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Morality in autism spectrum disorder: A systematic review

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Abstract

Moral reasoning and decision making help guide behavior and facilitate interpersonal relationships. Accounts of morality that position commonsense psychology as the foundation of moral development, (i.e., rationalist theories) have dominated research in morality in autism spectrum disorder (ASD). Given the well-documented differences in commonsense psychology among autistic individuals, researchers have investigated whether the development and execution of moral judgement and reasoning differs in this population compared with neurotypical individuals. In light of the diverse findings of investigations of moral development and reasoning in ASD, a summation and critical evaluation of the literature could help make sense of what is known about this important social-cognitive skill in ASD. To that end, we conducted a systematic review of the literature investigating moral decision making among autistic children and adults. Our search identified 29 studies. In this review, we synthesize the research in the area and provide suggestions for future research. Such research could include the application of an alternative theoretical framework to studying morality in autism spectrum disorder that does not assume a deficits-based perspective.

Keywords: autism spectrum disorder, commonsense psychology, ethics, moral foundations theory, moral psychology, social cognition

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Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by differences in social communication and social interaction and the presence of stereotyped or repetitive interests or behavior (American Psychiatric Association [APA], 2013). Differences in social cognition between autistic[1] and neurotypical individuals are also common (Gallese, 2006). Moral reasoning, i.e., how people think about moral issues, is a form of social cognition; as such, it may be atypical among autistic individuals. A lay understanding of morality is that it provides a guide or set of norms for how to treat other people and nonhuman animals and coexist with them in society.

Autistic individuals often show difficulties with interpersonal interactions and friendships (Howlin, Moss, Savage, & Rutter, 2013; Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011). These challenges could arise in part from differences in moral development and subsequent moral reasoning. For instance, if autistic children do not adhere, adhere too rigidly, or adhere in ways that differ from neurotypical children to moral prescriptions regarding care, harm, and fairness, this may interfere with social interactions and

relationships (Hamlin, Wynn, Bloom, & Mahajan, 2011; Rakoczy, Kaufmann, & Lohse, 2016). Given the potential ramifications of differences in moral thinking in autistic individuals, researchers have investigated whether the development and execution of moral judgement and reasoning differ in this population compared with neurotypical individuals (e.g., Bellesi, Vyas, Jameel, & Channon, 2018; Blair, 1996; Koster-Hale, Saxe, Dungan, & Young, 2013; Shulman, Guberman, Shiling, & Bauminger, 2012).

In the following sections, we will describe theories of morality that have informed investigations of moral reasoning and development in ASD. We will then describe differences in social cognition often observed in autistic individuals that may be relevant to their moral development and reasoning. We then review research investigating morality in ASD and offer directions for future research.

Rationalist Moral Development

Piaget's empirical investigations of moral judgement differentiated two stages of development: the heteronomous stage, wherein moral judgements are strictly guided by external rules; and the more mature, autonomous stage, wherein moral judgements are based on a consideration of actors' intentions (Piaget, 1932). Piaget found that children up to six years old tend to be in the heteronomous stage; older children progress to the autonomous stage.

Building on Piaget's rationalist approach to moral development (1932), Kohlberg (1969, 1971) posited that moral development takes place through a series of six progressively nuanced stages. The six stages are classed under three higher-order levels with two stages in each level. The first, preconventional level is

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marked by responsivity to external cultural rules based on desire for positive, or fear of negative, physical consequences. The second, conventional level is reached when children learn to value moral rules as a means of maintaining order among one's social group. The final, postconventional level is achieved when individuals view moral rules as internalized abstract principles used to maintain their own and others' rights and well-being. Children ostensibly develop through the later stages by imagining themselves in the role of others, i.e., role-taking (Kohlberg, 1969, 1971). The postconventional stages are marked by a departure from reliance on authority for informing moral decision-making in favor of an increased appreciation of individual rights, reciprocity, and justice, which require role-taking and sophisticated verbal reasoning.

Turiel (1983) expanded on Kohlberg's conceptualization by developing social domain theory, according to which children learn to differentiate conventional transgressions (those that violate institutional norms) from moral transgressions (those with intrinsically harmful or unfair consequences). Turiel (1983) asserted that children learn this distinction using role-taking to imagine themselves in the position of transgressors or victims, and that perception of victims' pain allows children to understand certain transgressions as *immoral*.

Such accounts of morality that position social cognition as the foundation of moral development, i.e., rationalist theories (Kohlberg, 1971; Piaget, 1932; Turiel, 1983), emphasize the role of commonsense psychology. Commonsense psychology refers to the human tendency to attempt to make sense of relationships and interactions by *representing the internal states of others* (Moore, 2006). This requires identifying others as psychologically similar to, yet distinct from, oneself. This understanding must be integrated with the notion that psychological representations denote references to objects that are often invisible. For instance, imagine seeing a downcast mourner in a graveyard. Despite the fact that the object of her psychological distress, a lost friend, is not visible, commonsense psychological skills allow us to infer the source of her sadness. This example demonstrates that commonsense psychology requires complex coordination of social information from a variety of temporally diverse sources, i.e., synthesizing the significance of the mourner's tears with past or imagined experiences with grief. Verbal reasoning and communication skills are also required to integrate increasingly complex social information from others regarding their psychological representations (Moore, 2006). For Piaget, moral development requires consideration and understanding of others' intentions. For Kohlberg, role-taking and discursive reasoning are required to progress to higher stages of moral development. For Turiel (1983), recognizing and empathizing with victims' pain is crucial for differentiating moral from conventional transgressions. As such, commonsense psychology is implicated in rationalist accounts of moral development.

Representing internal states of others requires an understanding of those states as distinct from one's own, i.e., theory of mind, or mentalizing (Wimmer & Perner, 1983). Despite autistic individuals' ability to attribute mental states to others during theory of mind tasks (Baron-Cohen, Leslie, & Frith, 1985), mentalizing has been found to be less automatic among this population, suggesting a compensatory cognitive strategy for mentalizing (e.g., verbal reasoning skills: Senju, Southgate, White, & Frith, 2009; or nonverbal reasoning skills: Patil, Melsbach, Hennig-Fast, & Silani, 2016). Development and execution of rationalist moral judgement therefore requires psychological processes and cognitive skills that could be atypical among autistic individuals.

Social Cognitive Differences in ASD

Autistic individuals show altered development of commonsense psychology (Baron-Cohen, Tager-Flusberg, & Lombardo, 2013). Empathy, i.e., a response to another based on her or his psychological or contextual circumstances (Hoffman, 1987), is an aspect of commonsense psychology (Moore, 2006). Empathy can be disassociated into cognitive and affective elements (Blair, 2008). Cognitive empathy involves the ability to consider others' perspectives, thereby inferring their mental states (Baron-Cohen & Wheelwright, 2004). Affective empathy is an emotional response appropriate to another individual's mental state (Dziobek et al., 2008). Cognitive empathy in response to the funeral mourner would entail the capacity to infer the source of the mourner's distress. An affective empathic response to the mourner would be the ability to share in her pain while recognizing that it is distinct from one's own experience of pain (i.e., self-other distinction). Some studies suggest that affective, but not cognitive, empathy is largely preserved in autistic individuals (Dziobek et al., 2008; Rueda, Fernández-Berrocal, & Baron-Cohen, 2015). Another study of empathy in autistic adolescents suggested that affective empathy is only preserved when the emotional valence is positive (Mazza et al., 2014). There is also evidence to suggest that both cognitive and affective elements of empathy are impaired in ASD (Bos & Stokes, 2018). Further evidence for differences in empathy among autistic individuals comes from neuroimaging studies (Kana, Keller, Cherkassky, Minshew, & Just, 2009; Schulte-Rüther et al., 2011). Compared with neurotypical adults, autistic adults have demonstrated hypoconnectivity in brain regions considered to be involved in commonsense psychology (e.g., the right temporo-parietal junction) during cognitive empathy tasks (Shulte-Rüther et al., 2011) and hyperconnectivity in these regions during affective empathy tasks (Kana et al., 2009). Despite differences in right temporo-parietal junction activity in autistic compared with neurotypical participants, the self-other distinction during empathic responding remains intact in autism, suggesting an alternative role for this brain region in commonsense psychology among autistic individuals (Hoffmann, Koehne, Steinbeis, Dziobek, & Singer, 2016). Differences in empathy among autistic individuals would suggest delayed or atypical moral development in ASD according to rationalist theories, which hold that commonsense psychology is crucial for moral maturity.

Rationalist theories assert that moral decision-making relies on an emotional response to others' distress (Turiel, 1983). This ability could be impaired among individuals with constricted emotional functioning that involves difficulties describing their own emotions, i.e., those with alexithymia (Sifneos, 1973). Estimated prevalence of alexithymia in neurotypical adults is 20% (Loas, Fremaux, Otmani, & Verrier; 1995; McGillivray, Becerra, & Harms, 2017; Mason, Tyson, Jones, & Potts, 2005). In contrast, 40% to 50% of autistic adults may have co-occurring alexithymia (Hill, Berthoz, & Frith, 2004). Rates of alexithymia are also elevated among autistic relative to neurotypical children (Griffin, Lombardo, & Auyeung, 2016). Elevated rates of alexithymia among autistic individuals may lead to differences in emotionally arousing moral judgements.

Given the dominance of rationalist accounts of moral development, empirical investigations of morality in ASD have been primarily guided by the notion that commonsense psychology is required for typical moral development. Indeed, this supposition has led many researchers to hypothesize delayed or atypical moral

development in autistic individuals (e.g., Takeda, Kasai, & Kato, 2007; Zalla, Barlassina, Buon, & Leboyer, 2011). Despite this hypothesis, autistic individuals successfully discriminate between moral and conventional transgressions (Blair, 1996; Buon et al., 2013) that appear unlikely to arise from a knee-jerk emotional response in the absence of moral discrimination (Leslie, Mallon, & Dicorcia, 2006). Intact moral reasoning in autism suggests a difficulty for the rationalist account of moral development, which would predict an inability to make typical moral judgements among autistic individuals with differences in commonsense psychology development. In contrast, moral foundations theory is an intuitionist account of moral psychology (Haidt, 2001) that offers an alternative framework for understanding autistic moral development and reasoning. We will return to the intuitionist account of moral development in our discussion of the results of this review.

A critical evaluation of the literature is needed to synthesize research on this important social-cognitive skill in ASD and to guide future research. The authors are aware of two systematic reviews investigating morality in ASD, both written in languages other than English with no available translations (Li & Liu, 2017; Margoni, Scarpa, & Surian, 2017). A third review by Margoni and Surian (2016) focuses primarily on intent-based moral judgements among autistic individuals, and the researchers did not include a systematic search. A fourth review covers morality in ASD, but focuses on its relationship with criminal responsibility (Grant, Furlano, Hall, & Kelley, 2018). As such, our English-language review, with its systematic search and coverage of various aspects of moral decision making, is much needed. Though investigations of morality in ASD have extended beyond effects of commonsense psychology to include the role of executive functioning skills, the present review focuses on moral judgement and social cognition, due to the latter's salience in the dominant rationalist paradigm. Some research on morality in ASD has focused on developmental differences in this population; other studies have focused on qualitative differences in moral reasoning across the lifespan in ASD. The current systematic literature review was conducted to synthesize the extant literature investigating moral development and reasoning in autistic individuals, thereby clarifying directions for future research. The review's primary purpose was to enhance the field's understanding of this aspect of social cognition in ASD.

Methods

Search Strategy

A comprehensive search was conducted on February 2, 2018 using 7 electronic databases: PsycInfo; Cumulative Index to Nursing and Allied Health Literature, CINAHL; Academic Search Premier, ASP; Social Work Abstracts, SWA; Educational Resources Information Center, ERIC; Web of Science, WoS; ProQuest Dissertations and Theses Global, ProQuest. Search terms and databases were selected with the assistance of a librarian with expertise in psychology research. The search was conducted in three phases; all searches included terms related to autism spectrum disorder (i.e. Autis* OR Asperger* OR "Pervasive Developmental Disorder" OR "Pervasive Development Disorder" OR PDD OR "Kanner's Syndrome" OR "Kanner Syndrome" OR "Kanners Syndrome"). The first search included the term (moral*). The second search included the terms (ethic* OR conscience NOT moral*) to identify research more likely to deal with ethical issues in ASD

intervention and research. The third and final search included terms related to utilitarian decision-making that may have been missed by the first two rounds (trolley* OR dilemma OR utilitarian* NOT ethic* NOT conscience NOT moral*). An updated search was conducted on October 5, 2018, using the same search terms and databases (except ProQuest Dissertations and Theses Global, as dissertations were omitted from the systematic review to focus on studies of peer-reviewed quality).

Inclusion/Exclusion Criteria

Inclusion Criteria

1. Empirical studies published in peer-reviewed journals
2. Papers written in, or with available translation to, English
3. Papers investigating moral reasoning, moral decision-making, or moral behavior in autistic individuals
4. Papers documenting studies in which autistic children/adults were participants
5. Papers that differentiate autistic participants from other neurodevelopmental disorders

Exclusion Criteria

1. Papers that are not reports of empirical studies
2. Papers published in magazines, non-peer-reviewed journals, etc.
3. Papers investigating empathy, theory of mind, prosocial behavior, social cognition, etc., without specifically investigating moral reasoning, judgement, or behavior
4. Papers that investigate parents' perceptions of moral behavior in an autistic child
5. Papers that do not differentiate autistic participants from other groups (e.g. papers that combine autistic individuals and those with intellectual disability who are not autistic in data analysis)

Screening Procedure

The identified documents were exported to and screened using Covidence software. The three initial searches together yielded 1943 articles, 631 of which were duplicates identified by Covidence software, leaving 1312 documents. Studies were screened for relevance with 96% agreement at the abstract stage by the first author and a trained volunteer. Conflicts ($n = 47$) were resolved to consensus by discussing inclusion and exclusion criteria. A further 1241 documents were deemed irrelevant (e.g., related to ethical considerations in ASD research or intervention; reviews; commentaries; 105 additional duplicates that were not automatically detected by Covidence). Full texts of the 71 remaining documents were screened for relevance with 96% agreement by the first author and a second trained research assistant. Conflicts ($n = 3$) were again resolved to consensus by discussing inclusion and exclusion criteria. Forty-five documents were omitted based on the following categorizations: 8 duplicates; 4 conference abstracts; 4 combined ASD with other diagnoses; 3 in languages other than English with no available translations; 9 dissertations; 5 commentary/review articles; twelve not related to moral judgement (e.g., prisoner's dilemma; sharing). Reference lists of the two reviews without English translations (Li & Liu, 2017; Margoni et al., 2017) and of all included articles were searched for relevant studies; all had been identified by our search. The October 5, 2018 search yielded 51 new references with no duplicates. These studies were screened by the first author and the second trained research assistant at the abstract stage with
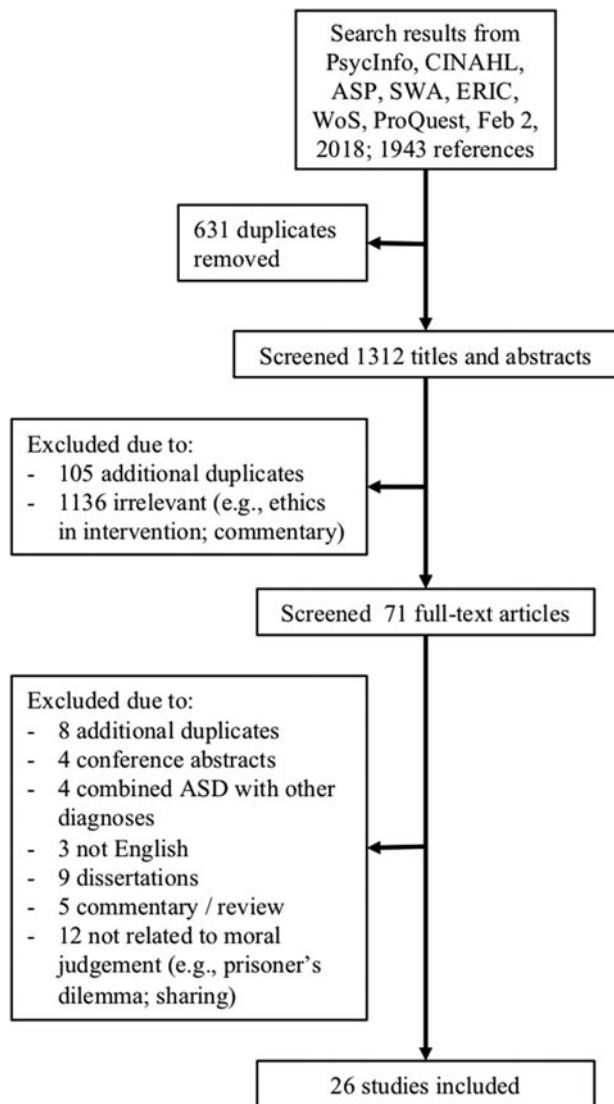
Figure 1. Systematic review of morality in autism spectrum disorder conducted on February 2, 2018. CINAHL, Cumulative Index to Nursing and Allied Health Literature. ASP, Academic Search Premier. SWA, Social Work Abstracts. ERIC, Educational Resources Information Center. WoS, Web of Science. ProQuest, ProQuest Dissertations and Theses Global.

Figure 2. Systematic review of morality in autism spectrum disorder conducted on October 5, 2018. CINAHL, Cumulative Index to Nursing and Allied Health Literature. ASP, Academic Search Premier. SWA, Social Work Abstracts. ERIC, Educational Resources Information Center. WoS, Web of Science. ProQuest, ProQuest Dissertations and Theses Global.

98% agreement. The single conflict was resolved to consensus through discussion of inclusion and exclusion criteria. At the full-text screening stage (percentage agreement = 75%), the only conflict was resolved through discussion of inclusion and exclusion criteria. This study was omitted because it did not examine moral outcome measures. Reference lists of the three added studies were screened for additional articles with no new relevant studies found. See Figures 1 and 2 for an outline of the study selection process. The 29[2] relevant articles are reviewed below. Studies were grouped and summarized based on the aspect of moral reasoning investigated.

[2]Two studies that were considered but omitted from inclusion in this review were: Barnes, Lombardo, Wheelwright, and Baron-Cohen (2009); and Steele, Joseph, and Tager-Flusberg (2003). Barnes et al. (2009) used a set of morally laden films to evoke narratives from autistic participants but moral reasoning was not investigated in their study. Steele et al. (2003) studied moral development but did not analyze moral reasoning in isolation from other measures of social cognitive development.
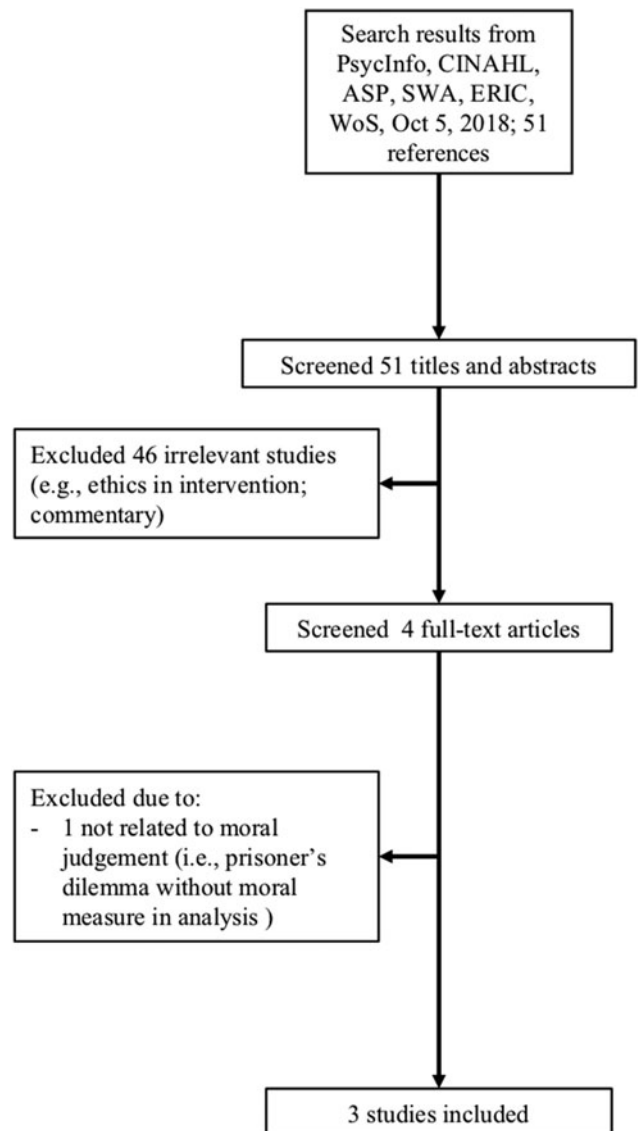
Results

Moral Stages

Three studies offer evidence regarding the development through Kohlberg's moral stages among autistic and neurotypical children and young adults (see Table 1). In two of them, autistic children scored significantly lower in moral reasoning than neurotypical children (Senland & Higgins-D'Alessandro, 2016; Takeda et al., 2007). However, in another study, no significant difference was found in moral reasoning development between autistic and neurotypical children (Kretschmer et al., 2014).

Conventional/Moral Distinction

The conventional/moral distinction has traditionally been measured using variations of Smetana's (1981) classic task.

Table 1. Summary of studies investigating moral stage development among autistic children (*n* = 3)

Reference	*n* ASD	Age (years)		IQ (*Mean* Standard Score)	Gold Standard Diagnosis[1]	Matching	Morality	
		Mean	Range				Between-Groups Differences	Relation to Aspects of Commonsense Psychology
Kretschmer, Lampmann, & Altgassen, 2014	21 (F = 3)	10.22	6–14	Matrix Reasoning[2]: 10.8 Vocabulary[2]: 9.3	Y	age, gender[3], cognitive abilities	N	N false-belief understanding
Senland & Higgins-D'Alessandro, 2016	22 (F = 3)	19.2	18–27	FSIQ[4]: 104.7	N	FSIQ[4], age, sex, years education, SES,	Y	Y perspective taking
Takeda, Kasai, & Kato, 2007	23 (F = 3)	9.38	6.33–14.16	FSIQ[5]: 106.1 VIQ[5]: 107.2 PIQ[5]: 103.3	N	FSIQ[5], VIQ[5], PIQ[5], age, sex, SES	Y	N/A

Note: F: female; FSIQ: full-scale IQ; IQ: intelligence quotient; PIQ: performance IQ; VIQ: verbal IQ; Y/N under Morality heading indicates whether relations were found between constructs; N/A indicates that the relation between constructs was not assessed.
[1] Diagnosis made/confirmed using Autism Diagnostic Observation Schedule—Second Edition (Lord et al., 2015); Autism Diagnostic Interview—Revised (Lord, Rutter, & Le Couteur, 1994). [2] Scaled scores of subtests of Weschler Intelligence Scale for Children-IV, German version (Petermann & Petermann, 2008). [3] Sex and gender are used in accordance with authors' terminology. [4] Wechsler Abbreviated Scales of Intelligence—Second Edition (Wechsler, 2011). [5] Wechsler Intelligence Scale for Children-III—Japanese Version (Japanese WISC-III Publication Committee, 1998).

Table 2. Summary of studies investigating conventional/moral judgements among autistic individuals (*n* = 5)

Reference	*n* ASD	Age (years)		IQ (*Mean* Standard Score)	Gold Standard Diagnosis[1]	Matching	Morality	
		Mean	Range				Between-Groups Differences	Relation to Aspects of Commonsense Psychology
Blair, 1996	20 (sex not reported)	failed ToM: 11.6; passed ToM: 14.6	8.25–17.5	failed ToM: VIQ[2]: 71; passed ToM: 80; learning disability: 68	N	age	N	N false-belief understanding
Leslie, Mallon, & Dicorcia, 2006	exp 1: 19 (F = 3) exp 2: 17 of same group	12.42	7.58–16.67	VMA[3]: 3:3–11:1; mean 5:4	N	—	N	N false-belief understanding
Shulman, Guberman, Shiling, & Bauminger, 2012	18 (F = 2)	12.07	8.08–17.16	FSIQ[4]: 94.31 VIQ[4]: 92.66 PIQ[4]: 97.12)	Y	FSIQ[4], VIQ[4], PIQ[4], age, SES	Y	N/A
Skolnick Weisberg & Leslie, 2012	12 (F = 2)	10.7	—	VMA[3] > 4y	N	—	Y	Y false-belief understanding
Zalla, Barlassina, Buon, Leboyer, 2011	20 (F = 3)	28.3	17–38	FSIQ[5]: 96	Y	FSIQ[5]; VIQ[5], PIQ[5], age, gender[6], years education	Y	Y faux-pas recognition

Note: F: female; FSIQ: full-scale IQ; IQ: intelligence quotient; PIQ: performance IQ; SES: socioeconomic status; ToM: theory of mind; VIQ: verbal IQ; VMA: verbal mental age; Y/N under Morality heading indicates whether relations were found between constructs; N/A indicates that the relation between constructs was not assessed. [1] Diagnosis made / confirmed using Autism Diagnostic Observation Schedule—Second Edition (Lord et al., 2015); Autism Diagnostic Interview—Revised (Lord, Rutter, & Le Couteur, 1994). [2] Test not indicated. [4] Peabody Picture Vocabulary Test (Dunn & Dunn, 1997). [5] Wechsler Intelligence Scale for Children—Third Edition (Wechsler, 1991). [6] Wechsler Adult Intelligence Scale—French Edition (Wechsler, 1999a). [6] Sex and gender are used in accordance with authors' terminology.

Vignettes involve: (a) clear-cut moral transgressions wherein an actor unjustifiably causes harm to a victim or to property, e.g., a child hitting another child, and (b) an actor who commits a harmless norms violation, e.g., a child wearing pyjamas to school. After hearing or reading these vignettes, participants are asked about (a) permissibility: whether the actors' behavior was okay; (b) seriousness: whether it was bad to have committed the act; and, (c) authority jurisdiction: whether the act would be okay if deemed so by an authority figure (i.e., an authority-bound transgression).

Three studies have researched the conventional/moral distinction among autistic children (see Table 2). Autistic children did not differ from children with moderate learning difficulties or neurotypical children in distinguishing between moral and conventional transgressions (Blair, 1996). Children across groups also maintained that morally wrong (i.e., harmful) acts remained so even if approved of by an authority figure (Blair, 1996). In another pair of studies, researchers found greater similarities than differences between groups of autistic and neurotypical children on the conventional/moral distinction task, even when victims were shown to be distressed without having been morally wronged (Leslie et al., 2006). These results suggest that autistic children do not base moral judgements on distress of victims alone. Skolnick Weisberg and Leslie (2012) further investigated the effect of victims' distress on autistic children's ability to distinguish between moral and conventional transgressions. In their experimental manipulation, half of the stories from each category (i.e., conventional/moral/neutral) showed the victim crying, whereas half did not. Results showed that autistic children were affected by the transgression *and* by crying; judgements of neurotypical children were not affected by crying, presumably due to less reliance on outcome than autistic children. These three studies were limited by their group matching strategies. In Blair's (1996) study, participants were roughly matched according to verbal mental age between groups. Leslie and colleagues (2006) did not describe matching procedures. Skolnick Weisberg and Leslie (2012) did not directly compare autistic children with a control group but rather compared results of neurotypical and autistic children between two separate experiments. Autistic participants in all three studies were chronologically older than the comparison participants.

Shulman and colleagues (2012) investigated the conventional/moral distinction in autistic and neurotypical adolescents (see Table 2). Rather than asking whether a behavior would be acceptable if approved of by an authority figure as in Smetana's task, the authors asked for examples of contexts in which the behavior would be considered appropriate (i.e., universal applicability). The two groups did not differ significantly in judgements of universal applicability for moral transgressions, but the autistic group judged the conventional transgressions as more universally abiding than did the neurotypical participants, suggesting less cognitive flexibility among the autistic group. When asked to justify conventional/moral judgements, justifications by autistic adolescents tended to be more concrete, more utilitarian, less elaborate, less flexible, and with fewer abstract rules than those offered by neurotypical adolescents (Shulman et al., 2012).

One study investigated the conventional/moral distinction among autistic adults with the addition of a scenario describing a disgusting but harmless act (i.e., disgust transgression; e.g., a person spits in her water glass before drinking from it; Zalla et al., 2011; see Table 2). Autistic adults did not differ from neurotypical adults in their judgements of permissibility for each

Table 3. Summary of studies investigating intent-based judgements among autistic children (n = 5)

Reference	n ASD	Age (years) Mean	Range	IQ (Mean Standard Score)	Gold Standard Diagnosis[1]	Matching	Morality Between-Groups Differences	Relation to Other Aspects of Commonsense Psychology
Akechi et al., 2018	33 (F=9)	15.7	7–24	FSIQ[2]: 96.9	Y	Age, sex, FSIQ	N	Y judgements of agency
Fadda et al., 2016	30 (F=0)	11.8	—	FSIQ[3]: 87.57	Y	Sex[4]	Y	Y false-belief understanding
Grant, 2005	19 (sex not reported)	12.2	—	VMA[5]: 102 months; VIQ[3]: 74	N	Clinical group: CA and VMA[5]; TD group: VMA[5]	Y	N/A
Komeda et al., 2016	19 (F=2)	12.5	—	FSIQ[6]: 100	Y	FSIQ[6], age	Y	N/A
Rogé & Mullet, 2011	25 (F=5)	—	7–14 (n=10); 15–18 (n=9); 22–36 (n=6)	—	Y	chronological age OR mental age[3]	Y	N/A
Salvano-Pardieu et al., 2016	14 (F=2)	12.9	11.5–14.8	FSIQ[7]: 118, NVIQ[8]: 47.2	Y	FSIQ[7], age, sex, SES, academic level[9]	Y	N/A

Note: CA: chronological age; F: female; FSIQ: full-scale IQ; IQ: intelligence quotient; NVIQ: non-verbal IQ; VIQ: verbal IQ; VMA: verbal mental age; SES: socioeconomic status; Y/N under Morality heading indicates whether relations were found between constructs; N/A indicates that the relation between constructs was not assessed. [1] Diagnosis made/confirmed using Autism Diagnostic Observation Schedule—Second Edition (Lord et al., 2015); Autism Diagnostic Interview—Revised (Lord, Rutter, & Le Couteur, 1994). [2] Wechsler Intelligence Scale for Children-III—Japanese Version (Japanese WISC-III Publication Committee, 1998). [3] Name of cognitive test not reported. [4] Sex and gender are used in accordance with authors' terminology. [5] British Picture Vocabulary Scale (Dunn, Dunn, & Whetton, 1982). [6] Wechsler Intelligence Scale for Children—Fourth Edition (Wechsler, 1991). [7] Wechsler Intelligence Scale for Children—Fourth Edition (French; Wechsler, 2005). [8] Raven's Progressive Matrices; scale of score not indicated (Raven, Raven, & Court, 1998). [9] Assessed by teachers based on average grades.

condition. However, whereas neurotypical participants judged disgust transgressions as less seriously wrong than moral transgressions, autistic participants did not significantly differentiate between the two. Autistic adults used more rule-based justifications of moral judgements than neurotypical participants, who appealed more to others' welfare (Zalla et al., 2011).

Intent-based Moral Judgement

Six studies investigated intent-based moral judgements by autistic youth and neurotypical controls (see Table 3). Participants across groups based their judgements primarily on intentions (Grant et al., 2005; Rogé & Mullet, 2011; Salvano-Pardieu et al., 2016), judged damage to people as more serious than damage to property (Grant et al., 2005), and judged more serious consequences more harshly than less serious consequences (Rogé & Mullet, 2011; Salvano-Pardieu et al., 2016).

However, subtle differences in the influence of intentions on moral judgements were found between autistic and neurotypical youth. When intentions and outcomes were at odds, neurotypical children were significantly more likely to base judgements on intention than autistic children of below-average verbal IQ and children without autism whose mean IQ was also below average (Grant et al., 2005). Similarly, when behavior, outcomes, and personal characteristics (e.g., "Takeru-kun is a nice boy who likes to please his father") were at odds, autistic children did not use information about personal characteristics in making moral judgements, unlike neurotypical children (Komeda et al., 2016). In another study, autistic children judged moral culpability most often on consequences, followed by rules, with the fewest participants basing judgements on intentions, in contrast to neurotypical children, who judged moral culpability first on intentions, then consequences, then on rules (Fadda et al., 2016). Further, intention had a weaker effect on judgements of moral culpability among autistic compared with neurotypical adolescents (Rogé & Mullet, 2011). Salvano-Pardieu and colleagues (2016) showed a similar result when comparing autistic with neurotypical adolescents. Finally, whereas autistic individuals considered outcomes in moral judgements regardless of how serious those outcomes were, neurotypical individuals considered intentions alone if potential outcomes were very serious (Salvano-Pardieu et al., 2016). Akechi and colleagues (2018) compared autistic children and young adults with neurotypical individuals on judgements of blame. In contrast to the above results, Akechi and colleagues (2018) found that autistic participants did not differ from neurotypical controls in their assignation of blame to targets with varying degrees of agency (e.g., god, human adult, robot), suggesting sensitivity among autistic individuals to differences in moral culpability based on the capacity to act intentionally.

A limitation of two of the above studies is failure to consider language and intellectual abilities (Fadda et al., 2016; Rogé & Mullet, 2011). This is especially salient given that the ability of autistic children to justify their moral judgements was correlated with verbal IQ and verbal mental age in Grant and colleagues' (2005) study.

Nine studies tested moral judgements by autistic and neurotypical adults using vignettes showing either intentional or unintentional harms, with neutral or harmful outcomes (see Table 4). Across groups, actions with neutral intentions and outcomes were judged as more permissible than those with negative intentions and outcomes (Baez et al., 2012; Bellesi et al., 2018; Moran

et al., 2011), and intentional harms were viewed as less permissible than unintentional harms overall (Baez et al., 2012; Buon et al., 2013; Channon et al., 2011; Moran et al., 2011). Autistic and neurotypical adults considered acts with physical and psychological harms as more wrong than neutral acts (Tsoi et al., 2018).

However, neurotypical participants judged transgressions with neutral intentions and negative outcomes as more permissible than did autistic participants (Moran et al., 2011). Autistic adults were more punitive in their responses to transgressions and were less accepting of transgressions than neurotypical adults regardless of intentionality (Bellesi et al., 2018). When asked to explain their judgements, autistic participants offered significantly fewer sophisticated rationales than neurotypical participants when controlling for IQ (Bellesi et al., 2018). Autistic individuals assigned greater relative blame to intentional than unintentional harms (Channon et al., 2011; Koster-Hale et al., 2013), yet significantly less blame for intentional harms than neurotypical participants (Koster-Hale et al., 2013). In another study, autistic adults supported greater punishment for, and assigned greater blame to, an accidental agent than did neurotypical adults (Buon et al., 2013). Also, autistic adults were significantly less sympathetic to drivers with poor justifications for negligence than were neurotypical controls (Channon et al., 2010). In contrast, Baez and colleagues (2012) did not find differences in moral judgements between groups, perhaps owing to their relatively small sample size.

No differences between autistic and neurotypical adults were found in estimates of victims' suffering or degree of causality between accidental, coincidental, or intentional harms (Buon et al., 2013). Differences were also not found between autistic and neurotypical participants' acceptability ratings of self-interested moral violations (e.g., lying on a job application; Bellesi et al., 2018). Further, autistic and neurotypical participants rated intentional acts as more instrumental to outcomes than unintentional acts, and rated acts by protagonists with envy as more instrumental to outcomes than protagonists with revenge motives (Channon et al., 2011). However, autistic adults judged accidental harms as more intentional than did neurotypical individuals, and only the autistic participants judged accidental harms as more intentional than harms that merely coincided with an action (Buon et al., 2013). Groups equally assigned greater intentionality to a protagonist with neutral intentions and poor outcomes than to a protagonist with neutral intentions and good outcomes (i.e., Knobe effect; Knobe, 2003), but autistic participants assigned more praise to actors with neutral intentions and good outcomes than did neurotypical participants (Zalla & Leboyer, 2011).

Two studies investigated neural responses to intent-based moral judgements using functional magnetic resonance imaging (fMRI; see Table 4). Neurotypical participants but not autistic participants showed greater activity in the right temporo-parietal junction when judging accidental versus intentional harms (Koster-Hale et al., 2013). However, as in neurotypical controls, autistic participants did show greater activity in the right and left temporo-parietal junctions and the precuneus when judging harmful compared with neutral actions (Koster-Hale et al., 2013). Tsoi and colleagues (2018) conducted secondary analyses on data from Koster-Hale and colleagues (2013) to assess the brain regions involved in judgements of intentional or unintentional transgressions that led to physical harms, psychological harms, or neutral outcomes. Across groups, brain regions related to commonsense psychology (i.e., right temporoparietal junction,

Table 4. Summary of studies investigating intent-based moral judgements among autistic adults ($n = 7$)

| Reference | n ASD | Age (years) | | IQ (*Mean* Standard Score) | Gold Standard Diagnosis[1] | Matching | Morality | |
		Mean	Range				Between-Groups Differences	Relation to Other Aspects of Commonsense Psychology
Baez et al., 2012	15 (F = 4)	35	—	Lowest FSIQ[2] score: 94	N	age, sex[3], years education	N	N social cognition and empathy tasks
Bellesi et al., 2018	20 (F = 8)	22.65	—	FSIQ[4]: 110.75	N	age, sex, FSIQ[4]	Y	—
Buon et al., 2013	16 (F = 3)	26.8	—	FSIQ[5]: 98	Y	FSIQ[5], VIQ[5], PIQ[5], gender, age, years education	Y	N/A
Channon, Fitzpatrick, Drury, Taylor, Lagnado, 2010	20 (F = 5)	40.65	—	FSIQ[4]: 106	N	FSIQ[4], age, years of education	Y	N/A
Channon, Lagnado, Fitzpatrick, Drury, Taylor, 2011	20 (F = 5)	38.5	—	FSIQ[4]: 109	N	FSIQ[4], age, years of education	Y	N/A
Koster-Hale, Saxe, Dungan, & Young, 2013	16 (F = 2)	31	20–46	FSIQ[2]: 120	Y	FSIQ[2], age	Y	N right temporo-parietal junction activity
Moran et al., 2011	13 (F = 4)	33.15	—	FSIQ[2]: 120	Y	FSIQ[2], sex, age	Y	N false-belief understanding
Tsoi et al., 2018	16 (F = 2)	31	20–46	FSIQ[2]: 120	Y	FSIQ[2], age	Y	N/A
Zalla & Loboyer, 2011	20 (F = 4)	27.6	—	FSIQ[6]: 93.5 VIQ[6]: 99.4 PIQ[6]: 87.2	Y	FSIQ[6], age, gender, years education	Y	N faux-pas recognition

Note: F: female; FSIQ: full-scale IQ; IQ: intelligence quotient; PIQ: performance IQ; VIQ: verbal IQ; Y/N under Morality heading indicates whether relations were found between constructs; N/A indicates that the relation between constructs was not assessed.
[1] Diagnosis made/confirmed using Autism Diagnostic Observation Schedule—Second Edition (Lord et al., 2015); Autism Diagnostic Interview—Revised (Lord, Rutter, & Le Couteur, 1994). [2] Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999b; ascertained through personal correspondence with author). [3] Sex and gender are used in accordance with authors' terminology. [4] Wechsler Test of Adult Reading (Wechsler, 2001). [5] Wechsler Adult Intelligence Scale—Third Edition (Wechsler, 1997). [6] Wechsler Adult Intelligence Scale—French Edition (Wechsler, 1999a).

precuneus, dorsolateral prefrontal cortex) were more active during judgements of psychological relative to physical harms (Tsoi et al., 2018).

Emotion-backed Moral Judgement

The trolley problem has been used by philosophers and psychologists for decades to demonstrate the influence of intuition and emotion on moral decision-making (Stratton-Lake, 2014). This task is useful for studying moral psychology because it discerns subjective utilitarian versus deontological moral inclinations. Whereas utilitarian ethics advocate maximizing good for the greatest numbers of people (Mill, 1863), deontological ethics advocate strict adherence to ethical rules despite consequences (Kant, 1785/2002).

The trolley problem includes two dilemmas. In the standard trolley dilemma, participants are told to imagine they can see a trolley with broken brakes barreling down tracks in front of them. Strapped to the tracks are five innocent people. A switch that would allow the participant to change the path of the trolley is available, but one person is strapped to the alternate track. As such, pulling the switch would spare five lives at the cost of one. The footbridge variant of the trolley dilemma similarly pits five lives against one, but in this scenario, preventing the trolley from killing five requires throwing a man off a footbridge in front of the runaway trolley. Whereas most children and adults indicate they would pull the switch in the trolley dilemma (i.e., the utilitarian solution), the majority indicate they would not throw the man onto the tracks in the footbridge scenario, preferring instead a duty-based, deontological solution (e.g., Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Moore, Clark, & Kane, 2008; Pellizzoni, Siegal, & Surian, 2010).

Two studies investigated responses to the trolley problem in autistic adults (see Table 5). In Gleichgerrcht and colleagues' (2013) study, autistic adults were equally as likely as neurotypical adults to endorse the utilitarian solution to the trolley dilemma. However, autistic adults were significantly more likely than neurotypical participants to endorse the utilitarian solution to the footbridge dilemma (i.e., throwing the man onto the tracks to save the five others), despite expressing the belief that this act was inappropriate. In contrast, Patil and colleagues (2016) did not find between-groups differences in responses to either the trolley or footbridge dilemmas in their sample of autistic adults and neurotypical controls. The emotional responses of autistic participants also differed between the two studies. Gleichgerrcht and colleagues (2013) found that when asked how strongly they felt about their decisions, autistic adults reported greater emotional arousal following trolley decisions and less emotional arousal following footbridge decisions compared with neurotypical participants. Patil and colleagues (2016) asked participants how emotionally arousing they found the scenarios (not their decisions) and found that autistic adults reported *more* emotional arousal than neurotypical participants regardless of the dilemma type. Patil and colleagues (2016) added a measure of alexithymia and conducted a path analysis of the autistic participants' data to further investigate responses to the footbridge dilemma. When controlling for shared variance between autistic and alexithymic traits, alexithymic traits were associated with *increased* endorsement of action in footbridge-style scenarios, whereas autistic traits were associated with *reduced* tendency to endorse action in these scenarios among autistic adults. Thus, while alexithymic and autistic traits are usually positively correlated, when controlling

Table 5. Summary of studies investigating emotion in moral judgements among autistic adults (n = 5)

Reference	n ASD	Age (years) Mean	Range	IQ (Mean Standard Score)	Gold Standard Diagnosis[1]	Matching	Morality Between-Groups Differences	Relation to Aspects of Commonsense Psychology
Brewer et al., 2015	25 (F = 6)	34.52	—	—	Y	alexithymia[2], age, gender[3], FSIQ[4]	N	N/A
Gleichgerrcht et al., 2013	36 (F = 12)	32.6	—	VIQ[5]: 114 PIQ[5]: 104	N	VIQ[5], PIQ[5], age, gender, years education	Y	Y faux-pas recognition
Hirvelä & Helkama, 2011	41 (F = 23)	F = 34; M = 31	—	—	N	matching strategy not described	Y	Y empathy
Patil, Melsbach, Hennig-Fast, & Silani, 2016	17 (F = 6)	37.35	—	VIQ[6]: 31 NVIQ[7]: 7.5	N	age, gender, years education	N	Y empathy
Schneider et al., 2013	30 (F = 13)	31.39	—	FSIQ: 109.1[8]	N	gender, age, years education; digit span[9], lexical fluency[10], semantic fluency[10], flexibility[11], social desirability[12]	N	N/A

Note: F: female; FSIQ: full-scale IQ; IQ: intelligence quotient; M: male; PIQ: performance IQ; VIQ: verbal IQ; Y/N under Morality heading indicates whether relations were found between constructs; N/A indicates that the relation between constructs was not assessed. [1] Diagnosis made/confirmed using Autism Diagnostic Observation Schedule—Second Edition (Lord et al., 2015); Autism Diagnostic Interview—Revised (Lord, Rutter, & Le Couteur, 1994). [2] Toronto Alexithymia Questionnaire (Bagby, Parker, & Taylor, 1994). [3] Sex and gender are used in accordance with authors' terminology. [4] Raven's Progressive Matrices; scale of score not indicated (Lehrl, 1995). [5] Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999b). [6] Wechsler Adult Intelligence Scale—Third Edition (Wechsler, 1997). [7] Wechsler Abbreviated Scale of Intelligence; scale of score not indicated (Raven, Raven, & Court, 1998). [8] Mehrfachwahl-Wortschatz-Intelligenztest. [8] Wortschatztest (Schmidt, & Metzler, 1992). [9] Wechsler Intelligenztest für Erwachsene (Von Aster, Neubauer, & Horn, 2006). [10] Regensburger Wortflüssigkeitstest (Aschenbrenner, Tucha, & Lange, 2001). [11] Trail Making (Reitan, 1958). [12] Deutsche Kurzskala zur Erfassung des Bedürfnisses nach sozialer Anerkennung (Stöcké, 2009).

for their shared variance, the two have different associations with actions in footbridge-style scenarios. Nonverbal IQ was negatively predictive of utilitarian moral judgments when controlling for autistic and alexithymic traits (Patil et al., 2016).

Hirvelä and Helkama (2011) explored the connection between self-reported empathy and moral values in autistic adults and neurotypical controls using online surveys (see Table 5). Autistic adults rated benevolence lower and tradition higher than neurotypical adults on a values questionnaire, but they did not differ significantly in ratings of other moral values such as universalism and conformity. In contrast to Patil and colleagues' (2016) findings, moral values were generally similar despite differences in self-reported empathy. Brewer and colleagues (2015) used questionnaires to investigate the influence of co-occurring alexithymia on moral decision-making among autistic adults and neurotypical controls (see Table 5). Participants were asked to rate the moral acceptability and report on their emotional response to saying each of 100 potentially upsetting statements to another individual (Marsh & Cardinale, 2012). No significant differences in moral acceptability judgements were found between groups (Brewer et al., 2015). In contrast to Patil and colleagues' (2016) findings, alexithymia was a significant predictor of moral judgements among neurotypical adults but *not* among autistic adults. The contrasting findings of these two latter studies with Patil and colleagues' (2016) study could be due to the difference in emotional salience of the tasks. Perhaps autistic individuals used emotional information in moral decision making when the emotional information was highly salient, as in the trolley problem. In contrast, the task used in the studies by Brewer and colleagues (2015) and Hirvelä and Helkama (2011) may have been less emotionally arousing, such that alexithymia did not disrupt moral judgements in autistic individuals.

Schneider and colleagues (2013) used an ethical decision-making task to investigate neural activity underpinning emotional moral judgements in autistic individuals and neurotypical controls (see Table 5). When responding to moral dilemmas (i.e., ethical versus neutral; socio-ethical versus individual-group comparisons), the autistic group showed lower activation in the left amygdala, left insula, and left posterior cingulate cortex than the neurotypical controls, despite no differences in judgements of the dilemmas (Schneider et al., 2013). No significant correlations were found among activations of brain areas of interest and either autism symptom severity or alexithymia in either group (Schneider et al., 2013).

Moral Judgement and Behavior

Only one study investigated the effect of moral thinking on behavior (see Table 6). Li, Zhu, and Gummerum (2014) tested moral judgement and cooperation in autistic and neurotypical children. Participants were asked to rate the relative naughtiness or niceness of protagonists depicted in a series of moral vignettes. Accuracy of moral judgements did not differ significantly between the groups; however, autistic children judged the naughty children as significantly naughtier than did the neurotypical children. Following the moral judgement task, participants were asked to engage in a cooperation game (the prisoner's dilemma game, wherein participants choose between personal benefit at cost to another or a smaller mutual benefit), ostensibly with the protagonists from the moral vignettes. Cooperation in the prisoner's dilemma game among autistic individuals did not differ significantly depending on the partner (i.e., naughty versus nice), in contrast

with the neurotypical children, who cooperated more with the nice than the naughty child. The authors concluded that the perceived moral behavior of one's partner in a cooperation game does not influence cooperation among autistic children, unlike among neurotypical children.

Commonsense Psychology

Results of studies investigating the role of commonsense psychology in moral reasoning by autistic individuals were mixed. Kretschmer and colleagues (2014) found no relations among first- and second-order false-belief tasks, i.e., tasks that assess children's understanding that others' knowledge and perspectives differ from their own, and moral stage maturation. Although Senland and Higgins-D'Alessandro (2016) measured empathy and found both it and moral stage levels to be lower among autistic than neurotypical adolescents, the influence of commonsense psychology on moral reasoning was not investigated statistically.

The specific role of false-belief understanding in the conventional/moral distinction among autistic children is also unclear. No relations were found between false-belief task performance and the ability to make the conventional/moral distinction by Blair (1996) or by Leslie and colleagues (2006). However, Zalla and colleagues (2011) found a significant negative correlation between faux pas scores (i.e., the ability to identify mild social transgressions) and judgements of seriousness of transgressions among autistic adults, whereas the two variables were positively correlated among the neurotypical controls. The authors interpreted this finding as indicating that neurotypical adults' use of mentalizing skills lessens their negative judgements of unintentional or inoffensive acts. In contrast, autistic participants were argued to rely more on rule-based heuristics for making moral judgements. As such, mentalizing may interfere with outcome-based judgements for moral transgressions among autistic adults. Further, in another study, autistic children who passed a false-belief task made greater distinctions between moral and neutral transgressions than did autistic children who failed the false-belief task (Skolnick Weisberg & Leslie, 2012).

As for intent-based moral judgement, Fadda and colleagues (2016) found that autistic children who passed a second-order false-belief task (5%) considered intentions in moral judgements less than did neurotypical children who passed the false-belief task (50%). Akechi and colleagues (2018) found that autistic children and youth integrated judgements of others' agency with moral judgements. Among autistic adults, false-belief, faux pas, and empathy scores were not related to intent-based moral judgements (Baez et al., 2012; Koster-Hale et al., 2013; Moran et al., 2011; Zalla & Leboyer, 2011). Despite the lack of connection between these forms of commonsense psychology and moral-decision making, autistic adults showed atypical lack of association between activity in the right temporo-parietal junction (an area associated with commonsense psychology; Sellaro et al., 2015; Yamada et al., 2012) and judgement of intentionality for accidental harms among autistic adults (Koster-Hale et al., 2013). These findings suggest that subtle differences in autistic moral reasoning are not related to their performance on commonly used measures of commonsense psychological skills.

The relation among commonsense psychology skills and emotion-backed moral decision making is complicated by the high comorbidity of alexithymia and related differences in empathic responding among autistic individuals. Faux pas understanding among autistic adults was negatively related to

Table 6. Summary of study (n = 1) investigating the relation of moral judgements to behaviour among autistic children

		Age (years)					Morality	
Reference	n ASD	Mean	Range	IQ (Mean Standard Score)	Gold Standard Diagnosis[1]	Matching	Between-Groups Differences	Relation to Aspects of Commonsense Psychology
Li, Zhu, & Gummerum, 2014	38 (F = 8)	9.6	6–12	FSIQ[2]: 110	N	age, gender[3]	Y	N/A

Note: F: female; FSIQ: full-scale IQ; IQ: intelligence quotient; Y/N under Morality heading indicates whether relations were found between constructs; N/A indicates that the relation between constructs was not assessed. [1] Diagnosis made/confirmed using Autism Diagnostic Observation Schedule—Second Edition (Lord et al., 2015); Autism Diagnostic Interview—Revised (Lord, Rutter, & Le Couteur, 1994). [2] Combined Raven's test (second revision in Chinese; Wang, & Qian, 1997). [3] Sex and gender are used in accordance with authors' terminology.

willingness to sacrifice one life to save five in the footbridge dilemma (Gleichgerrcht et al., 2013). Increased alexithymia symptoms were associated with reduced empathic concern, which was in turn associated with increased utilitarian action (Patil et al., 2016). Conversely, greater autistic traits were positively associated with self-reported empathic hyperarousal, which predicted a reduced utilitarian response (Patil et al., 2016). In contrast to Patil and colleagues' (2016) findings, Hirvelä and Helkama (2011) found that moral values were generally similar across groups despite differences in self-reported empathy; however, there were subtle differences among relations of self-reported empathy and specific moral values between groups (e.g., universalism and empathic concern were correlated among neurotypical but not autistic participants). Schneider and colleagues' (2013) findings of differences in emotion-related brain regions during a moral decision-making task yielded no between-groups differences. Taken together, differences in emotion-backed moral decision making in ASD appear to be related to the presence or absence of comorbid alexithymia and the use of emotional information in decision making more generally.

Discussion

Moral Stages Research

Two of the three studies investigating development through Kohlberg's (1969, 1971) moral stages among autistic children and youth suggest lower moral development in autistic participants than neurotypical participants (Senland & Higgins-D'Alessandro, 2016; Takeda et al., 2007). Autistic children and youth were concluded to have less mature moral reasoning skills, based more on concrete rules than on abstract principles. These conclusions should be hedged by inconsistent findings—Kretschmer and colleagues (2014) did not find between-group differences in moral stage development.

A general limitation of research investigating moral development according to Kohlberg's stages derives from Kohlberg's (1969, 1971) assumption of invariant progression through moral stages across cultures. Haidt (2001) challenges this view—his intuitionist account proposes that children have an innate capacity to internalize moral intuitions across five social contexts, or "foundations" that humans have evolved to recognize as morally salient (i.e., harm/care, fairness/reciprocity, in-group/loyalty, authority/respect, and purity/sanctity). The relative importance of these foundations depends on early cultural environments that may reinforce the development of some moral foundations over others. To illustrate, whereas Kohlberg's (1969,

1971) stages describe moral reasoning based on authority as less mature than reasoning based on individual rights, Haidt and colleagues assert that reasoning based on authority represents a different (not lesser) moral foundation, the importance of which is determined by one's culture (Graham, Haidt, & Nosek, 2009). Given the emergent conceptualization of autism as a culture (Davidson, 2008; Jaarsma & Welin, 2012), it may be inappropriate to conclude that autistic youth have less mature moral reasoning than neurotypical participants based on differences in Kohlberg's (1969, 1971) moral stages. Instead, Haidt's framework would suggest that autistic youth value the authority domain more than neurotypical youth.

Conventional/moral Distinction

Autistic children and adults have consistently demonstrated the ability to discriminate between conventional and moral transgressions, despite their impaired commonsense psychology skills and lower mean level of intellectual abilities. However, subtle differences in cognitive flexibility among autistic individuals with respect to conventional distinctions (Shulman et al., 2012) and greater weight of severity of disgust transgressions have been found (Zalla et al., 2011). Zalla and colleagues (2011) argued that emotional empathy has greater involvement in moral decision-making among autistic than neurotypical individuals to compensate for relative lack of cognitive empathy, which they argue could be important for differentiating the severity of moral and disgust transgressions. An alternative explanation can again be derived from the work of Haidt (2001). Autistic individuals in Zalla and colleagues' (2011) study were more sensitive to Haidt's purity/disgust foundation, perhaps due to greater sensory sensitivity than neurotypical individuals (Crane, Goddard, & Pring, 2009), leading them to judge these violations more stringently. This interpretation, coupled with findings that authority may be more valued as a moral concept among some autistic individuals (Senland & Higgins-D'Alessandro, 2016; Takeda et al., 2007), suggests that differences in moral reasoning in this population could offer a comparison point to better understand how people think about moral issues and how moral reasoning develops.

Intent-Based Moral Judgement

Given the prominence of Piaget's theory of moral development, investigators of morality in children and adults have often sought to determine the extent to which individuals base moral judgements on intentions (e.g., Cushman, Sheketoff, Wharton, &

Carey, 2013). Autistic children show differences in intent-based moral judgements compared with neurotypical children (Fadda et al., 2016; Grant et al., 2005; Komeda et al., 2016; Rogé & Mullet, 2011; Salvano-Pardieu et al., 2016). These differences are present from as early as nine years old (Grant et al., 2005). This seems particularly true when intentions and outcomes are incongruous (Grant et al., 2005; Komeda et al., 2016), such that intentions are generally weighted less heavily than outcomes among autistic individuals (Fadda et al., 2016; Salvano-Pardieu et al., 2016). In contrast to these results, Akechi and colleagues (2018) did not find differences in judgements of blame for individuals with varying levels of agency.

Older autistic individuals also seem to rely on outcome more than intention when making moral judgements (Buon et al., 2013; Channon et al., 2010; Channon et al., 2011; Koster-Hale et al., 2013; Moran et al., 2011). The development of intent-based moral judgements in autistic children appears to follow a similar, yet slower developmental trajectory compared with neurotypical children (Cushman et al., 2013; Rogé & Mullet, 2011). However, it is important to note that neurotypical individuals also base some of their moral judgements on outcomes rather than intentions, as demonstrated by the Knobe effect (i.e., assigning greater intentionality to agents whose acts with neutral intentions lead to negative, rather than positive, outcomes). Further, there are situations in which focusing on outcomes rather than intentions is appropriate and valuable. For example, impaired drivers may not intend to cause accidents, but when accidents occur as a result of such negligence, neutral intentions do not compensate for negative outcomes. As such, it would be inaccurate to cast differences in intent-based moral reasoning in autism as necessarily detrimental or erroneous.

Although much research in intent-based moral judgement in autism has suggested some subtle differences, there are many similarities in intent-based moral judgements across groups. Moreover, not all studies have found differences (e.g., Baez et al., 2012) despite similar participant characteristics and methodologies. Further, autistic individuals do use intentionality in a typical manner when making moral judgements of intended harms with neutral outcomes (Moran et al., 2011). Finally, in one study, autistic participants judged both unintentional and intentional transgressions more harshly, suggesting that some differences in moral judgements between groups may not depend on considerations of intentionality (Bellesi, 2018).

Margoni and Surian (2016) reviewed intent-based moral judgement in ASD and concluded that autistic people have "less mature" moral reasoning due to deficits in mental state understanding. However, we argue that greater reliance on outcome than intention when making moral judgements need not imply that autistic individuals overlook the importance of intention. Indeed, we see evidence of increased emphasis on intention when judging culpability of outcomes consistent with intentions (Channon et al., 2010; Channon et al., 2011; Koster-Hale et al., 2013; Li et al., 2014). Further, autistic individuals' assignment of intentionality appears itself to be informed by outcome rather than being automatically cued (Koster-Hale et al., 2013; Zalla & Leboyer, 2011). Since both outcomes and intentions matter for autistic moral reasoning, but outcome trumps intention when the two are at odds, we propose that autistic individuals use outcomes as a heuristic to infer intentionality more than do neurotypical adults, who rely instead on their more automatic mentalizing skills to infer intention and subsequent moral judgements. Differences in intent-based moral judgements among

autistic individuals despite their ability to identify faux pas and understand false beliefs supports this hypothesis. Our interpretation is also consistent with research demonstrating intact false-belief understanding in the absence of automatic attributions of intent to others (Senju et al., 2009). Therefore, we argue that the ability to infer and base moral judgements on intentionality is present among autistic individuals, but that the method of inferring intentionality differs between autistic and neurotypical participants. However, it is unclear whether compensation is mediated by verbal or nonverbal cognitive skills (Senju et al., 2009; Patil et al., 2016).

The different cognitive mechanisms involved in intent-based moral judgement in ASD may be underpinned by atypical activity in the right temporo-parietal junction (Koster-Hale et al., 2013). This finding is consistent with research showing that autistic adults demonstrate hypoconnectivity in the right temporo-parietal junction during cognitive empathy tasks (Shulte-Rüther et al., 2011). Differences in activity in this region might account for differences in assignment of intentionality. Specificity of this atypical activity in response to intent-based moral judgements is supported by the finding that right temporo-parietal junction activity was similar between autistic and neurotypical participants when distinguishing physical from psychological moral wrongs (Tsoi et al., 2018) and that different patterns of activation in this brain region do not predict an inability in ASD to make the self-other distinction (Hoffman et al., 2016).

Emotion-backed Moral Judgements

Results of the two studies investigating the trolley problem in autistic adults were mixed. In Gleichgerrcht and colleagues' (2013) study, autistic individuals were more likely than neurotypical individuals to endorse the utilitarian solution to the footbridge dilemma. In contrast, Patil and colleagues (2016) did not find differences in responses to the footbridge dilemma across groups, despite the fact that autistic adults reported more arousal than neurotypical participants in response to both the trolley and footbridge dilemmas (Patil et al., 2016). Gleichgerrcht and colleagues (2013) reasoned that less emotional responding to the footbridge dilemma and differences in commonsense psychology led to the between-group differences in moral decision making. However, differing methodologies could account for discrepancies in findings, and it is unclear how emotionally arousing the dilemmas were to participants in Gliechgerrcht et al.'s (2013) study. Alexithymic traits and autism symptoms appeared to have counterbalancing moderating effects on trolley responses such that alexithymia scores were associated with increased utilitarianism and autism traits were associated with decreased utilitarian decision-making (Patil et al., 2016). However, an fMRI investigation showed no significant correlations between emotion-related brain activity and either autism symptom severity or alexithymia during moral decision making (Schneider et al., 2013). Despite this, limbic system activity differed significantly between autistic and neurotypical participants during moral reasoning (Schneider et al., 2013).

In contrast to the results of Patil and colleagues (2016), Brewer and colleagues (2015) found that the presence of alexithymia affected moral judgements and self-reported emotional arousal in otherwise neurotypical individuals but *not* among autistic individuals. Brewer and colleagues (2015) used a moral acceptability scale that assumes normative moral judgement from acceptability ratings of a series of statements intended to evoke specific emotional

responses (i.e., anger, disgust, fear, happiness, and sadness; Marsh & Cardinale, 2012). Although these emotions might be related to moral judgements (Haidt, 2001; Nichols, 2002), the task is based on the premise that eliciting negative emotions in others is morally wrong, a theoretical position that has not been validated as a metric of moral judgement. Similar limitations were present in a study investigating differences in moral values between autistic and neurotypical individuals (Hirvelä & Helkama, 2011). It is unclear to what extent between-group differences in self-reported values of benevolence and tradition, which were unrelated to empathy, affect moral judgements and decision-making. Further, the extent to which these tasks are emotionally arousing, with subsequent emotional influences on moral decision making, likely varies. In addition, autistic people tend to rate subjective emotional states differently than do objective observers (Johnson, Filliter, & Murphy, 2009; Legiša, Messinger, Kermol, & Marlier, 2013), making self-reported emotional arousal potentially unreliable for the researchers' purposes. Despite limitations, research investigating emotion-backed decision making in ASD suggests that autistic individuals with and without alexithymia do not use emotionally informed strategies in the same way as do neurotypical individuals to arrive at the same moral conclusions.

Moral Judgement and Behaviour

All save one investigation of moral development and decision-making in autistic individuals reviewed here have focused on laboratory-based moral-judgement tasks or self-report questionnaires. Li and colleagues (2014), in contrast, investigated the effect of moral judgement on subsequent patterns of cooperation using a prisoner's dilemma game. The authors found that, unlike neurotypical children, autistic children did not modulate their cooperative behavior based on naughtiness ratings (Li et al., 2014). These findings have important implications for autistic children, whose reciprocity is less influenced by others' moral transgressions, which might contribute to difficulty forming and maintaining friendships (Hamlin et al., 2011; Howlin, et al., 2013; Kasari et al., 2011; Rakoczy et al., 2016).

Justifications for Moral Judgements

In one study investigating justifications of moral judgements offered by autistic children, participants tended to reiterate vignettes instead of offering sound rationales (Grant et al., 2005). In another study, these explanations tended to be more concrete and less elaborate than those offered by neurotypical children (Shulman et al., 2012). Justifications for intent-based moral judgements appeared more rule-bound and focused on consequences among autistic children than neurotypical children, whose focus was more on protagonists' intentions (Fadda et al., 2016; Takeda et al., 2007). Autistic adults also reported more concrete, rule-bound rationales for moral judgements than neurotypical participants (Zalla, Barlassina, Buon, & Leboyer, 2011). Rationales were also found to be less sophisticated among autistic than neurotypical adults (Bellesi et al., 2018). Differences between autistic and neurotypical participants in justifications for moral judgements were similar to atypicalities in moral judgements among autistic individuals, which tended to prioritize outcomes over intentionality. At first glance, this convergence might appear to support a Kohlbergian reliance of moral judgement on discursive reasoning. Yet, some studies of human reasoning have suggested that moral and other forms of reasoning may be nothing more than post hoc rationalizations of emotion-based judgements that function to aid communication and argumentation (Haidt, 2001; Mercier & Sperber, 2011). Concrete moral reasoning in autistic adults may therefore suggest post hoc rationalizations for moral judgements that are limited by the relatively concrete thought processes often observed in ASD (Hobson, 2012).

Commonsense Psychology

The majority of studies investigating links between commonsense psychology and moral reasoning in ASD did not find evidence of a connection. Mentalizing skills, as measured by false belief and faux pas tasks, were at best tenuously related to moral stage progression, the ability to discern between conventional and moral transgressions, and intent-based moral judgements. However, a neuroimaging study suggested an atypical pattern of activity in the right temporo-parietal junction (Koster-Hale et al., 2013), suggesting that alternative neural mechanisms underpin mentalizing during intent-based moral judgements for autistic individuals.

When making emotionally demanding moral decisions, autistic individuals appear to be influenced by emotions, but the emotional landscapes and resultant moral decisions of autistic individuals differ from those of neurotypical individuals due to common co-occurrence of alexithymia and differences in empathic responding. Greater faux pas understanding and greater autistic traits *decrease* utilitarian responding to footbridge dilemmas, perhaps due to heightened empathic responding. Alexithymia *increases* such decisions, presumably due to lower empathic responding. In less intense emotion-backed decision-making paradigms, emotion-related brain regions (i.e., left amygdala, left insula, and left posterior cingulate cortex; Schneider et al., 2013) show atypical hypo-arousal despite no concomitant differences in moral decision making, suggesting an alternative heuristic for emotional moral judgement among autistic adults.

Differences in neural activation in mentalizing and emotional regions in autistic compared with neurotypical individuals could help account for the subtle differences found in moral decision making between groups. However, a challenge to the rationalist theory that role-taking is central to moral development arises because autistic individuals make moral judgements that are similar to those of neurotypical people despite having different mentalizing skills. Haidt's (2001) moral foundations theory proposes that intuition arises in response to moral scenarios leading to moral judgement; reasoning follows judgement as a means of justifying and communicating one's perspective to others. This theory could help account for similarity of moral judgements between these two groups despite differences in empathy, mentalizing skills, and verbal justifications for moral judgements. It could also help account for differences between groups (e.g., moral stage ascension and judgements of disgust transgressions) leading to understanding these as reflecting differential importance of five moral domains (i.e., authority; sanctity).

Future Directions

Several avenues for future research emerge from the current literature review. First, studies investigating moral development through hierarchical stages could be strengthened by adopting longitudinal designs. Longitudinal research could also help elucidate the role of commonsense psychology in the development of moral maturity. Conclusions drawn regarding the role of commonsense psychology in the conventional/moral distinction in

ASD (Skolnick Weisberg & Leslie, 2012) would be strengthened by introducing age-matched neurotypical control participants. Future studies of intent-based moral reasoning in ASD could be designed to elucidate the cognitive and neural mechanisms involved in this form of moral thinking. In particular, researchers could investigate the hypothesis that autistic individuals rely on outcomes to infer intentions to compensate for less developed automatic mentalizing compared with neurotypical individuals. Research on emotion-backed moral decision making in ASD would be strengthened by including objective measures of emotional arousal (e.g., heart rate, electrodermal response, breathing rate), given deficits in self-reports of emotion (e.g., Johnson et al., 2009) and the common co-occurrence of alexithymia and ASD (Hill et al., 2004), which could prevent accurate self-reports of emotional arousal in ASD. Finally, much of the research investigating moral development and judgement among autistic children and adults has adopted a rationalist perspective. The rationalist account of moral development is challenged by only tenuous links between commonsense psychology and moral development based on the studies reviewed here—future studies should investigate moral development in ASD from an intuitionist perspective (Haidt et al., 2001) to help account for similarities and differences in moral reasoning between autistic and neurotypical individuals. Examining moral reasoning in autism through Haidt's framework could also further our understanding of the cognitive and neural mechanisms at play in moral judgements of autistic and neurotypical individuals. However, we believe that Haidt's framework must be tested in ASD before we can conclude that autistic moral reasoning is consistent with the intuitionist hypothesis.

General Limitations

Limitations of the above studies include *n*s of less than 30 per group in 79% of the studies reviewed, making statistical analyses unlikely to have sufficient power to achieve acceptable type I and type II errors rates (Button et al., 2013). Three studies did not report participants' sex (Blair, 1996; Buon et al., 2013; Grant et al., 2005). Further, only 48% of studies reviewed above reported that autistic participants were diagnosed using standard measures (e.g., Autism Diagnostic Observation Schedule—Second Edition, ADOS-2, Lord et al., 2015; Autism Diagnostic Interview—Revised, ADI-R, Lord, Rutter, & Le Couteur, 1994). In the remaining studies, diagnoses were reported based on various criteria, including previous clinical diagnosis (using interviews: Bellesi, et al., 2018; Channon et al., 2010; Channon et al., 2011; or methods not reported: Blair, 1996; Leslie et al., 2006; Li et al., 2014; Patil et al., 2016; Schneider et al., 2013); meeting "the established criteria" (Grant et al., 2005); clinical evaluation and information gathered from parents (Gleichgerrcht et al., 2013); evaluation by a clinical team (Takeda et al., 2007); screening questionnaires and interview by a psychiatrist (Baez et al., 2012); methodology not described (Hirvelä & Helkama, 2011; Skolnick Weisberg & Leslie, 2012); or self-reported clinical diagnosis (Senland & Higgins D'Alessandro, 2016). A further limitation is that most studies included samples with IQs in the average range. In contrast, only highly cognitively able autistic participants (i.e., mean full scale IQ of 120) were included by Koster-Hale and colleagues (2013), Moran and colleagues (2011), and Tsoi and colleagues (2018). Blair (1996) and Grant and colleagues (2005) included only participants with relatively low IQs. As such, results may not generalize to autistic individuals across the full IQ range.

Conclusions

The results of investigations into moral judgement and reasoning among autistic individuals call into question Piaget's (1932), Kohlberg's (1969, 1971), and Turiel's (1983) theories of moral development, all of which assert the prominence of discursive reasoning and commonsense psychology in moral decision-making. As such, researchers should carefully evaluate conclusions drawn regarding moral development in ASD researched from a rationalist perspective. We propose that Haidt's (2001) intuitionist model of moral judgement may better account for weak moral reasoning with generally intact moral judgements among autistic individuals, as Haidt's model does not rely on discursive moral reasoning for moral development. Investigations into moral reasoning in ASD using an intuitionist approach may more accurately convey both social-cognitive strengths and weaknesses among autistic people.

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