2015) or try to restore order and familiarity (c.f. Hellendoorn, Wijnrocks, & Leseman, 2015). Minimally verbal individuals may tend to decline in nonverbal cognitive abilities (Skwerer, Jordan, Brukilacchio, & Tager-Flusberg, 2015) and across the spectrum individuals may tend to fall behind in secondary school as classes require higher-order thinking that place demands on complex information processing and executive functioning (Goldstein, Minshew, & Siegel,
Adaptive behavior tends to decline from childhood to adolescence, with a growing gap between developmental expectations and IQ with higher cognitive abilities and age through strained executive functioning, and particular influence from poor self-monitoring skills across domains (Kapp & Ne’eman, 2012; Pugliese et al., 2016, 2015). Yet autistic youth without intellectual disability may decline in their strategically positive self-presentations from childhood to adolescence, with no apparent effect of social motivation (Scheeren, Banerjee, Koot, & Begeer, 2015). Their social anxiety tends to increase over adolescence, with the opposite pattern in typical development (Kuusikko et al., 2008). Their risk-taking tends to relate positively to anxiety and behavioral avoidance (avoidance motivation) and IQ, as opposed to behavioral activation (reward motivation) in typical development (South, Dana, White, & Crowley, 2011), which may suggest that fear of failure rather than possibility of success per se drives autistic individuals’ risk-taking in contexts such as social initiations. As they become more aware of their differences from typical peers, their distress may tend to increase but they may suppress their autism to try to fit in, yet those with lower core symptoms or greater positive attempts to interact and more internalizing problems more often get victimized as a likely result of peer attribution of their behavior as reflecting oddness or poor character rather than disability. Autistic individuals’ reward processing center in the brain associated with habits in the striatum tends to increase in adolescence with the opposite effect in typical development, and corresponds with greater repetitive behaviors, suggesting that individuals may seek solace or become cognitively stuck in routines or perseverative interests amid this trying time of change. Those with intellectual disabilities may become so physically overwhelmed with the changes their bodies take hold of them, possibly explaining the unusual onset of epileptic seizures (Rutter & Pickles, 2016) and catatonic motor freezes (American
Psychiatric Association, 2013) in this period that threaten quality of life and their existence itself. Adolescence-onset epilepsy particularly affects autistic females (Amiet et al., 2008; Bolton et al., 2011), who may find pubertal changes like menstruation especially confusing and overwhelming, as autistic adolescents with intellectual disabilities less often receive education about bodily changes and have less capacity to understand them (Holmes, Himler, & Strassberg, 2015). Autistic girls may have more sensitivity to touch (Kumazaki et al., 2015), and even young women without intellectual disabilities may have lower daily living skills in personal care than their male counterparts (Taylor, Henninger, & Mailick, 2015), so assistance with hygienic needs may overwhelm autistic girls with low awareness. Tactile issues often make touch challenging for highly intelligent autistic women in diverse areas such as sex, childbirth (Gardner, Suplee, Block, & Lecks, 2016), and medical care, let alone the possibility of less comfortable clothes and the like for females. These biological vulnerabilities may interact with various factors such as unapproved antipsychotics more often prescribed for individuals with intellectual disabilities as they get older, and warrant further research.

**Psychopathy**

Callous-unemotional traits with conduct problems present the earliest, most persistent, and most severe clinically identified antisocial trajectory (Longman, Hawes, & Kohlhoff, 2015). Only parenting practices of harsh punishment and low warmth have robust evidence for the development of early callous behavior and psychopathy (Waller et al., 2015), which influence children through genetic-environmental interactions (e.g. Hyde et al., 2016). Moral development typically undergoes multiple steps in maturation within the first year and into the next (e.g. Hamlin, Wynn, Bloom, & Mahajan, 2011), and shows particular susceptibility to the supportiveness of early parenting in children genetically vulnerable to psychopathy (Kochanska,
Kim, Barry, & Philibert, 2011; Sadeh et al., 2010). Positive-assertive parenting predicts the growth of callousness and lack of moral internalization in anger-prone young children with genetic risk (Kochanska, Boldt, Kim, Joon, & Philibert, 2015). Studies have found callousness and other psychopathic traits like fearlessness and deceitfulness identifiable by parent, teacher, and peer informants in children with conduct problems as young as age three (Colins et al., 2014; Ezpeleta, Osa, Granero, Penelo, & Domènech, 2013; Graziano et al., 2015; Kimonis et al., 2015). Inference of others’ mental states in the service of antisocial behavior (“nasty theory of mind”) such as strategic lying particularly involves the ability to understand others’ false beliefs in elementary school-aged children (Happe´ & Frith, 1996; Lonigro, Laghi, Baiocco, & Baumgartner, 2014; Wang & Wang, 2015). Children with conduct disorder with or without callousness tend to have good ability to understand others’ perspective or recognize emotions, although callous children do not care about or enjoy their victims’ suffering, opposite autistic children (Jones, Happé, Gilbert, Burnett, & Viding, 2010; Schwenck et al., 2012). Bullies tend to have strong moral understanding but low moral values (Gini, Pozzoli, & Hauser, 2011) along with other socioemotional skills (Juvonen & Graham, 2014), an effect driven by psychopathic narcissism (Stellwagen, & Kerig, 2013; c.f. Book, Volk, & Hosker, 2012), which positively relates to all dimensions of psychopathy (Drislane et al., 2015; Gaughan, Miller, & Lynam, 2012) and especially involves high theory of mind ability (Stellwagen, & Kerig, 2013). Among children with conduct problems, belief they can control parents and teachers distinguishes callous children from peers without those traits and affects their disruptive behaviors (Schneider, Cavell, & Hughes, 2003). Even callous children with ADHD and low self-esteem have confidence in their antisocial conduct, to which they attribute more negative outcomes than peers with ADHD and conduct disorder without those traits of low prosocial emotion (Haas,
Waschbusch, King, & Walsh, 2015). Thus that parent- and especially teacher-rated callousness rated positively to children’s social competence, but such children regarded themselves as less socially competent and peers tended not to like them (Barry, Barry, Deming, & Lochman, 2008), may suggest the children’s antisocial skills in manipulating adults who failed to effectively help them to learn to act prosocially. Such dysfunctional parenting and peer conflict in childhood may lead callous children with conduct problems to affiliate with delinquent peers in adolescence (Kimonis, Frick, & Barry, 2004). Adolescents with self-reported psychopathic traits tend to perceive more conflict in their peer relationships than their friends with whom they engage in antisocial activities, even though the friends may tend not to report low social support, especially for males (Muñoz, Kerr, & Besic, 2008). Developmental norms of adolescence, especially in individualistic cultures and for those predisposed to disinhibition, may empower psychopathic youth as it marks the greatest spike in rebelliousness (e.g. conflict with parents or other authorities) and impulsive excitement-seeking (e.g. motivated risky behavior) due to neurological, hormonal, and societal changes (c.f. Arnett, 1999; Galván, 2014; Shulman et al., 2016). Delinquent conduct forms a somewhat normative part of development for adolescent males, whereas relative abstention from it relates to anxiety and weak social skills and peer relationships (Moffitt, Caspi, Dickson, Silva, & Stanton, 1996; Shedler & Block, 1990), extending to those diagnosed with autism (Hurtig et al., 2009). Conflict features prominently in the cognitive schemata of incarcerated youth with callous traits across genders (Pardini, 2011), but their influences from their abilities to bully (Fanti & Kimonis, 2012) or influence more vulnerable peers (Kerr, Van Zalk, & Stattin, 2012; Van Zalk & Van Zalk, 2015) may “help” them to lead antisocial networks (Kimonis et al., 2004; Van Zalk & Van Zalk, 2015).
Influence from more experienced offenders that results in criminal activity and imprisonment (Tatar, Cavanagh, & Cauffman, 2016) may especially apply to adolescence-onset psychopathy, as those with a long developmental history become more set in their ways over time (Kimonis et al., 2004; Lynam, Loeber, & Stouthamer-Loeber, 2008; Waller, Gardner, & Hyde, 2013). In adolescence and young adulthood in the general population, people’s personality tends toward more emotionally stability, socially dominance, conscientiousness, and openness (Roberts, Walton, & Viechtbauer, 2006; Shulman, Harden, Chein, & Steinberg, 2015), and psychopathic traits over these periods tend mature in a more adaptive direction as they gain more impulse control (Blonigen, Hicks, Krueger, Patrick, & Iacono, 2006; Harpur & Hare, 1994). Nevertheless, a criminal identity in response to longer periods of confinement in adolescents and criminals may form as a result of the mean rather than impulsive aspects of psychopathy as they callously form “friendships” with fellow prisoners to manipulate (Boduszek, Dhingra, & Debowska, 2016; Sherretts, Boduszek, & Debowska, 2016). Thus while formative experiences in affective (especially parental) relationships may mediate whether psychopathic individuals develop trust and define themselves as interdependent with others (Blagov, Patrick, Oost, Goodman, & Pugh, 2015, Craig, Gray, & Snowden, 2013), mean individuals who construe themselves as independent (Blagov et al., 2015) may fail to see how they often adapt to their adverse experiences through forming (anti)social ties as a result of failed or unresolved attachment (c.f. Christian, Meltzer, Thede, & Kosson, 2016; Craig et al., 2013; Martens, 2003; Patrick et al., 2009).

Following the Child’s or Adult’s Lead: The Praxis of Imitation

Autism
**Echopraxia.** Greater *automatic* mimicry of others’ actions in autistic people in association with higher autism and developmental severity may reflect a condition called echopraxia (relatively involuntary or subconscious motor movement). In autistic adults automatic hyperimitation of hands relates to greater autism symptoms in social and emotional reciprocity and difficulties with understanding others’ mental states (Spengler et al., 2010), and especially applies to a greater bias toward copying human over robot hand movements (Bird et al., 2007). Similarly, automatic hyperimitation of fingers relates to higher overall severity of autism symptoms (Sowden et al., 2015). Other studies consistently find evidence of at least typical levels of automatic imitation in autistic people (Hamilton, Brindley, & Frith, 2007; Press, Richardson, & Bird, 2010; Schunke et al., 2016). These findings dovetail with robust evidence of high responsiveness of children across the autism spectrum to adults’ imitation of their behavior (e.g. Nadel, 2015), as they may raise self- and thus interpersonal awareness beyond eliciting more attention and affectionate engagement through greater reciprocity from the other (Gernsbacher, 2006). Similarly, when parents’ synchronize or match their behavior (e.g. mirroring the child’s rhythm or pace) in response to their autistic child’s, this arguably reflects a form of the adults’ imitation of the child, and predicts higher joint engagement and child language (Gulsrud, Hellemann, Shire, & Kasari, 2015). Indeed, increased within-person sensorimotor variability in autistic individuals challenges higher-level integration of information for efficient motor planning and control (Gowen & Hamilton, 2013; Torres et al., 2013a), likely contributing to the reduced impact of experience on an implicit sense of one’s own actions that most people rely on for quick perception of others’ behaviors as in joint attention (c.f. Donnellan, Hill, & Leary, 2012; Mostofsky, 2011; Mundy, Gwaltney, & Henderson, 2010).
**Echolalia.** High induced as opposed to volitional imitation (of vocalizations in this case) relates to more adaptive impairment among institutionalized autistic adults with low language (Grossi, Marcone, Cinquegrana, & Gallucci, 2012). Echolalia helps individuals learn language on and off the autism spectrum, yet if parents regard it as a repetitive behavior rather than a form of communication as the ADOS does, they may miss an opportunities to connect with their child.

**Dyspraxia.** Such an atypical internal representation of one’s own actions challenges the initiation and execution of intentional skilled movements such as gestures, known as dyspraxia (Steinman, Mostofsky, & Deckla, 2010). Experimental studies of imitation in the autism literature predominantly focus on a more conscious and unnatural form of copying another’s actions on command, which usually show reduced mimicry especially of apparently meaningless gestures, or compromised accuracy alongside more effortful approximation (Edwards, 2014; Williams, Whiten, & Singh, 2004). This ability to spontaneously, precisely match another’s movements in autistic two-year-olds predicts spoken language level two years later (Stone & Yoder, 2001) and language growth in autistic preschool-aged children a year later (Miniscalco, Rudling, Råstam, Gillberg, & Johnels, 2014). Such explicit imitation reflects not only ability at the motor level in autistic children (Vanvuchelen, Roeyers, & De Weerdt, 2007) but also a closer interrelationship between motor and imitation skills than in typical development and ADHD (Biscaldi et al., 2015). Indeed, impairments in the execution of skilled gestures on command (e.g. in response to verbal prompts or through imitation) relate to both motor and social communication challenges in autistic children (Dziuk et al., 2007), and challenges with recognizing and performing the hand postures for these gestures distinguish them from peers with ADHD (MacNeil & Mostofsky, 2012). Dyspraxia in autistic individuals affects timing of movement, such that children with poor motor timing consistently perform worse on sequences
of skilled movements, imitation of mouth and facial expressions, simple motor skill and coordination, eye movements (via slower and less accurate performance), and visual-motor integration, in contrast to typical praxis and eye movements in autistic children with regular motor timing (Miller, Chukoskie, Zini, Townsend, & Trauner, 2014). In line with imitation tasks’ requirement of observation of others’ actions and movement of one’s body in response, autistic children with less synchronization between visual and motor systems by experimental measures and brain activity have more severe core social communication traits, while children with stronger visual-motor synchrony in brain networks better imitate (Nebel et al., 2015). Similarly, for autistic children and adolescents dyspraxia in action execution of pantomime correlates with greater social communication symptoms (Gizzonio et al., 2015). Autistic adolescents and adults’ degree of reduced performance on tasks requiring visual-motor integration related to reaching, grasping, and passage through an opening strongly related to the severity of their parent-reported core social communication symptoms (Linkenauger, Lerner, Ramenzoni, & Proffitt, 2012). Thus ability to volitionally imitate facial movements and hand and finger gestures in autistic individuals improves with time even as robust difficulties with timing of motor performance and movement quality remain among highly verbal adults (Biscaldi et al., 2014). Even verbose autistic individuals well into adulthood with gifted intelligence tend to have less accurate imitation and rely on goals to consciously emulate as opposed to easily mimic (Wild, Poliakoff, Jerrison, & Gowmen, 2012; c.f. Hamilton, 2008).

Individual differences in the ability to produce finely tuned movements and visual hypersensitivity among autistic people contribute to challenges recognizing diverse movements. Autistic children show an automatically higher intake of complex movement: they demonstrate enhanced a) processing of motion at high perceptual contrast and weaker suppression of
processing at low contrast (Foss-Feig, Tadin, Schauder, & Cascio, 2013), and b) sensitivity to the
direction of variable motion but typical levels of processing coherent motion (Manning, Tibber,
Charman, Dakin, & Pellicano, 2015). Yet in autistic adults optical hyper-excitability to flickering
lights or intense visual motion may relate to higher core traits without conferring enhanced
performance (Peiker et al., 2015; Schwarzkopf, Anderson, de Haas, White, & Rees, 2014), and
more difficulty perceiving coherence in motion relates to impaired recognition of emotions from
body movements (Atkinson, 2009). Thus visual hypersensitivity to complex motion interrelates
with autistic adults’ ability to produce fluid movement, challenging the perception of
inconsistent stimuli whether of objects or people (Freitag et al., 2008; Price, Shiffar, & Kerns,
2012). Autistic adults showed typical performance in processing static form or coherent motion,
but postural sensitivity to optic flow and visual sensitivity to a point-light display of human
movement that both related to their poor motor skills (Price et al., 2012). Activity in a brain
region involved in perceptual-motor coordination (the intraparietal sulcus, or IPS) during
observation of point-light displays of walkers and non-biological spatially moving point lights
positively correlated with reported social abilities across autistic and typical adolescents and
young adults (Freitag et al., 2008). Autistic participants’ reduced activity in the IPS especially
related to self- rather than parent-reported interpersonal functioning, and fit into their broader
pattern of reduced brain activity and slower response times across motion conditions that suggest
more effort to perceive complex motion (Freitag et al., 2008). Their reduced neural processing
during observation of walking motions related to their own gross motor difficulties associated
with walking (dynamic balance and diadochokinesis: the ability to bring limbs into alternating
opposite positions) and difficulties with precise execution of hand and finger movements from
observation (Freitag et al., 2008). These gross and fine motor abilities strongly interrelated and
distinguished autistic from typical comparisons, while especially correlating with brain activity for autistic participants (Freitag et al., 2008). Middle-aged autistic adults with high IQ displayed atypical movement (hand) kinematics associated with both the degree of their observed autism symptoms and the perception of point-light displays of hand motion as unnatural (Cook, Blakemore, & Press, 2013).

Greater difficulties in processing moving visual stimuli has practical implications for helping an autistic person. Slowing down the presentation of facial expressions shows an atypically strong benefit for autistic children of vastly different verbal abilities: helping the individuals to recognize (Gepner, Deruelle, & Grynfeltt, 2001) and imitate (Tardif, Lainé, Rodriguez, & Gepner, 2007; Lainé, Rauzy, Tardif, & Gepner, 2011). Watching another adult’s imitation of their own hand movements elicited activity in the same the right insula in autistic men (Delaveau, Arzounian, Rotgé, Nadel, & Fossati, 2015), the same region that has shown an opposite pattern of size in association with greater autistic traits in young men (Kosaka et al., 2010) from that of young adults with psychopathic boldness traits (Vieira et al., 2015), and that along with other research suggests increased self-other awareness from better perception-action coupling (Delaveau et al., 2015; Nadel, 2015). Furthermore, autistic adults show difficulties with perceiving global motion at short viewing durations, related to the magnitude of self-reported autistic traits (Robertson, Martin, Baker, & Baron, 2012). Yet increasing the time window during which participants could integrate motion signals reduced the “deficit” to the extent that at the longest duration autistic and typical individuals showed no difference (Robertson et al., 2014).

Reduced habituation to moving visual stimuli whether of wheels or faces in the amygdala (Green et al., 2013; Kleinhans et al., 2009), may help to explain why an enlarged amygdala at age two predicts reduced joint attention at age four (Schumann et al., 2009) and higher
amygdalar volume or activity relates to more distress or threat perception across the autism spectrum, suggesting further need to accommodate intense visual processing such as by not insisting on eye contact. These findings have consistent effects when using eye tracking, suggesting that gaze aversion may produce false effects of under-responsiveness in the scanner, but likely also misunderstandings in everyday life. Children typically learn to interpret emotions from the eye region in dynamic real time and space, yet neural response to shifts in but not static eye gaze in infants predicts autism diagnosis at age three (Elsabbagh et al., 2012), matching that neurological differences in how autistic and typical adolescents and young adults process videos of people and dynamic representations of social stimuli but not static images (Weisberg et al., 2014). Thus motion’s effects on processing of others’ behavior appears to carry over to eye contact: groups defined similarly as in Weisberg and colleague’s (2014) separate study and research team did not differ in spontaneous attention to static images of faces, but the autistic participants looked less at clips of interactions (Hanley, McPhilips, Mulhern, & Riby, 2013). Difficulties recognizing others’ emotions from the eye regions even when presented statically (by photographs) relates to lower verbal IQ, higher observed communication and interaction autism symptoms, and higher self-reported autistic traits among highly verbal adults (Lombardo et al., 2015). Thus, the significant benefit of colored filters on autistic but not typically developing children’s ability to interpret emotional facial expressions from photographs (Ludlow, Taylor-Whiffen, & Wilkins, 2012; Whitaker, Jones, Wilkins, & Roberson, 2016), further suggests the role of visual overload from movement as a contributor to “social” difficulties such as “reading the mind in the eyes” (RMET; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). For example, greater lateral glances in young autistic children in association with lower parent-reported adaptive functioning in interpersonal relationships may
reflect atypical visual processing (Hellendoorn et al., 2014), associated with enhanced covert attention in association with high perception but possibly poor oculomotor control Gernsbacher, Stevenson, Khandakar, & Goldsmith, 2008). Looking out of the corner of one’s eye may help an autistic child to see (Grandin & Panek, 2013), and this atypicality would benefit from others’ understanding and adjustments for reciprocal joint attention (Gernsbacher et al., 2008). Basic visual strengths (Maljaars, Noens, Scholte, Verpoorten, & van Berckelaer-Onnes, 2011) and possible fine motor weaknesses (Shield & Meier, 2012; Seal & Bonvillian, 1997) often extend to deaf autistic children, but their visual perspective-taking and social cognitive difficulties may disappear when matched on receptive language (Shield, Pyers, Martin, & Tager-Flusberg, 2016), and better understanding of their sensorimotor differences may help to avoid casting them as “low-functioning” (Maljaars et al., 2011) and to sign or otherwise communicate (c.f. Shield & Meier, 2012).

**Psychopathy**

**Hyperpraxia.** Children typically learn reciprocal imitation from the “natural pedagogy” of engaging in similar movement in interaction (Gergely & Cisbra, 2013), and hyperpraxia may educate children susceptible to psychopathy on the “hidden curriculum” of scripts for the roles that actors learn to play in developmental stages within the dramatic classroom of normative morality, such as the social masks of emotion-display rules for conveying affect that does not necessarily reflect true feelings. According to Kochanska and colleagues (2015, p. 779), “The child’s accepting, cooperative attitude toward parental socialization, with the child willingly embracing the parent’s values and standards of conduct, is perhaps the single most powerful factor that promotes adaptive, competent trajectory and prevents destructive, antisocial, and callous behavioral cascades”. Yet caregivers vary greatly in their values and conduct, and
children susceptible to psychopathy appear to quickly mimic what they observe and personally experience for better and for worse, which may explain parental risk factors such as an antisocial mother or a home environment with conflict and intimate partner violence in the development of callousness in children with conduct disorder with high or low anxiety (Cecil et al., 2014). Findings such as lack of contact with biological parents relating to avoidance of crime among stress-reactive men with psychopathy (Ishikawa et al., 2001) and higher maternal social support for mothers of toddlers with difficult temperaments at age 18 months related to greater self-reported callousness in 20-year-old men (Waller, Shaw, Forbes, & Hyde, 2015), may respectively reflect the absence and presence of antisocial influences like a two-parent household with a psychopathic father as opposed to a single mother. Early motor and temperamental factors may incline infants susceptible to psychopathy toward behaviors that in effect test boundaries and parents’ discipline, yet all dimensions of the syndrome involve less (prosocial) learning from punishment, and early parental behaviors directed toward than rather than witnessed may especially influence their development.

Uninhibited (“easy”) or disinhibited (“difficult”) temperaments theorized as linked to the development of psychopathic boldness and disinhibition respectively (Patrick et al., 2009) both may involve hyperactivity such as through thrill-seeking risk-taking (Ross, Benning, Patrick, Thompson, & Thurston, 2009), which may position infants susceptible to psychopathy among the subset of individuals with ADHD who reach motor milestones early (c.f. Johnson, Gliga, Jones, & Charman, 2015). The general developmental literature finds that infants’ processing and understanding of goal-based grasping of objects may depend on whether they personally have executed the actions (Bakker, Sommerville, & Gredebäck, 2015; Loucks & Sommerville, 2012). Similarly, adults’ fine motor experience using rather than observing a tool relates more to
their own sensorimotor resonance (shared neural representation at the level of somatosensory or
motor activity) when they see the activity performed (Cannon et al., 2014). Infants’ grip strength
may mediate sensorimotor resonance: following their own interaction with blocks (but
controlling for their amount of engagement), only infants with higher grip strength showed
neural sensorimotor modulation in response to observation of lifting actions with weighted
blocks with which they had interacted, with higher resonance for infants with greater strength
(Upshaw, Bernier, & Sommerville, 2016). Furthermore, infants exhibit higher neural
sensorimotor modulation when reproducing an adult’s goal-directed reaching movements of
objects, and their corresponding activity during their own action execution predicted their
tendency to imitate the behavior (Fillipe et al., 2016). Recent research on newborns challenges
the notion of innate imitation and instead supports the role of experience (Heyes, 2016;
Oostenbroek et al., 2016), and thus the likelihood of greater grip strength in boys (than girls)
susceptibility to psychopathy may relate to their enhanced differential susceptibility to
callousness (i.e., in a for-better-or-worse fashion) that depends on parental sensitivity (Beaver,
Hartman, & Belsky, 2015), through earlier imitative development. Young children’s apparent
“over-imitation” seemingly irrelevant actions may help them to development causal
understanding of other’s (often false) intentions and beliefs (Lyons & Keil, 2013, and this
behavior may reflect rational selection rather than an automatic instinct (Keupp, Bancken,
Schillmöller, Rakoczy, & Behne, 2016), which may suggest that hyperpraxic imitation in
psychopathic children supports their social cognitive development. No one can exactly imitate,
so the “fast and loose” manner of psychopathic people (see Hare in Dutton, 2012, p. 142) may
fare better than the more precise and inflexible cognition of autistics (c.f. Van De Crys et al.,
2014) for understanding of pretense. In line with reduced ability or motivation for pretend play in
autistic children (Kasari, Chang, & Patterson, 2013) and reduced judgments of appropriateness toward social pretense in adults with high autistic traits that mediated their lower perceived quality of in-group relationships (Yang & Baillargeon, 2013), autistic people show low “over-imitation” of seemingly goal-less actions across the lifespan (Gowen, 2012), which may suggest that engagement in deceit helps psychopathic children to understand false representations. Whereas autistic children show reduced motor-based understanding of the reasons for actions despite the ability to identify them (Boria et al., 2009; Sparaci, Stefanini, D’Elia, Vicari, & Rizzolatti, 2014), and autistic adults show reduced executive functioning in initiation and strategy formation that distinguish them from peers with ADHD (Bramham et al., 2009) and may have a sensorimotor basis in their internal action representations (motor memory Chen et al., 2008; c.f. Bebko, Rhee, McMorris, & Ncube, 2015), highly strategic activity underlies psychopathy (Patrick et al., 2009).

**Sensorimotor Over-Control of Autism, Under-Control of Psychopathy**

**Eye contact**

**Autism.** Empirical evidence fails to support the hypothesis of an initial deficit in social orientation such as eye contact as the first sign of autism (Johnson, 2014), but instead provides evidence that visual and auditory hypersensitivities play a causal role in autism (Heffler & Oestreicher, 2016). Autism literature finds atypically sustained visual attention upon examination in newborns (Pineda et al., 2015) greater eye contact especially in the first few months (Jones & Klin, 2013), with greater eye contact within the first seven months predicting lower face recognition (Klerk, Gliga, Charman, & Johnson, 2014), language (Pineda et al., 2015; Young, Merin, Rogers, & Ozonoff, 2009), and motor (Pineda et al., 2015) abilities. Similarly, strong social responsiveness demonstrated to faces of caregivers (Rozga et al., 2011) such as eye
contact and smiling (Zapella et al., 2015) or by parental report (Clifford et al., 2013; Del Rosario et al., 2014) in infants between five and seven months predicts an autism diagnosis as toddlers, whereas diminished early responsiveness in infant siblings of autistic children predicts failing to meet criteria for autism (Clifford et al., 2013). Such responsive visual attention, smiling, laughing, and cooing happened alongside enhanced perceptual sensitivity (Clifford et al., 2013), atypical general movements (Zappella et al., 2015) and low activity (Del Rosario et al., 2014), but declined as reduced cuddliness drove a surge in negative affectivity (Clifford et al., 2013) and sensory reactivity grew alongside physical activity (Del Rosario et al., 2014). Similarly, six-month-old infants later diagnosed with autism show typical levels of contingent responsiveness to their parents except continued smiling when their parents suddenly stop displaying emotional facial expressions in contrast to reduced smiling among non-diagnosed infant siblings and typically developing peers (Lambert-Brown et al., 2015). These findings may reflect early difficulty modulating sensory input and motor (including facial) output, as found in longitudinal case studies of infants later diagnosed with autism who exhibited typical levels of social responsiveness at six months but hypersensitivities, inflexible face scanning, or little motor initiation before interpersonal engagement declined (Bryson et al., 2007; Dawson, Osterling, Meltzoff, & Kuhl, 2000). High newborn-like attention to intense visual stimulation at four months among infants in the Neonatal Intensive Care Unit later diagnosed with autism followed a prolonged auditory brainstem response as newborns (Cohen et al., 2013) or asymmetrical visual tracking at one month (Karmel et al., 2010), and respectively predicted lower language and greater autism symptom severity as young children (Cohen et al., 2013) and declining mental and motor performance around seven to 10 months (Karmel et al., 2010). Such visual and auditory hypersensitivity likely explains speech’s disruption on face scanning for six-month-old
infants later diagnosed with autism (Shic, Macari, & Chawarska, 2014), at a time when typically developing infants typically learn audiovisual competence for speech processing through shifting attention to mouths that provide simultaneous speech sounds and lip motion, and then to eyes as they begin to speak (DePaolis, Vihman, & Nakai, 2013; Kushnerenko et al., 2013; Lewkowicz & Hansen-Tift, 2012; Tenenbaum, Shah, Sobel, Malle, & Morgan, 2013; Tomalski et al., 2013). Yet autistic people often demonstrate reduced audiovisual integration, perhaps due to enhanced perceptual capacity within independent senses (Mottron, Dawson, Soulières, Hubert, & Burack, 2006) and thus expanded window of time for cross-modal binding (Stevenson et al., 2015), especially for complex stimuli like speech. Limited or slow audiovisual integration affects the ability to lip-read or accurately listen to speech even among highly verbal autistic children and adults (Iarocci, Rombough, Yager, Weeks, & Chua, 2010; Saalasti et al., 2012; Smith & Bennett, 2007), which appears driven more by the visual modality (Iarocci et al., 2010).

Looking at speaking mouths thus shows benefit for communicative competence from infancy through adulthood in autistic people (Elsabbagh et al., 2014; Falck-Ytter, Fernell, Gillberg, & Von Hofsten, 2010; Klin, Jones, Schultz, Volkmar, & Cohen, 2002; Norbury et al., 2009; Tenenbaum, Amso, Abar, & Sheinkopf, 2014).

Audiovisual convergence in lipreading provides an example of assistance to perceptual salience in autism through intersensory redundancy (c.f. Bahrick, 2010). Similarly, the pattern of averting eye contact in response to another’s speech but not when speaking observed in autistic children (Doherty-Snoddon, Riby, & Whittle, 2012, Falck-Ytter, 2015) may facilitate auditory processing by avoiding the additional cognitive demands of watching when listening that also promotes gaze aversion in typical development and conditions associated with greater eye contact like Williams syndrome (Doherty-Snoddon, Riby, & Whittle, 2012). Speaking about
familiar topics likewise promotes eye contact in autistic and typical development, apparently because of reduced cognitive effort (Nadig, Lee, Singh, Bosshart, & Ozonoff, 2010). For many reasons converging on perceptual, cognitive, and emotional difficulties with processing, reduced eye contact has shown benefits for autistic people, and cautions against insistence on eye contact as a caregiving or intervention strategy. Reviews have found emotional hyperreactivity to eyes at psychophysiological (autonomic, such as skin-conductance level) and neural (e.g. amygdala) levels in autistic people (Bons et al., 2013; Tanaka & Sung, 2013), versus the opposite in youth with conduct disorder and callous-unemotional traits (Bons et al., 2013).

Psychopathy. While evidence on the development and processing of eye contact directly challenge social motivation deficit theories of autism (Chavallier, Kohls, Trojani, Brodkin, & Schultz, 2012), the psychopathy literature does suggest reduced social gaze due to low affective interest but not ability. Reduced eye contact characterizes callousness across the lifespan, evident from five weeks (Bedford, Pickles, Sharp, Wright, & Hill, 2015; Dadds et al., 2012, 2014; Boll & Gamer, 2016; Dawel et al., 2015; Gillespie, Rotshtein, Wells, Beech, & Mitchell, 2015). It may grow from parents’ own reduced affection, as mothers reported negative feelings toward their oppositional-defiant child who displayed low eye contact toward her in response to her expressed love, and the children’s maternally rated callousness relates to her use of corporal punishment and fathers’ self-reported psychopathic fearlessness (Dadds et al., 2012, 2014). Levels of eye contact did not relate to severity of oppositional defiant disorder, attentive-deficit hyperactivity disorder, or autistic traits (Dadds et al., 2014), but eye contact toward parents during parent-child free play and emotional conversation positively relates to maternally rated empathy in such boys (Dadds, Jambrak, Pasalich, Hawes, & Brennan, 2011). Yet apparently reduced recognition of facial expressions like fear in relation to lower eye contact in children and
adults (Dadds et al., 2011; Dadds, El Masry, Wialaweera, & Gustella, 2008; Gillespie et al., 2015) may reflect less attention during those tasks. In adults all psychopathy facets relate to less visual exploration of faces or eye contact (Boll & Gamer, 2016) and callousness relates to decreased gaze outside of one’s goals not limited to eyes (Dawel et al., 2015), but increased recognition of fearful faces when experimental manipulation induces focus on them (Han, Alders, Greening, Neufield, & Mitchell, 2012; Alder, Oliver, Mao, & Mitchell, 2015).

### Cerebellum

The cerebellum in relation to the rest of the brain may illustrate psychopathy as a prototypical “undercontrolled” personality type of disagreeableness and lack of self-control and autism’s tendency toward an “overcontrolled” personality of introverted tenseness (c.f. Donnellan & Robins, 2010). Excessive information from the body (primary sensorimotor areas) yet lack of integration (e.g. reduced cerebellum, white matter, connectivity) may constrain autistic people in contrast to heightened filtering by psychopathic people, including a larger cerebellum, which houses most of the brain’s neurons (De Zeeuw & Ten Brinke, 2015). The motor tracts within the cerebellum especially linked to autism play an important role in the encoding of higher-order rules (Balsters, Laird, Fox, & Eickhoff, 2014; Balsters, Whelan, Robertson, & Ramani, 2013), and thus may help to explain why autistic people tend to have difficulty learning the “hidden curriculum” of implicit social “rules” such as through body language (Myles & Simpson, 2011), in contrast to the classic problem of psychopathy of understanding but disregarding socio-moral rules. More controversially, the cerebellum’s rapid growth in the evolution of humans and other great ages over the prefrontal cortex may have helped learning through use of tools using fine motor skills (Barton & Venditti, 2014, 2013), and
evidence will show a pattern of a large cerebellum but small prefrontal cortex often demonstrated in persistent violent (especially psychopathic) men.

Little neurological research investigates the conditions (especially psychopathy) in females, but the findings may particularly apply to males. Sheldon (1942) boldly suggested that criminal men often have a constitutional (genetically rooted) somatotype (body build) associated with muscular physical (e.g. grip) strength and a personality associated with aggressive assertiveness, risk-taking, and indifference to pain, while much research has found delinquent men to have a tendency toward that body type (Ellis & Walsh, 2000; Maddan, Walker, & Miller, 2008), the personality traits overlap with psychopathy. Psychopathy may function as “adaptively” in women in patriarchal societies, as social dominance relates to disagreeableness in American women but not men (Anestis, Caron, & Carbonell, 2011), callousness relates to greater conscientiousness in Egyptian women but less in men in Egypt (Latzman et al., 2015), and thinner women endorse more psychopathic manipulativeness and self-centeredness in poor countries of less progressive gender ideology (Neumann, Schmitt, Carter, Embley, & Hare, 2012), as women vulnerable to exploitation may need more self-control and to control men to get what they need. Regarding autism, cerebellar volume uniquely distinguished boys from girls in autistic and typically developing children and correlated with reduced restricted and repetitive behavioral symptoms in autistic girls (Supekar & Menon, 2015). Brain volumes in cerebellar and frontal motor regions distinguishes autistic children by gender with high accuracy (Supekar & Menon, 2015), and at-rest cerebellar connectivity to other brain regions also distinguished autistic children by gender (Di & Biswal, 2015). Corresponding evidence includes that movement differences may apply to autistic females but in subtler ways (Torres et al., 2013) that may allow many to “camouflage” their behavior by mimicking typical peers or adults (c.f. Hiller,
Young, & Weber, 2016; Wing camouflage hypothesis) beyond influences like gender roles for pretend play (Harrop et al., 2016; Knickmeyer, Wheelwright, & Baron-Cohen, 2008) and conversations (Kuo, Orsmond, Cohn, & Coster, 2013). Yet autistic adults show lower personality in terms of “masculine” traits (such as competitiveness, assertiveness, leadership) across genders (Bejerot & Erikkson, 2014), and even the author of the controversial “extreme male brain theory” of autism has published that autistic men showed brain activity comparable to typical women’s and vice versa (Beacher et al., 2012) on a cognitive domain that has shown the largest gender differences in the general population (Zell, Krizan, & Teeter, 2015; also see Muth, Hönekopp, & Falter, 2014; Zapf, Glindemann, Vogeley, & Falter, 2015). Separate research teams have repeatedly found autism to defy gender norms in biology, physicality, behavior, and identity (Bejerot et al., 2012; Eriksson, Lundström, Lichtenstein, & Bejerot, & Eriksson, 2016; Jack, 2014). Cerebellar sizes provide a crude measurement but the particular areas and connections with other neurological networks, traits, and behavior or activities may provide significant meaning about one of four major brain regions, that most linked to the body.

**Autism.** Theoretical models by researchers with diverse agendas have converged on the cerebellum’s role in multisensory feedback loops and action as critical to autism (e.g. Donnellan, Hill, & Leary, 2010; Kern, 2002; Mostofsky & Ewen, 2011). Understood to play an important role in learning through movement (Koziol et al., 2014), the cerebellum affects perception (Baumann et al., 2015), social cognition (Van Overwalle, D’aes, & Mariën, 2015), and autism (D’Mello & Stoodley, 2015; Fatemi et al., 2012; Hampson & Blatt, 2015; Mosconi, Wang, Schmitt, Tsai, & Sweeney, 2015; Wang, Kloth, & Badura, 2014) through its integration of signals between other brain regions and the sensory systems of the spinal cord for muscular activity. Decoupling of perception and action for motor sequence learning (Marko et al., 2015),
and reduced exploration of the environment and greater engagement in repetitive sensorimotor behaviors (Pierce & Courchesne, 2001) in autistic children relate to a reduced volume of the cerebellum’s motor tracts, which in turn associates with greater autism symptoms across all domains (D’Mello, Crochetti, Mostofsky, & Stoodley, 2015). In typical development the cerebellum plays a key role in learning during sleep in newborns (Fifer et al., 2010) and shows the greatest brain growth in the first few months across genders (Holland et al., 2014), but this region has shown uniquely reduced size in newborns diagnosed with autism as children (Ure et al., 2016), consistent with its possibly exceptional developmental stability evident in autism neuroscience research of a small cerebellum from the first year through adulthood across the autism spectrum (Courchesne, Campbell, & Solso, 2011). A smaller cerebellum shows a consistent relationship with speech skills or severity among autistic people, applying especially to those regarded as “low-functioning” (Riva et al., 2013), diagnosed with autistic compared with Asperger disorder (Kevin, Cheung, Chau, & McAlonan, 2011), and with a history of speech delay even when matched for average IQ as children (D’Mello, Moore, Crocetti, Mostofsky, & Stoodley, 2016) and adults (Lai et al., 2014). Similarly, studies have found a small cerebellum in autistic boys even without pervasive neurological differences (Sussman et al., 2015) and greater cerebellar volume with increasing age in autistic males in opposite association with typical peers as an exceptional pattern compared with other regions (Lin, Ni, Lai, Teseng, & Gau, 2015).

Reduced sensory integration as in motor learning may contribute to both unimodal (e.g. visual and auditory) perceptual strengths and speech delays in autistic people (c.f. Bonnel et al., 2010; Jones et al., 2009a; Sahyoun, Soulières, Belliveau, Mottron, & Mody, 2009), and vice versa in transaction. Signs of autism in early childhood that vanished in a rare case study of a man without a cerebellum yet no associated other brain malformations, yet persistently impaired
audiovisual integration (Ronconi et al., 2016), may not only provide further support for the role of the cerebellum in multisensory integration (Koziol, Budding, & Chidekel, 2011) but also that early brain-based audiovisual sensitivities in autism may tend to play a causal role in autism but need not persistently impair social functioning with good person-environment fit. Furthermore, evidence such as strengths in connectivity between classic language areas of the brain but marked lack of functional connectivity between those areas and the cerebellum in autistic children classified as language impaired (Verly et al., 2014) may provide a neurological explanation for the perceptual and intellectual strengths alongside oral and fine motor challenges often found among autistic people with little reliable speech who may often have unrecognized capacity for understanding language. Indeed, studies have found even smaller cerebellar volumes in association with greater disability in developmentally delayed compared with autistic peers (Webb et al., 2009) and in peers with specific language-impaired compared with language-impaired and especially relatively language-skilled autistic children (Hodges et al., 2010; also see Kaufmann et al., 2003). Smaller volumes in specifically the motor tracts help to distinguish children with autism of unknown causation from typically developing peers along with more extensive reductions in children with genetic intellectual disabilities such as Down syndrome and Fragile X (Kaufmann et al., 2003). Furthermore, smaller volumes within specific cerebellar regions show associations with brain networks associated with attending to cognitive demanding tasks, various observational activities, and emotional and sensory processing, which distinguish autism from ADHD and dyslexia (Stoodley, 2014).

Similarly, atypical circuitry between the cerebellum and frontal lobes may distinguish autism (D’Mello & Stoodley, 2015; Stoodley, 2014; c.f. Crippa et al., 2016). Opposite the pattern of reduced cerebellar growth, the regions in the cerebral cortex in the first year tend to
show early enlargement, led by the frontal lobe and followed by the parietal and temporal lobes ahead of the occipital lobe (Courchesne et al., 2011). Size difference patterns relate to greater distances, with the frontal lobe of course at the front (Courchesne & Pierce, 2005), affecting how autistic people process complex information (Mottron et al., 2006). The volumes of these regions positively parallel evidence for greatest early difficulties or lack of clear strengths respectively in motor, tactile, auditory, and visual functions in autistic people that respectively exert primary activity in those brain regions (e.g. as synthesized in the prior and this chapter). Moreover, the patterns of under-connectivity and structure of the thalamus that relays sensorimotor signals across the brain in relation to motor dysfunction and relative hyper-connectivity in the region that houses the amygdala, in association with greater autism symptoms (Nair, Treiber, Shukla, Shih, & Müller, 2013) may support neurological theories of hyper-emotion and over-reactive sensation (e.g. Markram & Markram, 2010). Similarly, apparently greater reorganization over time in cortical areas (compared with the cerebellum) may dovetail with theories of over-arousal from hyper-perception (e.g. Markram & Markram, 2010; Mottron, Belleville, Rouleau, & Collignon, 2014). Also adding further evidence of its opposite relationship to the cerebellum, the larger volume of the frontal lobe especially applies to autistic people with a history of speech delays (Kevin et al., 2011) and positively relates to the frequency of autistic children’s stereotyped sensorimotor behaviors (Pierce & Courchesne, 2001). Larger volume of the motor cortex within the frontal lobe positively relates to slower finger tapping speed in autistic males across childhood through adulthood and a fairly wide IQ range (Duffield et al., 2013), which overlaps with greater activity in the supplementary motor area within the frontal lobes in autistic than typically developing children during sequential finger tapping (Mostofsky et al., 2009), suggesting more conscious movement in autistic people (Rinehart & McGinley, 2010). Similarly,
a larger primary somatosensory cortex within the parietal lobe relates inversely to fine motor dexterity to autistic people with and without ADHD (Mahajan, Dirlikov, Crocetti, & Mostofsky, 2016), and these regions containing main motor and tactile functions may tend to have reduced inter-synchronization or communication in autistic people (Just, Keller, Malave, Kana, & Varma, 2012). Perhaps the cerebellum and its connections to other parts of the brain help to explain how sensory hypersensitivities may underlie both the challenges and talents of autistic people (c.f. Baron-Cohen, Ashwin, Ashwin, Tavassoli, & Chakrabarti, 2011).

Psychopathy. In contrast, criminal psychopathic males show a pattern of an enlarged cerebellar but smaller cortical (especially frontal and amygdalar) volumes, which appears to stem from an early developmental trajectory, and to relate to sadistic pleasure and motor disconstraint (hedonistic, impulsive excitement-seeking) toward violence that may require an increasing number of victims to satiate. Boys with callous-unemotional traits and conduct problems may tend to have a large cerebellum (De Brito et al., 2009). Boys with ADHD and early-onset conduct disorder also show an enlarged cerebellum (Heubner et al., 2008), which contrasts with the strong tendency in the opposite direction for most individuals with ADHD more so than most neuropsychiatric conditions (Teicher & Samson, 2016), including a smaller cerebellum in youth associated with more severe ADHD and larger size related to stimulant medication (Ivanov, Murrough, Bansal, Hao, & Peterson, 2014). High-risk violent offenders show an enlarged cerebellum, with psychopathic meanness traits positively correlated with cerebellar volume (Leutgeb et al., 2015). Persistent violent offenders showed larger cerebellar volumes and connectivity of the cerebellum and smaller frontal and some other cortical areas, with an even more pronounced pattern for psychopathic men (Tihonen et al., 2008). Non-psychopathic high-risk violent offenders showed a large cerebellum that had greater at-rest functional connectivity
to the amygdala, along with lower connectivity to and smaller volume of prefrontal areas (Leutgeb et al., 2016), which may suggest emotionally charged motor impulsivity (c.f. Picazio & Koch, 2015) in “hot-headed” individuals prone to explosive acts of poor judgment they may later regret depending on their tendencies toward emotional empathy (c.f. Polaschek, 2015). Yet a history of victimization from physical abuse associated with a smaller cerebellum in violent offenders diagnosed as psychopaths, on a permissive threshold that mostly reflected their impulsivity and criminal history (Kolla, Gregory, Attard, Blackwood, & Hodgins, 2014), which may suggest reinforced motor defensiveness toward rash acts rather than the sadistically proactive excitement-seeking of “true” psychopaths (c.f. Patrick et al., 2009). Indeed, individuals with a history as survivors of abuse and neglect, along with various psychiatric conditions such as bipolar and schizophrenia, tend to have small cerebellar volumes (Teicher & Samson, 2016). In a general population sample of young adults, larger cerebellar size related to increased anxiety, whereas a smaller size associated with a larger ego (Chung et al., 2010). Similarly, a recent review found that a larger cerebellum generally relates positively to the personality trait of novelty seeking and negatively to harm avoidance, and sometimes to less emotional self-awareness that might further explain approach toward dangerous or risky situations (Petrosini, Cutuli, Picerni, & Laricchiuta, 2016). Indeed, self-reported subclinical boldness (adventurousness and social influence, grandiose self-confidence and resiliency to stress) of psychopathy (Vieira et al., 2015) show the same neurological pattern (a large right insula) as general samples of individuals with low awareness of their own emotions (Goerlich-Dobre, Bruce, Martens, Aleman, & Hooker, 2014) and individuals who endorse well-being from a self-realized life of meaning (Lewis, Kanai, Rees, & Bates, 2014). Also consistent with the popular notion of ignorance as bliss if not the self-deception of “fake it until you make it” given risks of
lack of guardedness, individuals who endorse subclinical boldness traits or psychopathic “stress immunity” respectively or callousness show cognitive dissonance (Murray, Wood, & Lilienfeld, 2012) and less self-monitoring or awareness (Fullam & McKie, & Dollam, 2009) when lying, yet these traits guard against defensive mechanisms in incarcerated men (Sandoval, Hancock, Poythress, Edens, & Lilienfeld, 2000). Thus such individuals may believe the illusions they have constructed for themselves in part because they feel the sensations of the emotions within their body at a shallow level, perhaps in part through enhanced sensory integration, as illustrated by brain activity of men in the general population with subclinical boldness or “fearless dominance” traits when observing violence (Yoder, Porges, & Decety, 2015). Thus the cerebellum may dovetail with a unified theory of “impaired” integration in psychopathy (Hamilton, Hiatt Racer, & Newman, 2015), through excessive integration driven by top-down goals that block out various inhibitions, often resulting in unconscionable acts for those who most lack a “conscience” (transcending morality to self-consciousness in terms of awareness or anxiety and conscientiousness in terms of observing rules or caution).

**Integration.** Psychopathy’s status as an egosyntonic personality constellation may stem from actions in harmony with one’s thoughts and emotions, as suggested by neural communication and connectivity, whereas less integrated or reliable brain activity in autism dovetails with out-of-sync behavior. Indeed, Hamilton and colleagues (2015) cite in support of “impaired” integration in psychopathy the finding that larger volume of the fibers that connect the brain’s hemispheres (corpus callosum) relates to greater psychopathic callous-manipulative traits, lower autonomic stress reactivity, and low spatial ability (Raine et al., 2003), which contrasts with a smaller corpus callosum in relation to reduced functional connectivity but the unusual autistic pattern of visuospatial strength for understanding language (Kana et al., 2006).
Larger white matter communicating within the prefrontal cortex distinguished men with psychopathic pathological lying from antisocial and typical controls, with a contrast for large neural communication (white matter) but small core size (gray matter) noted as opposite the pattern typical of autism (Yang et al., 2005). Indeed, reduced white matter in the brainstem of the autonomic nervous system in autistic males from childhood through adulthood relates to weaker grip strength and greater severity of core symptoms (Travers et al., 2015). Pathological lying either drew from core psychopathy criteria or malingering to fake illness in the criminal justice system (Yang et al., 2005); such “faking bad” through reporting unlikely symptoms in that context relates to higher theory of mind ability in psychopathic offenders (Nentjes, Bernstein, Arntz, Slaats, & Hannemann, 2015). Reduced intrinsic tendencies toward the typical bias to “fake good” in psychopathic people relate to their true personality among those who regard themselves as ruthless deceivers, given their disregard for prosocial conventions (Ray et al., 2013; Verschuere et al., 2013), which may assist with exploitation such as through feigning vulnerability to unsuspecting victims. While psychopathic people may have neurological integration highly tuned for predation, the often smaller size of corpus callosum in autistic people of various IQ scores corresponds with sensory issues, reduced fine motor skill, repetitive behaviors such as stereotyped speech, difficulties with rule changes and planning, and core symptoms (Hardan et al., 2009; Keary et al., 2009). Many people without a corpus callosum show some overlap with autism (Booth, Wallace, & Happé, 2011; Paul, Corsello, Kennedy, & Adolphs, 2014), yet within-person reduced organization rather than absence may characterize autistic brains, as uneven cognitive skills within the same person and in discrepancy to academic performance typify autism (Estes, Rivera, Bryan, Cali, & Dawson, 2011; Jones et al., 2009b; c.f. APA, 2013).
A Balanced Position? Movement Sensory Systems

**Vestibular**

**Autism.** The sense of equilibrium that coordinates movement with balance may help to further explain dominant effects of external stimuli on autistic people’s perception compared with psychopathic people’s attentional influences on their senses. Vestibular processing plays the central role in classic theory on autism as a disorder of perceptual inconstancy or modulation of sensory input and motor output from which need for familiarity and social difficulties emerge, for which longitudinal research and studies on individuals’ inconsistent reactions to the same sensory stimuli over time provide support. Evidence for such intraindividual variability in the visual modality in autistic children already existed at the time of those theories (Colbert, Koegler, & Markram, 1959) and has found replication more recently in children (Milne, 2011; Weinger, Zemon, Soorya, & Gordon, 2014) and adults (Dinstein et al., 2012; Haigh et al., 2016, Haigh, Heeger, Dinstein, Minshew, & Behrmann, 2015). Yet the vestibular system itself resides in the inner ear and affects perception of sound vibrations (Curthoys, 2010), so it may especially overlap with auditory hypersensitivity in autism among the traditional sensory modalities (c.f. Thabet, 2014). Thus that separate research teams have found upregulated activity in the visual cortex for auditory processing in autistic youth for both nonsocial (Keehn et al., 2016) and interpersonal (Hubbard et al., 2012) contexts in association with greater severity of core social communication symptoms, may indicate out-of-sync sensory processing indicative of atypical vestibular functioning. Furthermore, autism studies that show difficulties attending to changing sensations and actions may indicate vestibular hypersensitivity that may underpin consistently found and persistent difficulties in postural and balance control (Cook, 2016). Autistic people often demonstrate impairment in volitional but usually not automatic actions, such as in eye
movements (Minshew, Luna, & Sweeney, 1999), gaze following (Kirchgessner, Chuang, Patel, & Sereno, 2015), bimanual lifting (Martineau, Schmitz, Assaiante, Blanc, & Barthélémy, 2004), locomotion and balance control (Vernazza-Martin et al., 2005), and grip (Stoit, van Schie, Slaats-Willemse, & Buitelaar, 2013). These findings may dovetail with greatest executive functioning impairment in response initiation and intentionality in (dis)engaging in goal-driven actions widely manifest even in adults diagnosed with Asperger’s using somewhat permissive criteria (Hill & Bird, 2006). Similarly, parent-reported vestibular behaviors (e.g. spinning and difficulties keeping a still upper body) most related to autistic boys’ tested stress (Bitsika, Sharpley, Andronicos, Agnew, & Mills, 2015), providing a possible illustration of responses to emotionally self-regulate through maintaining one’s sense of balance amid constantly changing environments.

**Psychopathy.** In contrast, psychopathic people seem to have excellent ability to make precise movements at will when motivated and feelings of invincibility do not overtake them. People with higher psychopathic manipulativeness show reduced involuntary leakage of their true emotions through facial expressions when engaged in deception, whereas well-being corresponded with longer accidental leakage (Porter, ten Brinke, Baker, & Wallace, 2011). This may pose a Darwinian advantage given the famed naturalist’s theory on the role of unintentional micro-expressions in helping to detect deception to foster cooperation among species (Darwin, 1872), and supports the notion of psychopathic people as evolutionary “Cheater-Hawks” (Coyne & Thomas, 2008). Effects of exploitativeness and negative well-being replicate with the findings that people with mean, disinhibited psychopathic traits and *higher* stress may more effectively fake a good impression (MacNeil & Holden, 2006) and resist cognitive dissonance when engaging in deception (Murray et al., 2012) or social desirability biases when thinking about
themselves (Ray et al., 2013). Those empirical studies challenge the theoretical notion that low anxiety links with better persuasiveness (Patrick et al., 2009) but support data that it typically relates to more agreeableness (Visser, Ashton, & Pozzebon, 2012). Moreover, “bistrategic controllers” who deploy both coercive and prosocial tactics tend to enjoy more social success (e.g. Hawley, 2014), and they tend to have lower psychopathic and other disagreeable personality traits but also higher neuroticism (Zeigler, Southard, & Besser, 2014). Indeed, all psychopathic dimensions promote social dominance (Gaughan, Miller, Pryor, & Lynam, 2009), including similar positive associations with deceitful flattery (Murray, Wood, & Lilienfeld, 2012). Similarly, psychopathic people can feign facial expressions of fear and produce narratives of remorse perceived as genuine in association with various measures of manipulativeness (mean and bold variants) and across community and criminal samples (Book et al., 2015). Criminal inmates regardless of psychopathy may demonstrate strong modulation of facial expressions on command and associated physiological changes (Nentjes, Bernstein, Meijer, Anttz, & Weiers, 2016), and perhaps lower well-being may provide motivation to develop expertise in offending (c.f. Nee & Ward, 2015). Conversely, psychopathic men with lower distress exhibit less antisocial competence in avoiding detection through a greater history of arrests (Drislane et al., 2014; Ishikawa, Raine, Lencz, Bihrle, & Lacasse, 2001, possibly driven by overconfident decision-making and lack of autonomic bodily defensive system functioning (c.f. Gao & Raine, 2010). The reduced stress reactivity and grandiosity of low-anxious psychopathic male violent inmates may contribute to a lack of automatic avoidance of social threat that results in precarious instrumental aggression (von Borries et al., 2012), yet positive cognitive reappraisal of their situation (Sandvik, Hansen, Hystad, Johnsen, & Bartone, 2015) that may perpetuate reckless activity and lack of physical vigilance. High stress immunity may drive psychopathic
individuals’ fast oculomotor processing of facial expressions (Almeida et al., 2014) and inaccurate processing of (Del Gazio & Falkenbach, 2008) and proactive aggression toward (von Borries et al., 2012) people with angry expressions, as they feel invulnerable to signs of threat despite higher ability to recognize it (Copestake, Gray, & Snowden, 2013; Vidal, Skeem, & Camp, 2010). Yet this same trait of low anxiety may promote accurate processing of fearful faces (Del Gazio & Falkenbach, 2008) and – contrary to theories of “primary” and “secondary” psychopathy – enhanced fear learning (Schultz et al., 2016), as they may take a predatory interest in studying cues of vulnerability cues for potential victims. Unlike the abilities (if not always exercised well) of psychopathic people to pose emotions, autistic adults tend to produce emotional expressions on command either interpreted as unrecognizable (Brewer et al., 2015) or as unnatural (e.g. exaggerated) and thus easily detectable (Faso, Sasson, & Pinkham, 2015). Conversely, non-autistic people struggle to interpret the natural facial expressions of autistic people, which likely contributes to their difficulties interacting with others (Faso et al., 2015; Sheppard, Pillai, Wong, Ropar, & Mitchell, 2016) and both atypical posed and evoked expressions may reflect sensorimotor differences (e.g. explicit proprioception and movement).

Proprioceptive

Autism. Individual differences in the reliability of proprioceptive feedback (the sense of the position of one’s body in space) from self-produced movement likely contributes significantly to the ability for autistic individuals’ posture to effectively support body language such as gestural production. Evidence across the autism spectrum of more variable and random fluctuations in pointing micro-movements reflect a lack of automatic proprioception and provide individual signatures of “noisy” patterns, contrasted with typical development by preschool age of intuitive proprioception built from experience that enables flexible, timely, and spontaneous
gestures (Brincker & Torres, 2013; Torres et al., 2013ab). Autistic children have repeatedly shown more reliance on visual attention to their joint position when learning fine motor movements while typically developing peers look outward, which relates to clinical observation of problems with imitation on command and the social behaviors diagnostic of autism and differentiates from efficient sensory integration in ADHD (Haswell, Izawa, Dowell, Mostofsky, & Shadmehr, 2009; Izawa et al., 2012). This atypical learning mechanism through proprioceptive input enables the autistic children to learn visuo-motor sequences (Haswell et al., 2009; Izawa et al., 2012; Sharer, Mostofsky, Pascual-Leone, & Oberman, 2015), and their performance show less adverse impact than typically developing peers and those with ADHD when others present them with an alternative pattern (Gidley Larson & Mostofsky, 2008), likely because their more conscious and effortful movements allow more rapid change compared to those who act more automatically. Separate research teams replicate this atypical reliance on proprioception over vision, which extends back to when autism had much narrower criteria (Masterton & Biederman, 1983) and relates to reduced sensory integration (slow visual-tactile binding: Greenfield, Ropar, Smith, Carey, & Newport, 2015) and having relative motor skills rather than meeting full criteria for developmental coordination disorder (Miller & McIntosh, 2013), which provide further evidence that this learning mechanism reflects an adaptation to sensory processing and works for those with sufficient movement skills. Neural evidence that may support the utility of attention to posture for fine motor movements in autistic children includes reduced differentiation between lower limb or torso and arm or hand regions within their motor cortex (Nebel et al., 2014) and larger connective fibers within that region related to higher motor impairment (Mostofsky, Burgess, & Larson, 2007). Developmentally, evidence for the emergence of attention to one’s own body to move may stem from reductions in eye contact in infancy (Jones & Klin, 2013;
Rutherford, Walsh, & Lee, 2015) that may shift toward their movement and the floor (c.f. Kretch, Franchak, & Adoph, 2014), which may help autistic people to avoid walking delays compared with peers matched for high and especially low nonverbal IQ (Bishop, Thurm, Fjarmer, & Lord, 2016) and other motor problems (Ming, Brimacombe, & Wagner, 2007). Proprioceptive contributors to autistic patterns of motor strengths and weaknesses may transfer to classic movement disorders, as autistic people with and without CP overlap in showing patterns for relatively strong ambulatory skills and muscular hypotonia (Bishop et al., 2016; Christensen et al., 2014; Kirby et al., 2011; Ming et al., 2007). Visual processing strengths in autistic people commonly and distinctively extend to perceptual reasoning (Soulières et al., 2009), which may explain the positive association between their scores in this nonverbal cognitive domain and object-referring referring gestures and hand-writing in autistic children (So, Lui, Wong, & Sit, 2015) and adolescents (Fuentes, Mostofsky, & Bastian, 2010) not found in typically developing peers, to possibly adapt the need for visual precision to guide fine motor movements (c.f. Glazebrook, Gonzalez, Hansen, & Elliot, 2009). Furthermore, this pattern of non-intuitive proprioception often requiring vision for compensation appears to demonstrate continuity over time: autistic adults show a pattern of atypically focusing on their body’s position rather than looking outward to control their posture (Morris et al., 2015), and motor difficulties with postural stability in autistic adolescents and adults relate to greater social communication symptoms of autism (Travers, Powell, Klinger, & Klinger, 2013).

**Psychopathy.** In contrast to the proprioceptive and related literature suggesting a lack of internal action model as core to autism (Mostofsky & Ewen, 2011; Stoit et al., 2011), psychopathic people may have a highly intuitive sense of their body in space that frees their attention to manipulate. Psychopathic and Machiavellian people tend to more effectively
negotiate in person than online (Crossley, Woodworth, Black, & Hare, 2016), whereas computers mediate the communication of autistic more than non-autistic people through reduction of sensory overload and assistance with time to think and process information (Gillespie-Lynch, Kapp, Shane-Simpson, Smith, & Hutman, 2014; van der Aa, Pollmann, Platt, & van der Gaag, 2016), with the absence of nonverbal cues assisting autistics’ but challenging non-autistics’ communication (van der Aa et al., 2016). Psychopathic traits in adolescence related to indirect aggression by peer and teacher report but not self-report, yet direct aggression across reporters (Klimstra, Sijtsema, Henrichs, & Cima, 2014), which may suggest use of subtle nonverbal forms of antisocial influence below conscious awareness. Psychopathic adults exercise a flexible array of tactics of influence such as charm, hardball, and coercion (Jonason & Webster, 2012), which again likely enhances their success through contingent prosocial and antisocial combinations for individuals not particularly high in boldness (Jonasan & Webster, 2010; Miller et al., 2012). Across adolescents, undergraduates, and offenders various measures of manipulativeness (with and without content of low anxiety or fear) correspond with better self-monitoring in adjustment to others’ responses (Bresin, Finv, Sprague, & Verona, 2014). Although observers could detect the meanness of maximum security inmates within the first five seconds, that impression uniquely vanished even as they recognized less critical aspects of the person telling a narrative (Fowler & Lilienfeld, & Patrick, 2009), which suggests prompt response monitoring that counteracts others’ ability to detect their deception (c.f. Levine, 2015). Both their manipulativeness and impulsiveness contribute to psychopathic people’s ability to perceive and monitor other’s reaction to them (Rauthmann, 2011), likely assisted by a strong implicit sense of their behavior to exploit immediate opportunities. Psychopathic offenders’ enhanced memory of their own violent acts (Cooper, Hervé, & Yuille, 2007) hints at an efficient
internal action model, whereas autistic adults often successfully visualize external phenomena such as objects, faces, and even language (Herringshaw, Ammons, DeRamus, & Kana, 2016; Samson, Mottron, Soulières, & Zeffiro, 2012), yet have perceptual difficulties in using their own body as a frame of reference (Pearson, Marsh, Hamilton, & Ropar, 2014) and remembering events in their lives (Kapp, 2013b).

**The Many Colors of Neurodiversity**

Autistic people may face the respective primary challenges of trusting their body, the world, and people, which parallel their sensorimotor, higher-order repetitive behavior, and social communication symptoms (Prizant, 2015), while psychopathy may develop through the opposite direction of failed attachment that turns individuals against society through reckless action. Benefit from tangible color filters may offer a metaphor for overload from hypersensitivity in autism versus psychopathic individuals’ internal filtering, yet everyone’s life involves unique tapestries of hues. That autistic children tend to benefit atypically from color extends to multiple areas, such as how they generalize words through their own means, or learn to read through color filters, or store memory. Indeed, a significant minority of autistic adults have a form of synesthesia in which they perceive letters and numbers as colors. Such differences in perspective and potential for unusual success provide more useful information than dysfunctions and failures, and particular dynamics of strengths and weaknesses in autism and psychopathy may more accurately correspond to people, rather than risk constructing social disorder through harmful diagnostic practices.
Chapter 4
Unmasking the Moral (In)justice of Punishment: Toward Healing the Pain of Autistics and Psychopaths

“The more experience I have had with psychopaths, the stranger it has seemed to me that a theory should insist that they have such deep and influential unconscious feelings of guilt when they are at the same time so plainly callous and free from remorse about grievous wrongs and crimes that they clearly recognize as their own. It strikes me as a quaint fantasy to assume without real evidence that they unconsciously go to such pains to obtain punishment and win redemption for unknown sins when they plainly and glibly ignore responsibility for every known misdemeanor and felony and pride themselves in evading penalties and in flouting the basic principles of justice.” (Cleckley, 1988, pp. 238-239)

This dissertation has argued for a conception of autism as involving high emotional yet low cognitive empathy and similarly high moral intuitions but low reasoning skills, opposite psychopathy in line with Cleckley’s description, revealing opposite tendencies in orientation to social justice. It has delved further into previous contrasts of “fine cuts” or “mirror opposites” of empathy in the conditions, a framing that may overlap with a universal model of social cognition through positioning opposite tendencies of warmth in autism and competence in psychopathy. People often explicitly perceived as having low competence but high warmth such as individuals with developmental disabilities may nevertheless tend to suffer from others’ implicit bias against them as having low warmth, whereas ongoing (mis)constructions of empathy in autism may lead to its under-recognition. Parents tend to explicitly under-report their autistic children’s demonstrated empathic responsiveness in association with greater severity of core symptoms (Scheeren, Koot, Mundy, Mous, & Begeer, 2013), and autistic adults
tend to under-report their emotional empathy in association with lower self-reported empathy across affective and cognitive domains (Trimmer, Mcdonald, & Rushby, 2016), let alone that measures tends to have difficulty disentangling the constructs. People may tend to underestimate a trend for self-other emotional blurring in autism associated with affective sharing in a variety of contexts that may lead to dysregulation from overarousal, such as heightened distress in response to parents’ (Park et al., 2013; Totsika et al., 2013; Zaidman-Zait et al., 2014), or embarrassment (Adler, Dvash, & Shamay-Tsoory, 2015) and anger (Pouw, Rieffe, Oosterveld, Huskens, & Stockmann, 2013) in reaction to other’s such emotions outside the family. Emotion dysregulation may constitute a core feature in autism, and anxiety overlaps with core symptoms in various domains. Yet anxiety often manifests atypically in autistic people, such as possibly automatic “flight” or “freeze” responses of shutdowns, avoidance, or withdrawal (Jahromi et al., 2012; Mazefsky et al., 2014) and “fight” responses of meltdowns (externalizing frustration as aggression or irritability: Evans et al., 2005; Gotham et al., 2013).

Sensory and motor issues have received much attention in part because autistic people’s narratives have often emphasized them, and they may have an exceptionally powerful and testable role in the development of autism as well as possibly psychopathy. Yet autistic people may tend to underestimate their responsiveness to senses such as smell, even though they may have an unusually negative reaction, and parents may tend to under-report further as their children learn to cope. Autistic females may tend to have greater hypersensitivity and awareness of it, which may especially extend to tactile defensiveness in the broader phenotype, and this could relate to the greater self-reported and observed warmth and lower harshness in mothers with higher autistic traits that very much clashes with historic conceptions. Others’ reduced tactile sensitivity may relate to illusions of greater empathy, through less physical defensiveness.
that misattributes even nonsocial stimuli as related to their body. Yet various informants may underestimate autistic people’s sensitivity to their own pain, even as it may play an unusually powerful role in their emotional empathy for others’ suffering, which may go under recognized (including in brain scans) if they avert their gaze due to hyperarousal or engage in other efforts of self-regulation. Psychopathic individuals’ tendency to greater “sensorimotor resonance” to others’ pain through suppressed corresponding neural responses in association with callousness and opposite autistic people, may reflect own pain histories and resultant desensitization, attention to, recognition of, and ability to mimic pain. While perceptions of others as highly competent but “coldhearted” may tend to solicit responses of envy in contrast to pity for the opposite perception, and indeed people conceived as psychopaths have drawn public fascination for conceptions as serial killers and prolific criminals yet con-artists and white-collar leaders. Among public figures at least, Ted Bundy may most simultaneously embody these often divergent, yet he had an exceptionally horrendous childhood and issues of failed attachment that appear both intrinsically linked with his crimes and as a stark exemplar of the quite unenviable pain psychopathic people tend to suffer. This chapter further explores the manifestations of opposite tendencies toward social justice in autistic and psychopathic people, with implications toward healing their pain and rethinking constructs that dangerously place social dysfunction within single people.

What is Just?

Reasoning Weaknesses in Autism

General difficulties with language, executive functioning, and reasoning underlie impairments with understanding others’ mental states usually evident in autistic people (
(Gernsbacher & Frymiare, 2005; Leekam, 2016; Scheeren, de Rosnay, Koot, & Begeer, 2013; Tager Flusberg, 2007). When autistic people have challenges with figurative language comprehension, this reflects broader problems with receptive language; difficulties like literal thinking tend to disappear in studies when matching for the general ability to understand language (Gernsbacher & Priapas-Kapit, 2012). Yet when matched for receptive language, autistic children exhibit delays in counterfactual (“what if”) reasoning as children (Grant, Riggs, & Boucher, 2004) such as that includes syllogistic reasoning in reaching a logical conclusion based on premises (Leevers & Harris, 2000), or apparent performance challenges in using these skills spontaneously (Peterson & Bowler, 2000). Such delays contribute to impairments in false belief reasoning for understanding others’ mental states known as “theory of mind” (Grant et al., 2004; Peterson & Bowler, 2000). Autistic children have exhibited increases in generating analytical counterfactuals while typically developing peers develop more flexible, creative reasoning (Begeer, Tergot, Lunenburg, & Steege, 2009). This explicit problem-solving strategy contributes to autistic children’s difficulty using counterfactual reasoning to explain emotions like contentment and relief when reality does not meet expectations, while typically peers exercise false-belief reasoning skills for improved understanding (Begeer, De Rosnay, Lunenburg, Stegge, & Terwogt, 2014). Relational reasoning (integrating relationships among multiple variables) performance in autistic children and adolescents inversely relates to the degree of their autism symptoms, and determines the ability to pass a false reasoning belief test of “theory of mind” (Purett, Kandala, Petersen, & Povilli, 2015), just as central coherence and executive functioning skills predict theory of mind ability in autistic children (Pellicano, 2010). Highly verbal autistic adults continue to show difficulties in relational reasoning, especially in the presence of distractors and (at greater disparity than for typical or schizophrenic
comparisons) for non-living items (Krawczyk et al., 2010), further revealing the general nature of reasoning challenges and particular challenges in real-life contexts that have much irrelevant stimuli. Indeed, autistic children with a mild verbal delay in receptive language show a high relationship between executive functioning in rule use and understanding of others’ false beliefs in both implicit and explicit tasks (Zelazo, Jacques, Burack, & Frye, 2002), matching that rule use may generally serve a more effective route to perspective-taking than theorizing (Apperly, 2009). Similarly, autistic children’s delays in understanding others’ false beliefs relate to broader difficulties in understanding false and misleading representations (Iao & Leekam, 2014; Perner & Lerner, 2008). Highly verbal autistic children’s challenges with causal reasoning (physical cause-and-effect) differentiate them from peers with callous-unemotional traits, conduct problems, ADHD, anxiety, and depression (Moul, Cauchi, Hawes, Brennan, & Dadds, 2015). Moreover, highly verbal youth with a history of meeting autism show difficulties with categorical induction in extending properties to new items regardless of whether they currently meet criteria, with more consistent performance related to stronger language skills and nonverbal IQ (Naigles, Kelley, Troyb, & Fein, 2013). Autistic children’s abstract analogical reasoning skills relate to their social abilities and show an atypical effect of age that suggests catchup helps their interpersonal communication (Green et al., 2014), and highly verbal autistic adolescents and adults show difficulties with similar strengths in abstract concept identification but still struggle with forming concepts (Minshew Meyer, & Goldstein, 2002), which continues to relate to their language skills (Williams, Minshew, & Goldstein, 2015). Similarly, this population demonstrates difficulties in conditional reasoning (Lawrence et al., 2012; McKenzie, Evans, & Handley, 2010; Pijnacker et al., 2009). While autistic adolescents show difficulties with contextualizing prior knowledge (McKenzie et al., 2010) unlike stronger performance in general...
conditional reasoning in adults (Pijnacker et al., 2009), adults demonstrate challenges with a more specific subdomain called defeasible reasoning that incorporates exceptions to premises (Lawrence et al., 2012; Pijnacker et al., 2009).

**Reasoning Strengths in Psychopathy**

In contrast, psychopathy may lean toward cognitive strengths in reasoning, as applied to manipulation and morality, perhaps especially for males. Psychopathic boys (Feilhauer, Cima, Benjamins, & Muris, 2013) and adult male offenders (Cima, Tonnaer, & Hauser, 2010) demonstrate good moral judgment but low affective resonance and values. Their strengths in moral judgment over other offenders may particularly relate to the interaction of psychopathic dimensions (Schaich et al., 2013), which supports the notion of a unified psychopathy construct relating to good reasoning skills. Across genders psychopathic offenders may have accurate moral judgment, particularly from their impulsive lifestyle (Aharoni, Sinnott-Armstrong, & Kiehl, 2012), which would support the notion that their disinhibition may differ from general externalizing in conferring competence in opportunistic predatory acts. Even in subclinical individuals, moral judgment may vary as a function of gender (with men finding killing one person to save many more acceptable) but not psychopathy, which affects the choice to engage in killing even if recognizing it as wrong (Tassy, Deruelle, Macini, Leistedt, & Wicker, 2013). Again across genders and in the general population, this willingness to perform the killing in sacrificial moral dilemmas stems from narcissistic exploitativeness and reduced concern for (if not interest in) others’ harm (Djeriouat & Trémolière, 2014), reduced aversion toward the action of personally killing another (Patil, 2015), and regarding life as less meaningful (Bartels & Pizarro, 2011). Similarly, male psychopathic rapists and child molesters may tend to have high moral reasoning skills (Valliant, Gautheier, Pottier, & Kosmya, 2000). Similarly, among male
sexual offenders a combination of adult and child victims tends to distinguish psychopaths (Porters et al., 2000). Higher use of physical force for sex without intoxication in college students (Muñoz, Khan, & Cordwell, 2011) and lower engagement in unprotected sex even among incarcerated female substance abusers (Richards, Casey, Lucente, & Kafami, 2003) in relate to psychopathic meanness in women also suggest strong self-serving strategic reasoning skills in light of higher risks of alcohol and pregnancy for biological females. Indeed, psychopathic girls and women may find sexual coercion or rape especially empowering (c.f. Fulton, Marcus, & Zeigler-Hill, 2014; Visser, Pozzebon, Bogaert, & Ashton, 2010) such as through carrying out sexual fantasies of domination (c.f. Visser, DeBow, Pozzebon, Bogaert, & Book, 2015). Gender inequalities in patriarchies societies may drive these differences: psychopathic women tend to have lower self-esteem and greater feelings of distress or invulnerability, higher openness to fantasy, and greater self-identified histories as victims of sexual abuse (Miller, Watts, & Jones, 2011; Poy, Segarra, Estellar, López, & Moltó, 2014; c.f. Visser et al., 2010). Indeed, in college students Grieve and Mahar (2010) found emotional intelligence to relate to emotional manipulation positively in men but negatively in women, and ethical idealism to positively relate to emotional intelligence in women but not men, further evidence for a constellation of poor emotional self-regulation associated and lower moral values in women. Both psychopathic men and women in the general population may find moral decision making relatively easy due to their callous disregard for prosocial conventions if not also experience with manipulation (Seara-Cardoso, Dolberg, Neumann, Roiser, & Viding, 2013; Seara-Cardoso, Neumann, Roiser, McCrory, & Viding, 2012). In diagnosed samples of inmates men’s neural activity during moral reasoning suggests high recruitment of a traditional center of intentional cognition for judging the severity of transgressions (Harenski, Harenski, Shane, &
Kiehl, 2010), with the opposite found for psychopathic traits in women (Harenski, Edwards, Harenski, & Kiehl, 2014), which (if assessment has validity) could alternatively reflect less cognitive effort for psychopathic women or more engagement if not skills in theory of mind-relevant processes in men.

**Complex Reasoning “Strengths” in Autism**

Even strengths in reasoning associated with autism may underlie core challenges with flexibility and social communication. Autistic children and adults of various levels of language proficiency (Dawson, Soulières, Gernsbacher, & Mottron, 2007; Stevenson & Gernsbacher, 2013), but especially those with lower verbal comprehension skills or a history of speech delay (Bölte, Dziobek, & Poustka, 2009; Soulières, Dawson, Gernsbacher, & Mottron, 2011; Nader, Jelenic, & Soulières, 2015), tend to demonstrate strong performance on nonverbal reasoning tasks using visuospatial patterns that test the capacity to problem-solve in novel situations known as fluid intelligence (Chen, Planche, & Lemonnier, 2010; Hayashi, Kato, Igarashi, & Kashima, 2008). These strengths usually draw from bottom-up visual hypersensitivity () that robustly may occur even as individuals integrate senses (Zaidel, Goin-Kochel, & Angelaki, 2015), as individuals focus on current stimuli rather than prior knowledge, which as noted can contribute to such challenges as recognizing body language. Furthermore, while autistic adults may have difficulty with reasoning, they show enhanced logical *consistency* through reduced susceptibility to the emotional bias of the framing effect (De Martino, Harrison, Knaof, Bird, & Dolan, 2008). Thus autistic people may evaluate problems based on sensory evidence with greater consistency across contexts, with reduced motivated reasoning biases alongside underdeveloped cognitive decision-making skills, which may might lead to misperceptions of callousness when situations
when socio-emotional situations require discretion.

**Complex Reasoning “Weaknesses” in Psychopathy**

Although Ermer and Kiehl (2010) claim to have found evidence for impairments in social exchange and precautionary reasoning, this may reflect biases toward interpersonal devaluation and impulsive decision-making that sometimes present advantages. Psychopathic people’s cognitions and lifestyle may reflect advanced deployment of the “negative reciprocity principle” of social exchange theory (c.f. Cropanzano & Mitchell, 2005), in which they learned to devalue others through life experiences that failed to properly care for their needs, yet still may behave prosocially contingently on the circumstances. Their emotional detachment and manipulation helps them to rationally accept unfair offers at enhanced levels across subclinical and diagnosed criminal samples (Osumi & Oshira, 2010; Radke, Brazil, Sheper, Bulten, & De Bruijn, 2013). In contrast with psychopathy, autistic people tend usually exhibit a circumspect reasoning bias toward deliberative thinking rather than “jumping to conclusions” for decision-making (Brosnan, Lewton, & Ashwin, 2016; Brosnan, Chapman, & Ashwin, 2014), which often has adverse impacts. Autistic adults have difficulties understanding rules in unstable contexts, especially unpredictable social situations (Robic et al., 2015). They reported more difficulty than typical adults in all 12 examined decision-making difficulties except frequently changing their mind, with challenges related to making quick decisions, changes of routine, and talking with others (Luke, Clare, Ring, Redley, & Watson, 2012). They tended to view their autism as interfering more than helping with decision-making, especially among those with anxiety or depression, and an avoidant but not rational or dependent decision-making style (Luke et al., 2012). For example, on the Iowa Gambling Task (Johnson, Yechiam, Murphy, Queller, & Stout, 2006; Mussey, Travers, Klinger, & Klinger, 2015; South et al., 2014; Yechiam, Arshavsky, Shamay-Tsoory,
Yaniv, & Aharon, 2010) and other designs (e.g. Johnson, Blaha, Houpt, & Townsend, 2010; Solomon et al., 2015), autistic participants tended to process the environment on a more case-by-case basis, more slowly, with fewer risks. Their loss-sensitive tendency to avoid making a decision usually resulted in poor performance (Johnson et al., 2006; Yechiam et al., 2010; Zhang et al., 2015), and even when risk aversion related to greater performance, greater autism symptoms related to lower outcomes (South et al., 2015). Psychopathy instead relates tends toward excessive risk-taking, and may present an advantage in contexts that require competitive gains and quick action, as opposed to cooperation (ten Brinke, Black, Porter, & Carney, 2015).

**Reduced Moral Permissibility in Autism**

People may tend to have a basic moralistic instinct to punish wrongdoers derived from evolutionary needs for cooperation against cheaters (Aharoni & Fridlund, 2013; Walsh, 2000), but children typically learning to become more flexible in their judgments of honesty as their social cognition and experiences develop (Lee & Evans, 2013), whereas an inflexibly raw drive for justice tends to remain in autistic people. They show a robust pattern of weaknesses in understanding of mental states and reasoning despite strengths in emotional empathy and distress in moral evaluations (e.g. Gleichgerrcht et al., 2013; Senland & Higgins-D’Alessandro, 2013). While they can understand rules and make appropriate judgments for basic moral situations (e.g. Sterponi, 2004; Leslie, Mallon, & DiCorcia, 2006), across age they tend to have reduced ability and propensity to take intention or motives into account for judgments of forgiveness and punishment (Buon et al., 2013; Channon, Fitzpatrick, Drury, Taylor, & Lagnado, 2010; Moran et al., 2011; Rogé & Mullet, 2011). Thus even as highly verbal adults they may judge people as responsible for accidents so they punish them more severely (Buon et al., 2013; Moran et al., 2011), while holding intentional wrongdoers as less responsible for their actions (Buon et al.,
They tend to find even positive misrepresentations less acceptable, such as using emotion display rules of false affect less often and finding them less prosocial as children (Begeer et al., 2011), with similar extension to prosocial pretense as adults even when understanding false beliefs (Yang & Baillargeon, 2013). Their lower moral permissibility also includes more nonspecific condemnations as adolescents (Shulman, Guberman, Shiling, & Bauminger, 2012) and as adults continuing to find diverse types of transgressions more serious, related to impairment in understanding others’ mental states (Zalla, Barlassina, Buon, & Leboyer, 2011). Reduced emotional self-awareness may not raise moral permissibility in moral permissibility in autistic adults with ADOS-confirmed diagnoses as it typically does (Brewer et al., 2015), which may not extend to adults without independently tested diagnoses who unusually show a typical ability to recognize other’s emotions, in whom higher autistic traits relate to avoidance of harming others through empathic overarousal and rigid reliance on (visuospatial) nonverbal reasoning (Patil, Melsbach, Henning-Fast, & Silani, 2016). Thus what others may (mis)perceive as vindictiveness as a symptom of oppositional defiant disorder in autistic children and adolescents may stem from a drive for justice (Mandy, Roughan, & Skuse, 2011), similar to motivation for social activism and positive community ties in many youth with impulsive aggression (Foulkes, Seara-Cardoso, Neumann, Rogers, & Viding, 2014), and the minimal general relationship between aggression and empathy (Vachon, Lynam, & Johnson, 2014). Non-psychopathic people with impulsive externalizing behaviors may tend toward high empathic concern (e.g. Hicks & Patrick, 2006; Seara-Cardoso et al., 2012; & Uzieblo et al., 2010), and autistic and other people with developmental disabilities express that their so-called problem behaviors reflect self-advocacy for basic needs (Ruef & Turnbull, 2002). Empathic anger or moral outrage as a general construct aligns somewhat with autism through relating to punishing
desires alongside emotional empathy but not perspective-taking, as well as personal distress and negative but not positive affect (Vitaglione & Barnett, 2003). A review found anger to uniquely have the same significant direction (high) among trait facets across personality disorders (Samuel & Widiger, 2008), so the (self-)righteousness or (im)morality of outrage may prove vulnerable to misinterpretation.

**Higher Moral Permissibility in Psychopathy and Lessons from Autism**

In contrast, psychopathy relates to greater moral permissiveness across dimensions and community or criminal samples and whether accidental or intentional, so they have lower punitive motives (Aharoni, Weintraub, & Fridlund, 2007; Decety & Yoder, 2016; Peace & Valois, 2014; Young, Koenigs, Kruepke, & Newman, 2012). They even exceptionally report relatively typical forgiveness for actions done against them personally, with no relationship for callousness (Gaughan, Miller, & Lynam, 2012). This may draw in part from their tendency to view other people as relatively mean like them (Mahaffey & Marcus, 2006; Miller, Rufino, Boccaccini, Jackson, & Murrie, 2011), which may normalize callousness, and similar perspective-taking that they would not others to punish them. Conversely, autistic adults with greater difficulty in interpersonal relationships and lower intuitive thinking tend to think that others would not endorse socially undesirable behaviors, related to their lower permissibility toward risk-taking and own reduced engagement in risky activities (Levin et al., 2015). Similarly, and opposite non-autistic peers with ADHD, autistic children’s apparent low self-awareness related to lower attribution of hostile intentions to peers (Lerner, Calhoun, Mikami, & De Los Reyes, 2012). These discrepancies might further help to explain why autistic people may have higher drives toward punishment, as it harmful actions toward them or others may especially surprise naïve evaluators and seem mal-intentioned (e.g. Heerey, Capps, Keltner, &
Furthermore, psychopathy across dimensions relates to low harm avoidance and punishment sensitivity (Dindo & Fowles, 2011; Drislanes, Patrick, & Arsal, 2014; Gaughan, Miller, Pryor, & Lynam, 2009; López, Poy, Patrick, & Moltó, 2013; c.f. Derefinko, 2015), whereas autism relates to high harm avoidance and punishment sensitivity even in “autistic psychopathy”, those with ADHD, who abuse substances, and the broader phenotype (Anckarsäter et al., 2006; Kadak, Demirel, Gökald, Erdoğdu, & Demirel, 2015; Luman, van Meel, Oosterlaan, & Geurts, 2012; Sizoo, van der Gaag, & van den Brink, 2015; Sizoo, van den Brink, van Eenige, & van der Gaag, 2009). Harm avoidance’s elements including fear of uncertainty, rapid fatigability, and social worry or shyness (Cloninger, Svrakic, & Prybeck, 1993) may differentially relate to sensory predispositions in autism and psychopathy. An example may include response inhibition to (energy-relevant) serotonin in autistic adults related to neurological regulatory patterns associated with centers of sensory regulation like the thalamus and cerebellum in opposite directions from typical adults, associated in association with greater severity of core symptoms (Daly et al., 2014) and possibly meltdowns when overwhelmed. These opposite directions between autistic and psychopathic people across all the major developmental pathways hypothesized in the development of psychopathy in relation to the crucial construct of punishment, could indicate that while discipline high in harshness or low in warmth may often demonstrate strong parent-to-child (more so than vice versa) effects on difficult behaviors or self-regulation (Bader & Barry, 2014; Midouhas, Yogaratnam, Flouri, & Charman, 2013; Shawler & Sullivan, 2015; Ostfeld-Etzion, Feldman, Hirschler-Guttenberg, Laor, & Golan, 2015; Smith, Greenberg, & Mailick, 2014; Woodman, Mailick, & Greenberg, 2016; Zaidman-Zaïd et al., 2014), autism may confer protection against psychopathy but not other externalizing problems. Indeed, autism (as diagnosed by the ADOS and related
instruments) shows little phenotypic overlap with conduct disorder entirely accounted for by environmental effects, as opposed to genetic overlap, while emotion dysregulation shows genetic effects and hyperactivity overlaps at a behavioral level (Tick et al., 2016). Even subclinical autistic-like social communication traits have shown almost complete genetic independence from callous-unemotional traits (O’Nions et al., 2015), despite the interpersonal nature of both and the nonspecific and non-comprehensive measurement compared with the more pervasive constructs of autism and psychopathy. Instead, much more (if sociological) evidence suggests that parental mistreatment often gives rise to moral drives toward justice, such as the social activism of the autism rights or neurodiversity movement that resulted from and has always emphasized lack of parental acceptance (e.g. Silberman, 2015; Silverman, 2012; Waltz, 2013).

Reevaluation of Social and Emotional Reciprocity

The development and stability of psychopathy and autism raise serious construct validity issues of the meaning of social disorder. All dimensions of psychopathy relate to higher willingness to “help” a stranger (Smith, Lilienfeld, Coffey, & Dabbs, 2013), using a measure of self-reported “altruism” that includes items such as inviting someone into your car, which the likes of Ted Bundy have exercised prolifically to lethal effect. Psychopaths’ aggressive meanness relates to emotional gratification from “altruistic” punishment (Masui, Iriguchi, Nomura, & Ura, 2011). Even psychopathic individuals’ utilitarian bias toward killing one person ostensibly to save many but truly for sadistic reasons could win them heroic status if they persuade people of cause for the greater good, as people’s drive for “moral coherence” may convince them of the ethics of the action, with flexibility toward outcomes (Clark, Chen, & Ditto, 2015) that contrasts with hypermoral rigidity in autism alongside perhaps less drive for “central coherence” (Happé & Frith, 2006). Whereas typical people may often have ethical
dissonance for their self-serving justifications (Barkan, Ayal, & Arieli, 2015; Mazar, Amir, & Ariely, 2008; Shalvi, Gino, Barkan, & Ayal, 2015), due to their self-concept as honest people (Mazar, Amir, & Ariely, 2008), psychopathic people’s lack of a moral identity (Glenn, Koleva, Iyer, Graham, & Ditto, 2010) may facilitate both exploitation and willingness to admit their antisocial personality anonymously (e.g. Verschuere et al., 2014). Whereas highly verbal autistic adults do tend to self-report high orientation toward justice as their highest value (Greenberg et al., 2016), this may reflect drives toward honesty and away from conformity to social norms such as deception (c.f. Yafai, Verrier, & Reidy, 2014), in likely contrast to typical adults’ high social desirability biases for items clearly relevant to psychopathic personality such as in emotional rather than cognitive empathy (Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004). While psychopathic people callously and manipulatively exercise the audience effect of behaving more prosocially in the presence of others to an extreme (White, 2014), no true altruism may exist across cultures (House et al., 2013).

**Conclusion**

While psychopathy’s origins may lie in the failure of people to follow newly established “social contracts” in the first constitutional republics despite understanding them, and autism may originate somewhat from psychopathy, both conditions indicate interdependence rather than free will that begins with failure to effectively meet their needs (c.f. Focquaert, Glenn, & Raine, 2013; Silvers & Francis, 2005). Autistic people tend to act more honestly even when doing so may impede social success, such as by not lying rather than ingratiating themselves by feigning common interests with a peer (Scheeren et al., 2010), donating more when in the presence of others (Izuma et al., 2011), or flattering another’s work (Chavellier et al., 2012) even in the highly competitive period of adolescence. These tendencies appear not to reflect lack of social
cognitive ability (Scheeren et al., 2010) but rather reduced expectation of reciprocity from others (Cage, Pellicano, Shah, & Bird, 2013), and a disinclination to have a false reputation may grow as an adaptation to lack of acceptance (c.f. Cage, Bird, & Pellicano, 2016; Scheeren et al., 2015). They may receive more reciprocity from and thus have more motivation to engage with family and friends (Bauminger-Zviely, Karin, Kimhi, & Agam-Ben-Artzi, 2014; Chen, Bundy, Cordier, Chien, & Einfeld, 2015), and peers may more often accept or understand them if also socially rejected (Campbell, Ferguson, Herzinger, Jackson, & Marino, 2005) or autistic (Komeda, 2015; Rosqvist, 2012; Sinclair, 2010). Autistic children and adolescents likewise have evidenced reciprocity through a balance of friends (Bauminger-Zviely et al., 2014) and chosen co-interactants (Gunn, Trembath, & Hudgry, 2014) with and without disabilities. As adults, higher donation to charities for people with disabilities and animals associated with higher symptoms of reduced social reciprocity (Lin, Tsai, Rangel, & Adolphs, 2012) and deep emotional ties to animals (Davidson & Smith, 2009) could reflect a moral drive linking the oppression of animal and autistic or disabled rights (Salomon, 2010). Even autistic people’s connections to objects (Davidson & Smith, 2009) may overlap with the moral foundation of sanctity through ritualistic “worship” of symbols, and indeed fear of a punishing God relates to greater severity of social autism symptoms (Schaap-Jonker, Sizoo, van Schothorst-van Roekel, & Corveleyn, 2013). Where autistic activists organize days of mourning for disabled people killed by family members and call for justice, the mainstream media and more powerful family-led organizations sympathize with the murderers (Gross, 2012), and the most dominant has produced a video of a senior executive discussing plans to murder her daughter in earshot while dismissing autistic people’s concerns (Yergeau, 2010). The United Kingdom has shown no increase in autistic children in child protective services for abuse and neglect (Spencer et al., 2005) and its research
agenda better aligns with the priorities of parents of parents than most autistic adults’ and practitioners’ (Pellicano, Dinsmore, & Charman, 2014), yet when evaluated autism shows an extremely high rate in children adopted after caregiver maltreatment (Green, Leadbitter, Kay, & Sharma, 2016). Despite if not reflecting the growth of the applied behavioral analysis industry, a significant proportion of its practitioners admit to using aversive punishments such as electric shocks, and a facility continues to openly use them against autistic and other developmentally disabled people despite the ban for murderers and terrorists.

Such phenomena raise serious questions about the meaning of “social disorders”: whether about those diagnosed with autism and psychopathy may tend to understand and care about typical people more than vice versa, and whether the diagnoses tend to help them, or whether leading agendas even truly have their interests in mind. Yet allowing “diagnoses” to take in the full humanity of strengths and contexts into account, using them to assist and care for people, and valuing the perspectives of those bearing the labels may strengthen both scientific validity of more accurately representing individual experiences alongside clinical utility of providing effective support.
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