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Moral Judgment in Autism

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1. Introduction

Haidt (2001) defined morality as an evaluation (good or bad) of the actions or character of a person and is made with respect to a set of virtues held to be obligatory by a culture or subculture. This definition remarks its nature shortly but it does not express all aspects of morality. So what is morality? What is the role of morality in our human society? Is morality nature or nurture? There are many questions about morality. Therefore, it is needed to review the history of moral study first and list related theories.

In the first period, morality is dealt as a philosophical problem. Plato was the first person to think ethics philosophically in the 4th century B.C.. In the next period, Socrates turned the philosophical/theoretical questions to the practical human questions. After that, Aristotle discussed morality in his book "Nicomachean Ethics". As same as Socrates, Aristotle thought ethics as practical matters. In the Aristotle's work, his main insistence was that good behavior is moderate behavior, not extreme behavior, and good life would be given by the appropriate/moderate judgment in each situation. His theory affected tons of later philosophers. In the third period, morality was treated as social philosophy. In 1759, Adam Smith wrote "The Theory of Moral Sentiments" from the view point of social philosophy. In his work, he discussed that the impartial spectator's view makes human act as unobjectionable and judge the propriety of other's behaviors. In the fourth period, morality is dealt from the view of development. In the 20th century, Piaget (1932) proposed his moral developmental theory that morality has been acquired through a childhood and Kohlberg (1969) improved Piaget's theory. The contexts of their theories would be explained later. After that, Eisenberg (1979) shed the light on the positive aspect like pro-social values of moral development although prohibition is needed when a child learns morality in their theories. Moreover, Turiel (1980, 1983) proposed a new moral developmental theory that morality and social convention are different and they have different developmental processes. These almost theories are focused on moral development but Gilligan (1982) focused on the moral differences between genders that males are justice-based moral evaluations and females are care-based ones. As same as Gilligan (1982), Eisenberg (1989) gave an equivalent value to justice-based and care-based moralities and used the next six levels; self-centered reasoning, needs-oriented reasoning, stereotyped and/or approval-oriented reasoning, empathetic reasoning, partly internalized principles, and strongly internalized principles. Like these, many moral theories has been proposed.

One of the most remarkable moral theories was proposed by Piaget (1932). Piaget was a developmental psychologist and proposed the genetic epistemology in intelligence that comes from the mixture of the cognitive development as the ontogeny and the history of science and technology as the phylogeny. This embryological parallelism assisted to raise a problem whether morality is innate or not. Therefore, it is needed to think moral development from the phylogenic view. Almost of our human behaviors are evolved from ancient animal's ones. This means that the key of moral acquisition is in the duplicated things between humans and other animals. Those are fitness and society. Fitness is very important for creatures to live and not only humans but also other animals have societies that are specific to each species. These two things have a very close relationship. For example, some animals are gregarious for avoiding predator animals and others are solely. Of course, human ancestors are thought to gather in crowds for avoiding predators. This gathering effect reduces the risk of individuals hunted and as the result it increases the fitness of the escaped individuals. Moreover, the behavior of one of a group members affects to the other members (i) positively, (ii) none (neutrally) or (iii) negatively in a group. These differences are divided from the view point of the affected individual's fitness. Cosmides and Tooby (1992) speculated that human have evolved to be able to detect a cheater easily. This theory is that animals act as increasing their inclusive fitness and when the cheaters decrease other's inclusive fitness, the others feel the negative effect from the cheaters' act. Therefore human evolve as stopping cheating acts. Therefore, we can think of this cheater detection system as a kind of or the origin of morality. Pardales (2002) described that moral judgment plays an important role in our attempts to lead our lives meaningful. In other words, the reason why moral judgment is important for human life is to avoid risks from the surroundings and to enhance fitness. From these, morality plays an important role in keeping each society. However, there is a strange example. That is incest. Incest that is sexual intercourse between close relatives would be usually avoided in animals, because it decreases the fitness genetically in the following generations. In human, although incest is "legally" prohibited in almost our human societies now, the ruling class drawn on incest for keeping their wealth and the derived influence in their class until medieval age.

When thinking about animals, there is no morality like human. Why do not animals have morality like us? Tse (2006) said that humans still have associative learning in common with other animals but humans have one-shot learning of associations among arbitrary categories of things and events. This suggests that because one-shot associative learning is needed to moral acquisition, it is hard for animals to get morality. Moreover, categorical learning that needs try and error is difficult to animals, even primates without human.

From Tse (2006), there is a possibility that moral judgment can be seen as a kind of well-trained moral knowledge tasks. There is a ward "moral intuition" that means moral assessments, judgments, or responses to someone's behavior in actual or hypothetical scenarios, where these responses typically occur quickly or automatically and carry with them a strong feeling of authority or appropriateness but where one need not be (and often is not) aware of any conscious reasoning process that leads to this assessment. Intuition, in this sense, is meant to contrast with moral judgments that are reached on the basis of some extended process of deliberate or explicit reasoning. A recent fMRI study showed that Japanese chess ("Shogi") experts activate the precuneus area of parietal lobe that is related to episodic memory and visualizing images rather than amateurs when they choose the next

step with longtime and the experts activate the caudate nucleus that is related to goal-directed behavior rather than the amateurs did not activate when players choose the next step as quick as they can (Wan et al., 2011). This means that repetitive training/learning changes brain activities and forms specific neural networks that belong to each by each and we can use those different neural networks for each situation flexibly. From their study, it can be thought that morality is not innate. In other words, the neural base is just the base and appropriate moral judgment needs this moral neural bases and moral knowledge. Moreover, appropriate moral judgment is learnt through our daily lives with try and error.
Emotion that is the most basic human function that comes from earlier species and is related to limbic system plays an important role for moral judgment. The examples of moral emotion are guilt, shame, embarrassment and pride (Haidt, 2003). Although babies do not have these emotions, from the view point of moral development, it is thought that the first step of morality begins from like and dislike during babyhood. For a baby, the only way to express his/her will is crying and smiling. This is very nascent and basic behavior to tell his/her demands. Then this faddiness is discharge of emotion. Like this, we human have emotion since we are babies. This means that the limbic system is the key part of morality in brain.

1.1 Moral development in typical developed people

As written above, Piaget (1932) proposed the moral developmental theory. The main claim of their theories is that human learn morality from prohibition from others and conventional rule is their keyword. Piaget's theory is composed of 4 stages; one is the period of sensory-motor intelligence (0-2 yrs old), one is the period of operational period (2-7 yrs old), one is the concrete operational period (7-12 yrs old) and the other one is the period of formal operations (12 yrs old and onwards). This Piaget's theory focused on the development of intelligence and morality is acquired according to the development of intelligence. Kohlberg (1969) improved the Piaget's moral development theory from the view point of developmental stage of morality with children's reaction to moral dilemmas and reconstructed into 3 levels that each level contains 2 stages; one is the pre-conventional level (obedience and punishment orientation stage and self-interest orientation stage), one is the conventional level (interpersonal accord and conformity stage and authority and social-order maintaining orientation stage) and the other one is the post-conventional level (social contract orientation stage and universal ethical principles stage). The Kohlberg's theory is constructed on the thought that the development of morality is related with the development of cognitive ability and role-taking ability.
Recently, neuroimaging studies revealed the relationship between morality and other cognitive abilities (especially "Theory of Mind", emotion and reasoning) (See review; Casebeer, 2003). "Theory of Mind" is a new theory and it has been focused in these decades. "Theory of Mind" is an ability to attribute independent mental states to self and others in order to explain and predict behavior, has been suggested to arise from a dedicated, domain-specific, and possibly modular cognitive mechanism (Premack, D. and Woodruff, G., 1978; Leslie, A., 1987). Keeping our social lives appropriately needs smooth communications between each other and read the situations around us. Reading the situation correctly is important, because we survive through negative situations. This reading situation behavior needs "Theory of Mind" and Hayashi (2009, 2010) reported "Theory of Mind" in children, especially from the view point of omission and commission.

He suggested that "Theory of Mind" is related to child development and morality. As same as Hayashi (2009, 2010), Wimmer et al. (1985) reported young children's conception of lying. They studied young children's conception of lying from the view point of development and moral intuition. These findings showed (a) that young children's moral intuition about lying is quite advanced as compared to their definition of "to lie" and (b) that children's realist definition of "to lie" carries a strong negative moral connotation that overrides their usual subjectivist moral intuitions.

These studies showed developmental changes of child in many cognitive abilities and morality. However, because the development of morality would be affected by many social and cognitive environments, further studies are needed to reveal the overall picture of the morality.

1.2 Brain activity during moral judgment in typical developed people

In this decade, the number of neuroimaging studies about moral judgment has been increased and moral dilemma studies gave new evidences. Those studies showed many activated brain areas; prefrontal cortex and orbito-frontal cortex (Broadmann area 10), superior temporal sulcus and amgdala (Greene and Haidt, 2002) and these brain areas suggest that morality is related to emotion, "Theory of Mind" and reasoning, too (Casebeer, 2003).

Greene and Haidt (2002) reviewed brain activities related to moral judgment. They guessed that reasoning, emotion and "theory of mind" is the components of moral judgment from the comparison of previous moral judgment neuroimaging studies and other studies. However, the participants of these neuroimaging studies are typical developed adults and the brain activities are already fixed. Therefore, it is not well known how the developmental change of morality.

However, the stimuli used in these moral judgment neuroimaging studies were mainly negative things. Moll et al. (2002) also reported the brain activities of typical developed participants during moral dilemma tasks. In their study, the negative moral emotion of participants was elicited and this helped them to judge the morality of it. At the same time, they insisted that participants compare some parallel imaginary outcomes and choice the one which they judge it one of the most appropriate. As same as Greene et al. (2002), Moll et al. (2002) reported that orbito-frontal cortex has dedicated sub-regions specialized in processing specific forms of social behaviors.

There is another view that moral judgment is a kind of reward related decision-making. From this view point, the brain areas activated by moral judgment may overlap the brain areas activated by decision-making or reward. There are many reward and decision-making related neuroimaging studies. These studies showed that

Hiraishi et al. (2007) researched brain activity during moral judgment that compared typical developed children and autistic children. In the study, typical developed children showed orbito-frontal cortex activity rather than autistic children. Moreover, my unpublished behavioral data showed that judging-bad is faster than judging-good and that judging-bad does not activated orbito-frontal cortex rather than judging-good. These results suggested that judging-good and judging-bad might use different neural circuit. Moreover, this fast judging-bad time rather than judging-good one can reinforce the view point of fitness. The situation that a person judges as bad is to be avoided.

Harenski et al. (2008) examined based on the Gilligan's theory (1982) showed that moral sensitivity is different between genders in neural mechanisms. Their evidence is that females activated posterior and anterior cingulated and anterior insula and males activated superior temporal sulcus rather than each other gender during moral judgment.
Harenski et al. (2010) gave evidence that the ventro-medial prefrontal cortex may contribute more to moral deliberation than moral intuition, whereas the temporo-parietal junction may contribute more to moral intuition than to moral deliberation. My unpublished data showed that judging-good (moral deliberation) needs longer time than judging-bad (moral intuition) and judging-good activated orbito-frontal cortex more but judging-bad deactivated there.
However, there are few studies that clarify the changes of moral development and its related brain activities from child to adult.

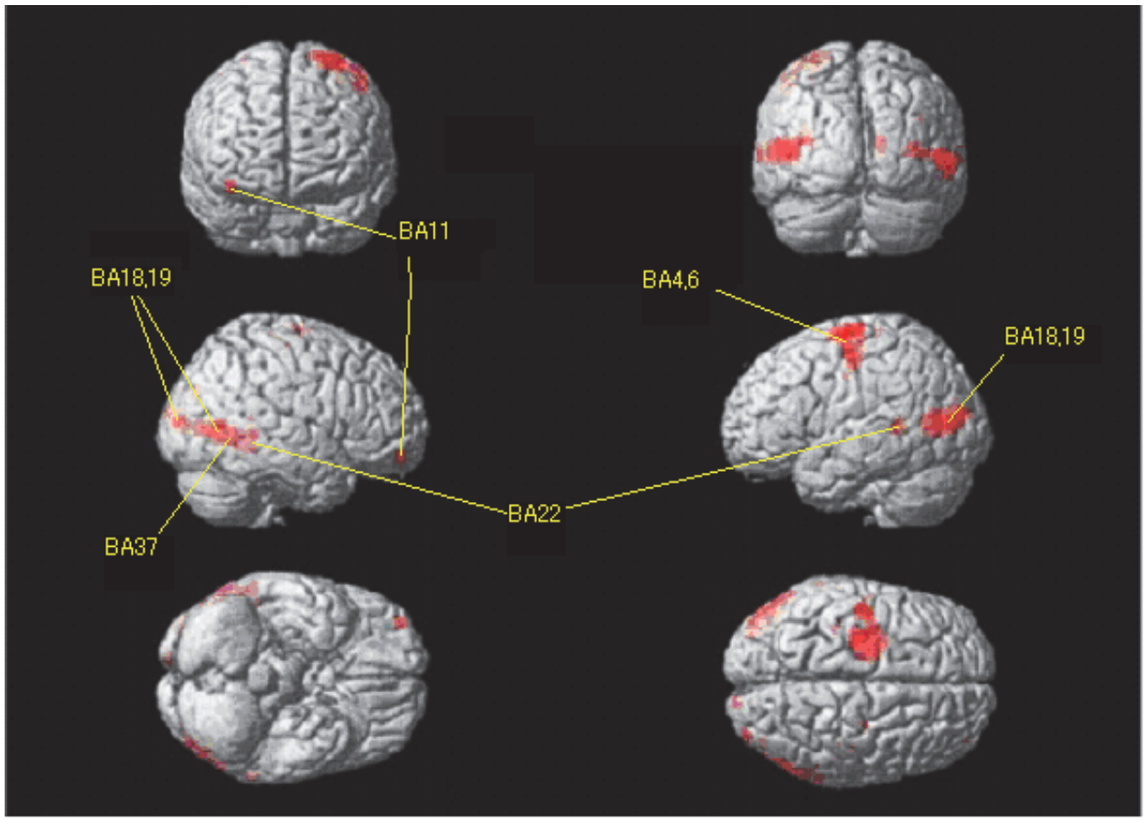

Fig. 1. An example of brain activity induced by moral judgment in a typical developed child (13yrs old). Those are left BA 4, 6, 18, 19, 22 and right BA 11, 18, 19, 22, 37.

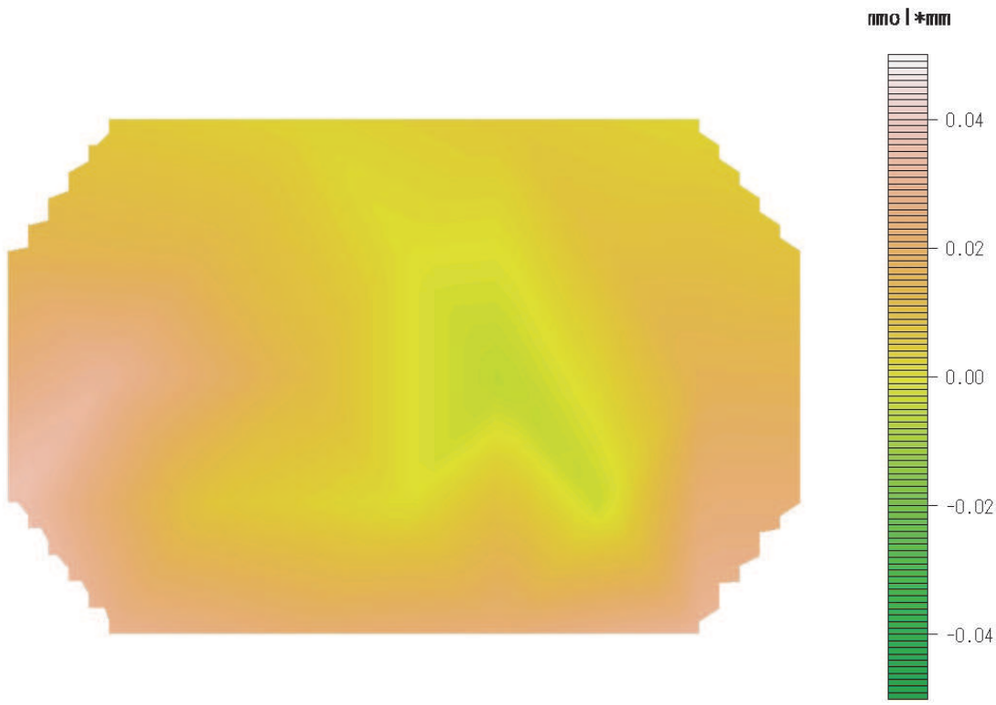

Fig. 2. Brain activity induced by moral judgment as good. The left side is the right hemisphere and the right side is the left one. The top is superior and the bottom is inferior.

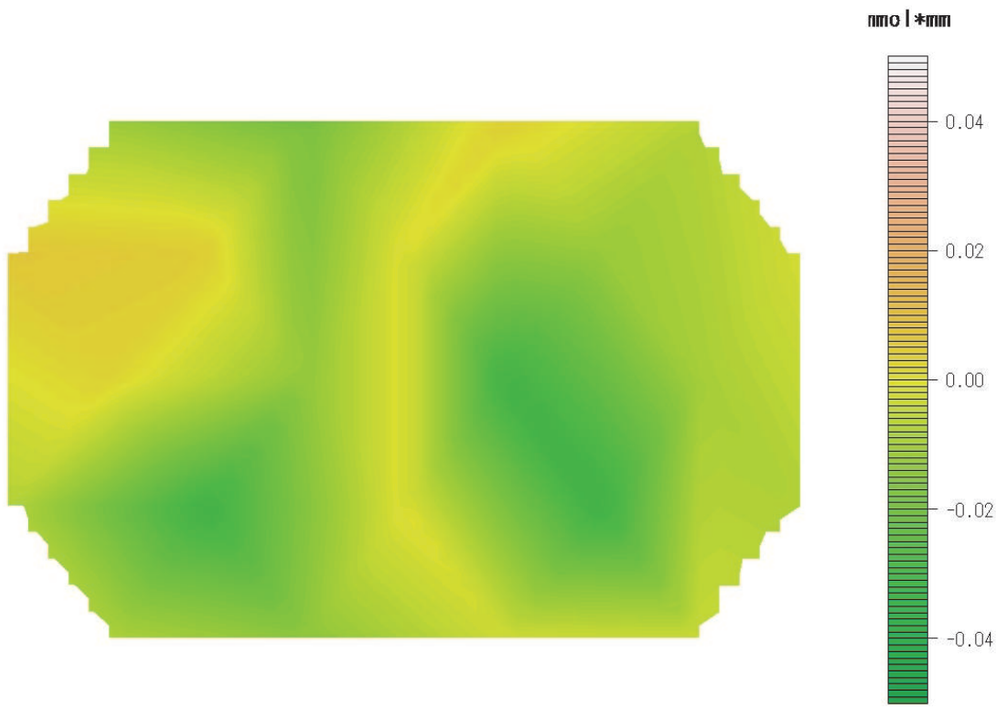

Fig. 3. Brain activity induced by moral judgment as bad. The left side is the right hemisphere and the right side is the left one. The top is superior and the bottom is inferior.

1.3 Autistic moral judgment and its development

Autism is diagnosed by behavioral features (qualitative impairment in social interaction, qualitative impairments in communication, and restricted repetitive and stereotyped patterns of behavior, interests and activities) and the cause comes from abnormalities of the central nerve system (APA, 2000). In Japan, one of the major complaints of autistic children is sometimes shoplifting. After that, they are diagnosed as autism. Almost autistic people have some deficits in their cognitive aspect and these deficits affects negatively to their social lives. Moreover, it is well known that autistic people are difficult to learn unwritten rules like morality. The number of autistic moral judgment study is very few and those studies investigated moral judgment from the view point of "Theory of Mind".

Autism is one of pervasive developmental disorders characterized by qualitative abnormalities in reciprocal and social interactions and in patters of communication, and by restricted and stereotyped repetitive repertoire of interests and activities and they have abnormality in their central nervous system (World Health Organization, 1992). Like this, autism is diagnosed by behavioral features. However, almost of them have many disorders in the cognitive aspect. Sometimes, these features give negative effects to their social lives. Baron-Cohen et al. (1985) adopted "Theory of Mind" to autistic people and pointed out that they lack "Theory of Mind". For example, they are difficult to read a situation. This may related to their deficits of "Theory of Mind".

There is one study about moral understanding in children with autism (Grant et al., 2005). Their study focused on "theory of mind" mainly and reasoning and executive functions. Their result is that children with autism have deficits in complex reasoning and executive functions. Not only autistic children but also typical developed children do not make it clear the relationship between acquirement of morality and its related social abilities.

1.4 Brain activity during moral judgment in autistic people

There is only one neuroimaging study about autistic moral judgment (Hiraishi et al., 2007). They reported that the orbito-frontal cortex was not activated in autistic children (Fig. 1.) although the brain area was activated in typical developed children (Fig. 2.) when they judged the morality of a behavior of the protagonist in a picture (Table 1). Because previous neuroimaging studies of moral judgment in typical developed persons showed that orbito-frontal cortex is one of the most moral related brain areas (Haidt and Greene, 2002; Casebeer, 2003), this is one of the most important evidence that autistic children deficits kinds of moral activities. However, Hiraishi et al. (2007) reported that the judgments of morality in autistic children are appropriate. This means that autistic children acquired moral knowledge properly but they did not use them properly in their daily lives. These are sound like a contradiction. Moreover, there are some suggestions that autism is sometimes lack their prefrontal cortex activities including orbital area. These suggested that further studies are needed to the lack of the prefrontal cortex activities during moral judgment in autism and moral knowledge.

Because the behavioral data suggested that autistic children can judge morality correctly as same as typical developed children did, the difference of the OFC activation Autistic children judge morality appropriately in their study. This means that other neural circuit activity in autism might compensate orbito-frontal cortex activity in typical developed people during moral judgment. However, because the stimuli in this study contain both good and bad situations, the brain activities induced by judging-good and judging-bad are not divided into each judgment. Therefore, further study is needed to make it clear whether

judging-good and judging-bad are processed in different neural networks and it is adopted the relationship between judging-good and judging-bad and those neural networks in autistic people as same as typical developed people.

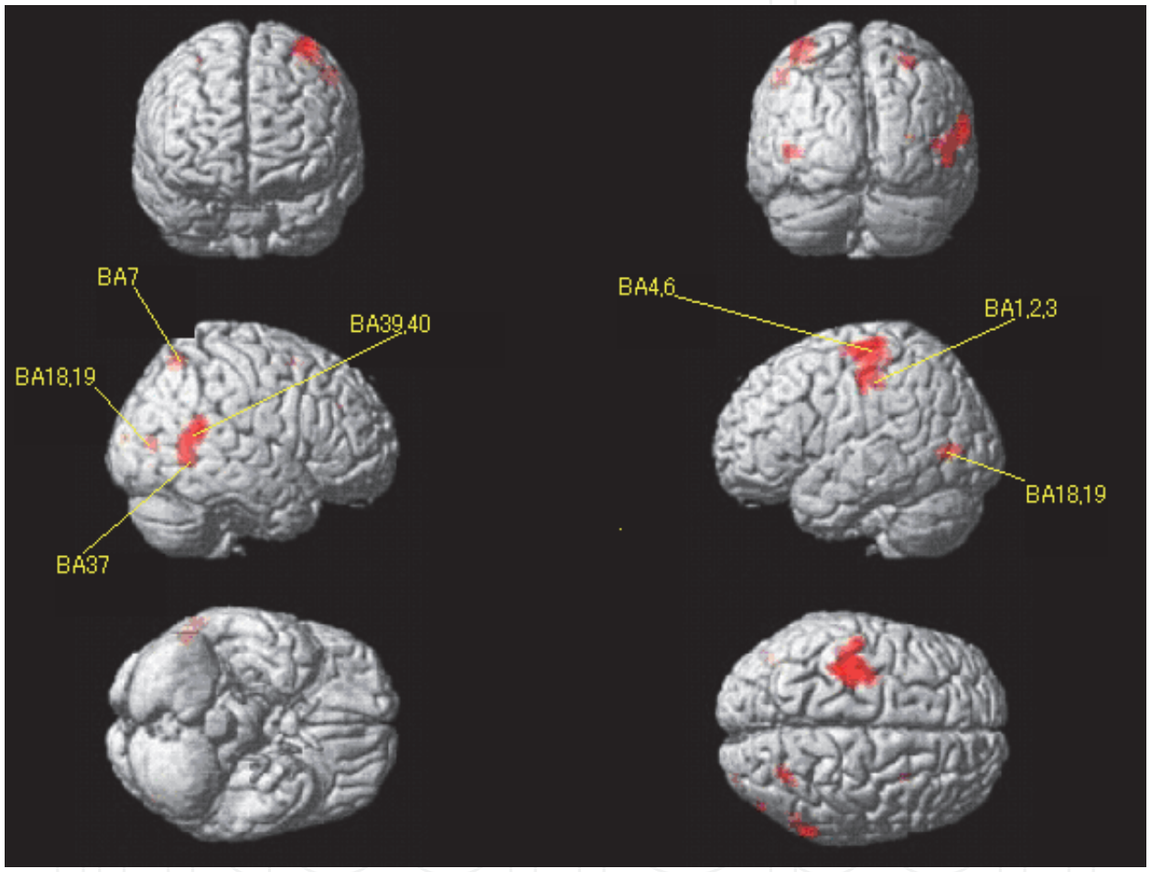

Fig. 4. An example of brain activation induced by moral judgment in a child with Asperger's syndrome. Those are left BA1, 2, 3, 4, 6, 19 and right BA 7, 18, 19, 37, 39, 40. This is the color version of the figure in Hiraishi et al. (2007).

participant	hemisphere	brain activated area (BA)														
TD1	left				4		6			18	19	22				
	right								11	18	19	22	37			
TD2	left				4					18	19					
	right								11	18	19					
AD1	left	1	2	3	4		6				19					
	right							7		18	19		37	39	40	
AD2	left	1	2	3	4	5	6	7	11	18	19					
	right								11	18	19					

Table 1. Activated brain area (BA:Broadman area) by moral judgment

2. Future study

Although the number of moral study has been increased day by day, the information is not enough to understand the essence of morality. Almost previous moral judgment study used a common method that compares negative situation and negative situation and their participants are typical developed adults. Moreover, in these studies, participants were asked which situation is worse. Of course, judging a negative situation is important for enhancing a person's fitness because it will give avoidance from that situation. However, judging a good situation may not be in the same line. Avoiding a good situation will not give more fitness than nothing.

Not only almost previous studies used negative moral situations as stimuli, but also participants were asked to judge the morality compared with negative situations. However, there are many situations that moral judgment is needed not only a negative situation but also a positive situation.

The developmental process of morality is mainly known from the behavioral studies. It is needed to investigate (1) the comparison of positive situation and another positive situation, (2) positive moral judgment, (3) developmental changes, (4) the relationship between other brain activities between ToM and emotion reasoning and (5) the brain activities of them. These results would suggest us better way that the autistic children acquire morality easily.

Although there are relationships between morality and other cognitive abilities that are needed to live appropriate social lives (e.g. "Theory of Mind"), it is not still unknown the developmental association between them.

There is a possibility that morality is composed of two different brain networks that one is related to negative moral judgment and another one is related to positive one (Young et al., 2011).

There is only one study that reported moral understanding in children with autism (Grant et al., 2005). They discussed that moral reasoning is related to "Theory of Mind" and deficits in complex reasoning and executive functions. However, there is no study to make it clear the role of emotion in moral judgment. In autistic people, moral judgment and moral understanding is different thing. There is a possibility that autistic children have moral knowledge but they do not judge appropriate morality in the real situation (Hiraishi et al., 2007). O'Neill and Petrinovich (1998) showed cross-cultural study of moral intuitions. In their case, Taiwanese students those are representatives of the Eastern culture and U.S.A. students those are representatives of the Western culture were compared and they showed similar reactions to moral dilemma tasks. Their study showed not only fundamental but also derivative moral attitudes are not so different between cultures and suggested that the cultural effect is low in morality. As the examples of their study, here I show the episode of the emperor Gaozu of Han and the Ten Commandments in the Bible. The Emperor Gaozu of Han remade the law from details to fundamentals; "Punish offenders who murders, hurts and thieves". The Ten Commandments is a list of religious and moral imperatives in the Bible. Both of them punish a person who attacks to others and threats others' wealth and family, and latter one admonishes to make good social relationships between neighbors. Like these, morality is affected by religion and culture. Therefore, cross-cultural moral study would be needed.

Moreover, social skill training (SST) is recently used to get the skills for communicating with others smoothly. The targets of SST are not only typical developed persons and children but also persons and children with developmental disorder. However, there are still few studies that clarify the relationship between behavioral changes that induced by SST and the related brain activity changes. The gathering of these reports would make a new way to assist autistic people to live comfortable in our human society that is mainly composed of typical developed people.

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A Comprehensive Book on Autism Spectrum Disorders

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The aim of the book is to serve for clinical, practical, basic and scholarly practices. In twentyfive chapters it covers the most important topics related to Autism Spectrum Disorders in the efficient way and aims to be useful for health professionals in training or clinicians seeking an update. Different people with autism can have very different symptoms.Â Autism is considered to be a â€œspectrumâ€ disorder, a group of disorders with similar features. Some people may experience merely mild disturbances, while the others have very serious symptoms. This book is aimed to be used as a textbook for child and adolescent psychiatry fellowship training and will serve as a reference for practicing psychologists, child and adolescent psychiatrists, general psychiatrists, pediatricians, child neurologists, nurses, social workers and family physicians. A free access to the full-text electronic version of the book via Intech reading platform at http://www.intechweb.org is a great bonus.

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