Chapter 15
Cognitive, Emotional, and Moral Decision Making in Adolescents and Adults with Autism Spectrum Disorder

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This chapter first reviews cognitive decision making in adolescents and adults with and without autism spectrum disorders (ASD), with a focus on executive function in scenarios such as gambling tasks. A second focus is on emotional decision making in adolescents and adults with and without ASD. Alexithymia and interoception have been found to have an important impact on emotional decision making. Alexithymia is characterized by difficulties in recognizing emotions from internal bodily sensations and frequently co-occurs in as many as 50% of individuals with ASD (Hill, et al., 2004; Shah, et al., 2016b). Effects of comorbidity, such as ASD with alexithymia traits, are also considered, along with neuroimaging and behavioral studies of emotional decision making. A third focus is on moral decision making and individual differences in adolescents with ASD and adolescents with callous and unemotional traits. Finally, a support program for enhancement of decision making in adolescents and adults with ASD is proposed.

Alexithymia is a subclinical phenomenon involving a lack of emotional awareness or difficulty in identifying and describing feelings and in distinguishing feelings from the bodily sensations of emotional arousal (Nemiah et al., 1976; Sifneos, 1973). Self-report is the most widely used approach to assessing alexithymia. The Toronto group developed a 20-item assessment instrument, the Toronto Alexithymia Scale (TAS-20) (Bagby et al., 1994a, b). The TAS-20 assesses three facets of alexithymia: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. Different dimensions of alexithymia may play a role in different anxiety disorders; in fact alexithymia dimensions of difficulty in identifying and describing emotions seem more correlated to panic disorder (PD), post-traumatic stress disorder (PTSD), social phobia, and generalized anxiety disorder, whereas externally oriented thinking may be more closely related to obsessive compulsive

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disorder (De Berardis et al., 2008). Alexithymia may cause anxiety and sleep-related issues (Tani et al., 2004), and the inability to express and externalize emotions in a healthy way can lead to a variety of psychosomatic manifestations, including immune, gastrointestinal, and circadian disruptions, all of which are frequently seen in ASD (Poquerusse et al., 2018).

Psychopathy is defined as an antisocial disorder in which an individual manifests amoral and antisocial behavior, shows a lack of ability to love or establish meaningful personal relationships, expresses extreme egocentricity, and demonstrates a failure to learn from experience and other behaviors associated with the condition (Hermann, 2017). The two most common ways to assess psychopathic traits are to use expert rater devices, such as the Psychopathy Checklist-Revised (PCL-R, Hare, 1991), and self-report inventories, such as the Psychopathic Personality Inventory (PPI, (Lilienfeld & Andrews, 1996) and the Minnesota Multiphasic Personality Inventory (MMPI, Lilienfeld, 1999).

A personality disorder such as psychopathy, and its likely developmental course, is also relevant to intellectual disabilities (ID) (Lindsay, 2007; Morrissey & Hollin, 2011; Torr, 2003). First, early environmental influences, including poor parenting, neglect, and emotional, physical, and sexual abuse, may play a role in the development of these disorders (e.g., Hatton & Emerson, 2004; Hill, 2003; Marshall & Cooke, 1999). Children with ID are more likely to suffer from environmental disadvantages, which may be related to psychopathology involving abnormal cognitions, behavior, and experiences including psychopathy and conduct disorder (Hatton & Emerson, 2004). Second, population studies indicate that conduct disorder is overrepresented in ID populations (Emerson, 2003), and many conduct disordered children and adolescents have significantly elevated rates of ID (e.g., Moffitt et al., 2008; Vizard et al., 2004). Third, longitudinal research has found that low verbal IQ (FSIQ below 90), poor concentration, restlessness, and high impulsivity at age 8–10 years significantly predict high psychopathy scores at age 48 years (e.g., Farrington, 2004, 2006). Thus, children and adolescents with ID may be likely to present with some of the early risk factors associated with the development of psychopathy.

Empathy can be divided into two types: cognitive empathy, which is to identify the emotions of others, and emotional empathy, which is to share or match one's emotions with another's (De Waal & Preston, 2017). Mencl and May (2009) found that cognitive empathy was more strongly related to principle-based evaluations that placed the individual's own responsibilities toward others and the well-being of others first.

Psychopathy and ASD are two conditions associated with empathy deficits. Psychopathy is predominantly characterized by a reduced capacity for remorse and a propensity for callous or antisocial behavior (e.g., Cleckley, 1976) and has been linked to intact cognitive empathy (i.e., ability to infer the thoughts and feelings of others) and to impaired emotional empathy (i.e., ability to experience vicarious arousal and resonate with others' feelings). On the other hand, ASD is characterized by social communication difficulties (American Psychiatric Association, 2013) and has been linked to impaired cognitive empathy but not necessarily to impaired emotional empathy (e.g., Blair, 2008).

Decision Making

Research in neuroscience and genetics has improved our understanding of the biological underpinnings and the nature of brain functioning in decision making in individuals with ASD and other developmental disorders (Libero & Kana, 2013). The development and implementation of functional MRI (fMRI) techniques have caused an explosion of research in the field. Within the past few decades, fMRI has become a sophisticated neuroimaging tool for in vivo study of the human brain, making possible more convincing investigations of the neurobiological basis of ASD and other developmental disorders such as ID and attention deficit hyperactivity disorder (ADHD).

Cognitive Decision Making

Decision making is one of the basic cognitive processes of human behavior by which a preferred option is chosen from among a set of alternatives based on certain criteria. Cognitive decision making is the cognitive domain of decision making. Cognitive decision making is a choice behavior in risky situations, in which the payoff and the probability of each option are explicit (Mochizuki & Funahashi, 2009).

The Cambridge Gambling Task is a typical task requiring cognitive decision making (Clark et al., 2008; Manes et al., 2002). In this task, the participants make a probabilistic decision in order to get a token hidden in one of the ten boxes. Each box is colored in either red or blue. In every trial, the participants choose the color of the box which they think the token is hidden inside. Also the participants select how much to bet on the color choice from the current balance of the game money. Participants have to make a decision based on a comparison of the payoffs and their probabilities among the options in order to earn as much money as possible.

A gambling task is often used to measure cognitive decision making (Table 15.1). Wu et al. (2018) designed and administered a gambling task to 33 adults with ASD and 47 typically developed (TD) participants who were matched for age and IQ. When participants were presented with choices for which they could make either a risky gamble (e.g., 20% chance of winning £5) or a safe choice (e.g., 100% chance of winning £1), the ASD and TD participants did not differ in their overall risk-taking choices; however, the ASD participants were more consistent in their individual choices from trial to trial. Further, while members of the ASD group were slower to make some decisions (i.e., in the win frame and the first half of the lose frame), by the end of the task their decision times were the same as those of the TD group. These results suggest that the tendency toward repetitive behavior exhibited by individuals with ASD may be demonstrated even in high-level decision-making tasks (Wu et al., 2018).

Fuzzy-trace theory has proposed two types of mental representation, gist and verbatim (Reyna & Brainerd, 1995). Fuzzy-trace theory predicts that children and

adolescents will use more precise, verbatim-based processing of risks and rewards. Because they trade off risks and rewards and are less influenced by gist or the context of gains or losses, their choices are more consistent. However, adults show more risky-choice framing biases than children (Reyna et al., 2015). Individuals with ASD show weaker gist-based processing but stronger verbatim processing than TD controls (Reyna et al., 2015), consistent with a cognitive strategy of detailed focus found in individuals with ASD (Happé & Frith, 2006).

In the Ultimatum Game (Table 15.1), two people are randomly matched, one as proposer and one as responder, and told they will play a game exactly one time. The proposer is endowed with an amount of money and suggests a division of that amount between herself or himself and her or his responder. The responder observes the suggestion and decides whether to accept or reject. If it is accepted, then both earn the amount implied by the proposer's suggestion. If it is rejected, then both the proposer and responder earn nothing for the experiment (Houser & McCabe, 2014). The Dictator Game (Table 15.1) has one decision point for player 1 and no decision point for player 2. Unlike the Ultimatum Game, the Dictator Game may also be played as a series of successive rounds. Pairs may remain the same across rounds or change for each round (Kahneman, et al., 1986). Hartley and Fisher (2018) compared how children and young adolescents with ASD and language-matched TD controls shared resources in age-appropriate versions of the Ultimatum Game, which illustrates conflict between fairness and economic utility, and the Dictator Game. In the Ultimatum Game, one participant has a desirable resource and is required to offer a proportion to a partner who has nothing. On acceptance, the resource is split as proposed and both persons keep a share. On rejection, neither person keeps any of the resource. The Dictator Game follows the same format except for one important difference: the partner must always accept whatever share is offered. Previous studies showed that TD adults consistently offer 40–45% of the endowed amount in the Ultimatum Game and 20–25% of the endowed amount in the Dictator Game (Camerer 2003; Henrich et al. 2005; Rigdon 2003). Children and young adolescents with ASD were significantly less likely to reciprocate the offers of a puppet in the Ultimatum Game and much more likely to accept unfair offers in the Ultimatum Game, indicating reduced aversion to inequality (Hartley & Fisher, 2018).

Bibby (2016) found that alexithymia is a precursor to loss-chasing in gambling. Loss-chasing is the tendency of a gambler to amplify their betting in an effort to recoup prior losses (Zhang & Clark, 2020). For example, participants high in alexithymia may bet 22.7% after a win. However, after a loss they often bet significantly more (e.g., 27.0%). In other words, participants high in alexithymia tend to chase their losses (Bibby, 2016). The tendency to loss-chase depends on the need to regain prior losses and the failure to process the emotional consequences of those losses. Two areas of research suggest why there is a relationship between alexithymia and loss-chasing. First, individuals who are high in alexithymia may have difficulty processing information about losses (Bibby & Ferguson, 2011), and second, the neurological structures implicated in loss-chasing (Campbell-Meiklejohn

et al., 2008) clearly differ in individuals with and without alexithymia (Berthoz et al., 2002; Kano et al., 2003, 2007; Mantani et al., 2005; Moriguchi et al., 2006).

Zhang et al. (2017) compared performance of participants with alexithymia and a control group on the Iowa Gambling Task and the Game of Dice Task. Participants with alexithymia demonstrated performance deficits relative to the control group on the Gambling Task but not on the Dice Task.

Lösel and Schmucker (2004) assessed 49 male prison inmates with the gambling task of Bechara et al. (1994), the Psychopathy Checklist-Revised (PCL-R, Hare, 1991), and standardized tests of the ability to concentrate and sustain attention. The results revealed no general relationship between psychopathy and gambling task performance. However, the finding that individuals with psychopathy and low attention had more prior convictions than those with high attention suggests that our differentiation has implications beyond an experimental problem situation such as the gambling task.

Mayer et al. (2018) presented healthy individuals (violent offenders and controls) with the Empathic Dictator Game, which extends the classical Dictator Game by inducing empathy. Mayer et al. (2018) measured both self-report data and performance in the Movie for the Assessment of Social Cognition (MASC, Dziobek et al., 2006), a video-based measure sensitive to deficits in cognitive empathy. As for participants, the mean age of male violent offenders ($n = 42$) was 32.79, and the mean age of a male control group ($n = 33$) was 28.82. Participants completed one standard Dictator Game scenario with a hypothetical player. Afterward, participants were introduced to the Empathic Dictator Game. They were told that they would watch the same videos two times, with and without empathy ratings. In the case without empathy ratings, they would be asked to distribute 10 monetary units at any rate between themselves and the person in the respective video. In addition, all participants were informed that the monetary units kept during the task would be converted into real money and added to their reimbursement. Just like in the empathy task, each trial started with the randomized presentation of one of the 44 videos, but was then followed by the question "How many points do you want to give to the person?". Participants indicated on a scale from 0 to 10 how many monetary units they wanted to share with the person in the respective video. Following the response, a feedback screen indicating the payoffs for both parties appeared for 3000 ms (e.g., "You get 3 points; the other person gets 7 points"). The final screen contained information about participants' overall payoffs. Although violent offenders exhibited less altruistic behavior than controls, empathy induction increased prosocial behavior in both violent offenders and the control group, although higher alexithymia scores were associated with less altruistic behavior. Psychopathic traits were associated with lower self-reported empathy, higher alexithymia scores, attenuated affective responding following empathy induction, and less altruistic sharing.

Osumi and Ohira (2010) measured electrodermal responses to fair and unfair offers in the Ultimatum Game to examine the decision making of college students with high and low tendencies for psychopathy. Compared to controls with low psychopathy, individuals with a high tendency toward psychopathy more often chose economic utility by accepting unfair offers. This suggests that the affective deficit of

Table 15.1 Evaluations of individuals with autism, alexithymia, and psychopathy relative to typically developing individuals on cognitive decision-making tasks

	Gambling task	Ultimatum and dictator games
Autism	No difference	Accept more unfair offers
Alexithymia	Greater loss-chasing	Exhibit less altruistic behavior
Psychopathy	No difference	Choose economic utility by accepting more unfair offers

psychopathy may be associated with insensitivity to unfairness, which may in turn contribute to a rational decision to accept unfair offers.

Emotional Decision Making

Emotional decision making is a choice behavior under ambiguous conditions in which the information regarding the payoff and the probability of each option is insufficient (Mochizuki & Funahashi, 2009). The Iowa Gambling Task (Bechara, et al., 1994; Bechara, & Damasio, 2005) is one of the typical behavioral tasks which requires emotional decision making. In the Iowa Gambling Task, the subject needs to accomplish 100 card selections from four options of card decks. Every card selection provides gain of the game money, but sometimes provides loss simultaneously. Four decks have different schedules of gains and losses, but the subject is not informed about these schedules and must learn the optimum choice strategy in a trial-and-error manner. Based on the series of experiments using the Iowa Gambling Task, Damasio (1996) proposed the somatic marker hypothesis, an important theory explaining the roles of emotion in decision making. The somatic marker hypothesis assumes that the decision is biased by the autonomic somatic responses closely linked to emotion (Damasio, 1996). These autonomic somatic responses may be related to emotional empathy.

Some individuals with ASD exhibit atypical emotional processing and moral judgments. Because emotional deficits in ASD may be due to co-occurring alexithymia, atypical moral judgments in ASD may also be attributable to alexithymia (Bird et al., 2010). In Brewer et al. (2015), individuals with and without ASD (i.e., matched for alexithymia) judged the moral acceptability of emotional statements (those evoking happiness, sadness, fear, disgust, and anger) and identified the emotions evoked by the statements. Twenty-five individuals with and 22 individuals without a diagnosis of ASD participated in this study. The task validated by a previous study assessed moral judgments (Marsh & Cardinale, 2012). Participants viewed 100 emotive statements evoking happiness, sadness, fear, disgust, and anger. For example, statements included "I bought you a present" (happiness), "I do not want to be friends any more" (sadness), "I could easily hurt you" (fear), "I never wash my hands" (disgust), and "I broke your phone on purpose" (anger). Each statement was presented once, with order randomized across participants. Participants

were required to rate the moral acceptability of saying each statement to another person, ranging from 1 (never acceptable) to 4 (always acceptable). Ability to identify the evoked emotion was assessed by presenting the same statements in a random order and requiring participants to identify their own emotional response to each statement, from happiness, sadness, disgust, anger, and fear. In the control group, the mean of happiness was 3.22, the mean of sadness was 2.34, the mean of disgust was 2.02, the mean of anger was 1.88, and the mean of fear was 1.85. In the ASD group, the mean of happiness was 3.50, the mean of sadness was 2.14, the mean of disgust was 1.99, the mean of anger was 1.80, and the mean of fear was 1.69. The ASD and alexithymia-matched control groups did not differ significantly in individual morality scores. Correlation analyses compared the relationship between emotion identification typicality and moral acceptability judgments in each group. In the control group, emotion identification scores correlated with Global Morality scores (higher scores indicate more severe difficulties in judging moral acceptability), $r = .741$, $p < .001$, whereas these scores were not correlated in the ASD group, $r = .093$, $p < .657$ (Brewer et al. 2015). Alexithymia predicted moral acceptability judgments only for individuals without ASD, and those with ASD did not base their moral acceptability judgments on emotional information. These results are consistent with evidence that decision making is less subject to emotional biases (distortion in cognition and decision making due to emotional factors) in individuals with ASD (Brewer et al., 2015; Damiano, et al., 2012; De Martino et al., 2008). Because the amygdala plays a role in emotionally biased decision making (De Martino et al., 2006), decision making in ASD may be less subject to emotional information because of reduced activation or atypical connectivity of the amygdala (De Martino et al., 2008).

The way choices are framed influences, and these framing effects emerge, when emotional responses are integrated under uncertainty. Framing effects were believed to be reduced in individuals with ASD because of their lower tendency to incorporate emotional information in the decision-making process. However, recent research suggests that emotional processing impairments in ASD may be attributable to co-occurring alexithymia, which is thought to arise from impaired interoception (the ability to perceive the internal state of one's body).

Interoception is the perception of visceral sensations such as cardiac signals and respiratory volume. It contributes significantly to variability in a range of affective experiences, including emotional lability (Schandry, 1981), arousal focus (Barrett et al., 2004), and emotional decision making (Furman et al., 2013; Harshaw, 2015). Furman et al. (2013) found that decision-making deficits in major depressive disorder are associated with reduced heartbeat perception in interoceptive dysfunction. Poorer interoceptive sensitivity is correlated with alexithymia and involves difficulty identifying and communicating about internal signals and emotional states (e.g., Herbert et al., 2011; Kano et al., 2007; Näring & Van der Staak, 1995). This raises the possibility that emotional signals are not perceived by individuals with ASD. Because decision making is impaired in individuals with alexithymia, reduced framing effects in ASD may be a product of co-occurring alexithymia rather than ASD itself (Shah et al., 2016a). Shah et al. (2016a) compared framing effects in

ASD individuals with TD controls matched for alexithymia. Framing effects were significantly smaller in ASD individuals, and there was no relationship between alexithymia or interoception and decision making in the ASD group. However, in the TD group, framing effects were associated with alexithymia and interoception even after controlling for autistic traits. Thus, although framing effects are associated with interoception and alexithymia in the TD population, emotional and interoceptive signals have less impact upon the decision-making process in ASD (Shah et al., 2016a, b).

In an online study ($N = 541$) and a laboratory study ($N = 55$), Samur et al. (2020) required participants with varying levels of alexithymia to read first- and/or third-person narrated texts and then rate their narrative engagement. Narrative engagement was higher for participants who assumed a first-person (rather than third-person) perspective and for those who were lower (rather than higher) on alexithymia. Narrative perspective interacted with affective facets of alexithymia (i.e., emotionalizing and fantasizing), such that first-person (rather than third-person) stories elicited more narrative engagement at lower (but not at higher) levels of affective alexithymia. These findings suggest that alexithymia is related to difficulties in mentally simulating narrative worlds (Samur et al., 2020).

As noted earlier, Brewer et al. (2015) found that moral acceptability judgments were predicted by alexithymia only for individuals without ASD, and those with ASD did not base their moral acceptability judgments on emotional information. Thus individuals with ASD may rely more on rules to judge moral acceptability. Brewer et al. (2015) also found that although ASD did not affect judgments of moral acceptability, it moderated the relationship between alexithymia and these judgments (Table 15.2). In TD individuals, alexithymia was associated with atypical moral acceptability judgments, such that individuals with more severe alexithymia considered it less acceptable to induce happiness in others and more acceptable to induce sadness, fear, disgust, and anger.

Vyas et al. (2017) examined the relationship between utilitarian decision making (e.g., the participant, a bystander, can pull a lever to divert the train onto another track, where only one worker will die) and two conditions considered to be associated with deficits in empathy: psychopathy and ASD (Table 15.2). Those who scored high for either psychopathic or autistic traits did not exhibit better utilitarian decision making than the low trait groups, although the two high trait groups reported that making decisions that caused harm or distress to others would cause them less discomfort.

Table 15.2 Evaluations of individuals with autism, alexithymia, and psychopathy relative to typically developing individuals on emotional decision-making tasks

	Trolley problem	Story task
Autism	No enhancement of utilitarian decision making	Unreliable judgments of accidental and attempted harm as morally different
Alexithymia	Greater utilitarian tendencies	Association with atypical moral acceptability judgments
Psychopathy	No enhancement of utilitarian decision making	Failure to use prospective regret signals to guide choice behavior

Using a counterfactual decision-making paradigm, Baskin-Sommersa et al. (2016) found that individuals who scored higher on a measure of psychopathy reported negative affect in response to regret-inducing outcomes as often as, or more often than, individuals who scored lower on a measure of psychopathy; however, they did not use prospective regret signals to guide choice behavior. Thus Baskin-Sommersa et al. (2016) identified a specific deficit in the ability of individuals with psychopathic traits to integrate prospective counterfactual signals into decision making.

Moral Decision Making

The broader term moral decision making refers to any decision, including judgments, evaluations, and response choices, made within the *moral domain* (Smetana, 2006, Turiel, 1983) for example, decisions regarding moral issues or principles such as justice, harm, fairness, and care (Garrigan et al., 2018). In the empirical studies in moral decision making, the following tasks were used, for example, paradigms involving semantic judgments of sentences with moral content (Heekeren et al., 2003), judgments of disgust and indignation in response to sentences with moral-emotional connotations (Moll et al., 2005), or moral judgments after participation in game tasks such as the Dictator or Ultimatum Games (Hofmann & Baumert, 2010; Takezawa et al., 2006).

Haidt (2001) proposed an intuitionist model of moral judgment in which moral development does not rely on discursive moral reasoning. According to Dempsey et al. (2020), Haidt's model may account for weak moral reasoning among individuals with autism, in whom moral judgments are generally intact. Investigations of moral reasoning in ASD that use an intuitionist approach may successfully identify both social-cognitive strengths and weaknesses among people with ASD.

In order to investigate the developmental processes of moral decision making, Komeda et al. (2016) examined the information used by early adolescents with and without ASD when they judged story protagonists as good or bad. Tables 15.3 and 15.4 show sample stories used in Experiment 1. Komeda et al. (2016) predicted that adolescents with ASD would use protagonists' behavior when making judgments, while TD adolescents would use protagonists' characteristics. In Experiment 1, sentence by sentence reading times and percentages of good or bad judgments were

Table 15.3 Sample stories with good characteristics and good and bad behavior outcomes in Experiment 1

Good characteristics with good behavior	Good characteristics with bad behavior
Takeru-kun is a nice boy who likes to please his father.	Takeru-kun is a nice boy who likes to please his father.
He said to his father, "Let's go watch your favorite football team play!"	He said to his father, "Let's go see my favorite cartoon movie!" when his father was very busy.
His father smiled when he looked at his son's happy face.	

Table 15.4 Sample stories with bad characteristics and good and bad behavior outcome in Experiment 1

Bad characteristics with good behavior	Bad characteristics with bad behavior
Tomoo-kun is a selfish boy who only thinks of himself.	Tomoo-kun is a selfish boy who only thinks of himself.
He said to his father, "Let's go watch your favorite football team play!"	He said to his father, "Let's go see my favorite cartoon movie!" when his father was very busy.
His father smiled when he looked at his son's happy face.	

Rin-san is a naughty girl who always plays tricks.

She is climbing onto the table to snitch food.

Because her favorite vase was broken, her mother was sad.

Yuki-san helps her mother with the housework.

She is cleaning up the table to help her mother.

Because her favorite vase was broken, her mother was sad.

Which girl is worse?
Rin-san   Press Left button
Yuki-san Press Right button

Fig. 15.1 Sample stimuli in Experiment 2 (bad characteristics with bad behavior, bad outcome vs good characteristics with good behavior, bad outcome)

measured. In Experiment 2, two story protagonists were presented, and the participants determined which protagonist was better or worse. Figures 15.1 and 15.2 show the sample stimuli in Experiment 2.

The results of Experiment 1 showed that, in order to judge story protagonists as good or bad, adolescents with ASD used protagonist behaviors and outcomes, whereas TD adolescents used protagonist characteristics, behaviors, and outcomes. In Experiment 2, TD adolescents used protagonist characteristics in determining which protagonist was worse. In situations in which participants could not go back and assess (Experiment 1), and in comparable situations in which all information was available (Experiment 2), adolescents with ASD did not rely on information about individual characteristics when making moral judgments.

People with ID and developmental disabilities often have impaired working memory abilities, and as a consequence, they may have poor decision-making abilities (Caceda et al., 2014). In Komeda et al. (2016), early adolescents with ASD who did not have difficulty with working memory showed altered decision making. The ASD group consisted of 19 participants (two females and 17 males), and the TD group consisted of 20 participants (two females and 18 males). Working memory abilities were measured by the Wechsler Intelligence Scale for Children-Fourth

Rin-san is a naughty girl who always plays tricks.	Yuki-san helps her mother with the housework.
She is cleaning up the table to help her mother.	She is climbing onto the table to snitch food.
Because her favorite vase was broken, her mother was sad.	Because her favorite vase was broken, her mother was sad.

Which girl is worse?
Rin-san   Press Left button
Yuki-san   Press Right button

Fig. 15.2 Sample stimuli in Experiment 2 (bad characteristics with good behavior, bad outcome vs good characteristics with bad behavior, bad outcome)

Edition (WISC-IV). The adolescents with ASD engaged in at least two updating processes during decision making: one to process the congruencies between the characteristics and behaviors and another to process the congruencies between the behaviors and outcomes, whereas TD adolescents appeared to engage in a single updating process for the congruencies between the behaviors and outcomes, when reading stories describing moral situation. As a consequence of these strategic differences, ASD adolescents fail to use characteristics information when making moral judgments about a story protagonist. In Experiment 2, TD adolescents used characteristics information when making moral judgments in a situation where multiple information could be processed at the same time. Taken together, in situations in which participants cannot go back and evaluate (Experiment 1), and in comparable situations in which all information is available at the same time (Experiment 2), adolescents with ASD do not rely on information about individual characteristics when making moral judgments.

Using a story task, Moran et al. (2011) tested whether adults with ASD make atypical moral judgments when they need to consider both the intentions (based on theory of mind) and outcomes of a person's actions. Moran et al. (2011) presented the following story:

Dan is giving a visitor a tour of a laboratory. Before visitors enter the testing room, all test tubes containing disease antigens must be contained in a chamber by flipping a switch. A repairman has just come to fix the switch, which had been broken. The switch has been successfully repaired, so the test tubes are quite safely contained. Thus, anybody who enters the room will be safe and unexposed. Dan believes that the switch is still broken after a conversation with the repairman, so he believes it is not safe for the visitor to enter. Dan tells the visitor to enter the testing room. The visitor does not contract any disease and is fine.

After reading the story, participants used a 7-point scale to judge whether telling the visitor to enter was forbidden (1) to permissible (7). Performance of ASD and TD groups did not differ on the false belief task, but on the moral judgment task, group differences were found for judgments of accidental harm, but not for neutral acts, attempted harm, or intentional harm. The TD group judged accidental harm as less morally wrong than attempted harm, but the ASD group did not find these to be morally different. In judging accidental harm, ASD participants relied less on information about a person's innocent intention and more on negative outcome of the action. To Moran et al. (2011), these results revealed impairments in integrating mental state information for moral judgments in individuals with ASD.

Gleichgerrcht et al. (2013) observed responses to two moral scenarios, one impersonal and one personal moral scenario, as follows:

(a) Impersonal scenario: The trolley dilemma required participants to decide whether to flip a switch to redirect a trolley onto a man and away from a group of five people (utilitarian response) or whether to allow the trolley to hit the five people (deontological response).
(b) Personal scenario: The footbridge dilemma required participants to decide whether to push a man off a bridge so that his body would stop the trolley from hitting five people further down the tracks (utilitarian response) or whether to allow the trolley to hit the five people (deontological response).

Gleichgerrcht et al. (2013) found that individuals with ASD who provided utilitarian responses to moral scenarios demonstrated lower ability to infer other people's mental states and to understand their intentions, as measured both by performance on neuropsychological tests and through dispositional measures. They concluded that greater prevalence of utilitarianism in ASD is associated with difficulties in specific aspects of social cognition.

On the other hand, Patil et al. (2016) investigated moral evaluations in individuals with ASD using a highly emotionally salient moral dilemma task that involved personally carrying out harmful utilitarian behaviors intended to maximize welfare. Individuals with ASD exhibited a normal pattern of moral judgments despite deficits in social cognition and emotional processing. Further, autistic traits were associated with lower utilitarian bias due to elevated personal distress from demanding social situations, while alexithymic traits were associated with greater utilitarian bias due to reduced empathic concern for the victim (Patil et al., 2016).

Patil and Silani (2014) studied responses to emotionally aversive personal moral dilemmas and found that trait alexithymia was associated with greater utilitarian tendencies, due to lower empathic concern for the victim (Table 15.5). These results underscore the importance of empathy in moral judgments in the harm/care domain of morality.

Komeda et al. (2019) investigated the relationship between alexithymia and cognitive empathy in helping motivation. Individuals with ASD and intelligence- and age-matched TD individuals were instructed to read 24 stories (12 which featured

protagonists with ASD and 12 which featured TD protagonists) and respond to the following questions: "How did the protagonist feel?" and "Would you help if the protagonist were in trouble?". After controlling for alexithymia and autism-spectrum quotient (AQ) based on multiple regression analyses, individuals with ASD were found to empathize with other people with ASD and were motivated to help other people with ASD.

Further, social skills and attention to detail were associated with decreased helping motivation for story characters with ASD. Social skills among AQ subscales (social skills, attention switching, attention to detail, communication, and imagination) were the dominant predictors of lower helping motivation. These findings suggest that alexithymia and low social skills reduce helping motivation in individuals with ASD (Komeda et al., 2019). Komeda et al. (2019) found that participants with ASD showed greater empathetic responses for people with ASD than did TD participants, whereas TD participants showed greater empathetic responses and greater helping motivation for TD people than did ASD participants (Table 15.5). In the decision-making situation, ASD adolescents are likely to judge other people with ASD more positively than other TD people. The difference between in-group and out-group on decision making should be considered in the social situations.

Patil (2015) showed that trait psychopathy is associated with both reduced outcome aversion (aversion to witnessing harmful outcomes) and action aversion (performing harmful actions), but only action aversion negatively mediates the influence of trait psychopathy on utilitarian moral judgment. Thus, the greater tendency of individuals with psychopathy to make utilitarian moral judgments is in part due to lower aversion to carrying out harmful actions (Table 15.5).

Pletti et al. (2016) reported that participants with high trait psychopathy were more likely to sacrifice one person to save others in sacrificial dilemmas and to pursue a personal advantage in everyday moral situations that caused harm to another. These participants also experienced less unpleasantness during decision making in these situations, compared to participants with low trait psychopathy. But for everyday moral situations that did not entail harm to others, no group differences emerged in choice of action, unpleasantness ratings, or moral judgments. These results suggest that high trait psychopathy affects action choices in sacrificial dilemmas because of reduced emotional reactivity to harmful acts (Pletti et al., 2016).

Koenigs et al. (2012) investigated whether psychopathic subtypes (low-anxious, high-anxious, and non-psychopathic) exhibit significant differences in moral judgment. Three groups of incarcerated participants (low-anxious psychopaths ($n = 12$), high-anxious psychopaths ($n = 12$), and non-psychopaths ($n = 24$)) completed a moral judgment test involving hypothetical moral dilemmas that featured *personal* (i.e., involving direct physical harm) or *impersonal* (i.e., involving indirect or remote harm) actions. Participants made judgments on a series of 24 hypothetical moral scenarios (e.g., "pushing one person off a bridge to stop a runaway train car from hitting five people," "pulling a switch to divert a runaway boxcar from hitting five people"), which were selected from a previously published set (Greene et al.,

2001, 2004; Koenigs & Tranel, 2007). Each scenario was presented on a single sheet of paper, followed by a question about a hypothetical action related to the scenario ("Would you ... in order to ...?"). This question format follows previous clinical and prison studies (Koenigs & Tranel, 2007; Cima et al., 2010). Participants chose "yes" or "no, and" "yes" responses always indicated commission of the proposed action. Both low- and high-anxious psychopathic groups were significantly more likely than the non-psychopathic group to endorse the impersonal actions. However, only the low-anxious group was significantly more likely to make the *utilitarian* choice of personal harm when committing the harm would maximize aggregate welfare. The high-anxious and non-psychopathic groups did not significantly differ in their personal moral judgments. In conclusion, the results presented here are broadly consistent with the theoretical perspective that primary (low-anxious) psychopathy may entail a particular affective deficit that is not necessarily present in secondary (high-anxious) psychopathy (Blackburn et al., 2008; Karpman, 1946; Karpman, 1948).

Individuals with psychopathy show antisocial and immoral behavior, but experimental studies have typically failed to identify deficits in their capacities for explicit moral judgment. Young et al. (2012) tested 20 criminal psychopaths and 25 criminal non-psychopaths on a moral judgment task featuring fictional scenarios that systematically varied an actor's intention and the action's outcome. Participants were instructed to assess four classes of actions: accidental harm, attempted harm, intentional harm, and neutral acts. Individuals with psychopathy showed a selective difference, compared with non-psychopaths, in judging accidents in which one person harmed another unintentionally. Specifically, individuals with psychopathy judged these actions to be more morally permissible. Young et al. (2012) suggest that this pattern reflects psychopaths' difficulties to appreciate the emotional factor of the victim's experience of harm. These findings provide experimental evidence of atypical moral judgment in psychopathy (Table 15.5).

Table 15.5 Evaluations of individuals with autism, alexithymia, and psychopathy relative to typically developing individuals on moral decision-making tasks

	Moral dilemma	Story task
Autism	No difference	Reliance on information about individual behaviors rather than individual characteristics
Alexithymia	Associated with increased utilitarian bias	Lower helping motivation in individuals with ASD
Psychopathy	More likely to sacrifice one person to save others in sacrificial dilemmas and to pursue a personal advantage in everyday moral situations entailing harm to another's good	Failure to appreciate emotional aspects of the victim's experience of harm

Support Program for Decision Making

Finally, support programs for decision making are considered based on empirical decision-making studies. The support programs for ASD, alexithymia, and psychopathy are introduced in this section.

Luke et al. (2012) found that participants with ASD reported experiencing problems in decision-making more frequently than TD participants and were also more likely to report decision-making avoidance, as measured by the general decision making style inventory (Scott & Bruce, 1995). The finding suggests that children and adults with ASD could benefit from support during decision making (Luke et al., 2012).

With respect to ASD, training programs have generally focused on children and young adolescents, either targeting behavioral difficulties (e.g., turn-taking or eye contact; Barry et al., 2003) or providing training in cognitive skills (e.g., explicit awareness of others' thoughts or emotions, Gray, 1995).

With respect to alexithymia, Gay et al. (2008) devised an eight-week training program using hypnotic imagery. Thirty-one female college students with alexithymia—defined as scores above 60 on the 20-item TAS-20—were randomly assigned to either an eight-week hypnotic-imagery training program ($n = 14$) or a control condition ($n = 17$), which consisted only of attending evaluation sessions. Participants in the hypnotic-imagery condition attended half-hour sessions during which they were read standardized scripts involving a traumatic situation and associated negative feelings, and they were guided to experience different emotions and mental imagery. Alexithymia was measured with the TAS-20. Hypnotic-imagery training resulted in a significant reduction in TAS-20 total score that was independent of changes in mood states. Alexithymia was not found to change significantly in the control group.

With respect to psychopathy, treatment has focused on reducing recidivism in forensic samples and has often been unsuccessful (Pickersgill, 2011). Interviews of a group of neuroscientists revealed that most believed that biological interventions should be used alongside psychotherapeutic strategies, although they were not sure about, or strongly committed to, such interventions. For example, a doctor who believed that neuroscience could help inform psychological interventions and that some kind of psychopharmacological management technique for psychopathy was likely to be necessary was "not sure exactly what that's going to be" (Pickersgill, 2011). Although respondents generally felt that neuroscience research held promise for psychological interventions, they recognized that translating this work into new interventions would not be straightforward, and some saw their work as better suited to identifying interventions that would not be productive.

There are few programs that support lifelong development of decision-making abilities in typically or atypically developing individuals with ASD, alexithymia, and psychopathy. More robust and reliable basic findings will be necessary to develop such training programs. For future advancement of these efforts, it is

increasingly important that psychologists, neuroscientists, biologists, medical doctors, counselors, social workers, and school teachers collaborate based on mutual respect.

Conclusion and Recommendations

This chapter reviewed several types of decision making in the individuals with ASD, individuals with alexithymia, and individuals with psychopathy. In the cognitive decision-making tasks, individuals with ASD tend to accept unfair offers, individuals with alexithymia show greater loss-chasing decision making, and individuals with psychopathy choose economic utility by accepting unfair offers. In the emotional decision-making tasks, individuals with ASD do not show enhancement of utilitarian decision making, individuals with alexithymia show greater utilitarian tendencies, and individuals with psychopathy do not use prospective regret to guide choice behavior. In the moral decision-making tasks, individuals with ASD tend to rely on information about individual behaviors rather than individual characteristics, individuals with alexithymia show increased utilitarian bias, and individuals with psychopathy do not appreciate the emotional aspect of victim's experience of harm.

It is important to consider the comorbidity to apply these findings to real-life situations. For example, the incidence of alexithymia is high in the ASD population (40–65% of adults with autism, Bird & Cook, 2013). A recent study shows that alexithymia could be considered a potentially common mechanism underlying psychopathy (Psederska et al., 2019). ID is also comorbid with ASD, alexithymia, and psychopathy. Thus, future studies on decision making should take into consideration the comorbidity of several personality traits and disorders.

Additionally, this chapter classified decision making in terms of its cognitive, emotional, and moral components. These classifications are not always appropriate in real-life settings. For example, moral decision making is associated with cognitive and emotional decision making. It is essential to look carefully at the individual in front of you and to consider individual differences when investigating decision making in special populations. This chapter may provide some evidence of the importance of observing people with different backgrounds from several points of view.

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