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RESEARCH ARTICLE

Moral educational implications of neuroscientific research on moral decision-making

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도덕적 의사결정에 대한 신경과학적 연구 성과의 도덕교육적 함의

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ABSTRACT

In this study, the two types of moral judgment, rational reasoning and emotional intuition, were analyzed with a focus on neuroscientific interpretation of human responses in the trolley dilemma and footbridge dilemma. Based on such analysis, the cognitive approach required to make correct moral judgments was sought with a focus on establishing the relationship between reason and emotion. And the implications of this neuroscientific approach for moral education were derived. According to the results of neuroscientific research on people's moral judgments in the trolley dilemma and footbridge dilemma, there are many neuroscientific research results supporting that emotional intuition leads to deontological judgments and rational reasoning leads to consequential judgments. In this way, emotional intuition and rational reasoning appear widely in human moral judgment. There is a need to find a method of moral education that can harmoniously utilize emotional intuition, which is fast and efficient but has the potential for bias, and rational reasoning, which is slow but accurate and fair.

Key words: Moral judgment, rational reasoning, emotional intuition, moral education

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Introduction

Whether the source of moral judgment that distinguishes between good and evil is reason or emotion is a subject with a long history of debate in the field of moral philosophy. The dominant view in the history of moral philosophy is the rationalist tradition that the source of moral judgment that distinguishes between good and evil is reason. This means that humans can establish their own moral laws through reason, and ultimately practice moral actions by exercising

their good will to put the moral laws they have established into practice.

However, in the history of moral philosophy dominated by this rationalistic tradition, D. Hume contests the mainstream rationalist view by arguing that it is not reason but emotions that judge moral values such as good and evil. According to Hume, human nature has the ability to feel in contrast to reason, and rather, these emotions function as the fundamental principle of moral value judgment and moral recognition rather than reason. Hume's claim that moral judgment is derived from emotion, not reason, did not see much light in academia at the time, when the rationalist tradition was very strong, but today, various research results in cognitive science and neuroscience on human judgment show that Hume's claim is true. It shows that it is close to.

In today's cognitive science, the human brain structure involved in judgment is divided into System 1, which makes quick decisions, and System 2, which makes slow decisions (Stanovich & West, 2000). Making a quick decision in System 1 means making an intuitive decision, and human emotional responses are involved at the basis of this intuition. When a child is about to fall into a well, everyone quickly runs to catch it, which is the result of the mind, or emotions, acting on the child's inability to watch it quietly. On the other hand, judging slowly in System 2 means making a decision with careful deliberation while considering many different situations. In particular, System 2 slows down judgment when System 1 makes a mistake and makes us think of other alternatives. In this way, because the human brain is equipped with both System 1 and System 2, sometimes it makes intuitive moral judgments immediately, and sometimes it makes moral judgments through reasoning while deliberating. The problem is, when we want to go beyond this technical level and establish a normative perspective on moral judgment, what kind of relationship should we establish and implement between the judgment mechanisms of intuition and reasoning?

In this study, the functions of intuition and reasoning, which are human judgment mechanisms for moral judgment, are analyzed with a focus on neuroscientific interpretation of human responses in the trolley dilemma and overpass dilemma, and the requirements for making correct moral judgments are based on such analysis. We will explore a cognitive approach that focuses on establishing the relationship between reason and emotion. Through this, we aim to derive practical implications in moral education.

Is moral judgment a Product of Reason or Emotion?

The Influence and Limitations of Rational Reasoning

Traditionally, humans have been recognized as rational beings. Therefore, it has been believed that humans can make correct moral judgments through moral reasoning based on reason. These ethical theories look for moral judgments in moral principles derived from reason, that is, in a 'form' unrelated to human desires, emotions, and experiences, and have a structure that highlights the motivational aspect of reason and excludes the motivational aspect of desire or emotion (Park, 2019).

I. Kant also does not completely deny the function of emotions that cause moral motivation, but from a normative perspective, he says that since humans are likely to act according to their natural tendencies, they should establish their

own moral laws and live a moral life according to the commands of reason. I saw it (Kim, 2017). According to this view of moral philosophy, human morality is based on rationality, which is the ability to ‘recognize the possibility of choice, make decisions, and carry out intentions’ (Jung, 2011).

This tradition of moral philosophy has continued into the field of modern moral psychology, with Kohlberg revealing that human moral judgment absolutely comes from moral reasoning. And it is argued that judgments derived from moral reasoning serve as direct motivation for human behavior.

Kohlberg's view that reason can free humans from external stimulus-responses has been accepted as a mainstream view in the field of moral psychology for a long time. According to him, moral behavior is caused by the normative obligation to comply with morality, and without specific judgment and rational deliberation, the phenomenon of morality cannot exist in the first place (Narvaez & Lapsley, 2005). In other words, judgments or actions that are not prompted by reason are outside the realm of morality. The thinking of System 1 and System 2 also operates in the process of moral judgment. According to Kohlberg, who follows the rationalist tradition, moral judgment is the result of the deliberation system (System II).

Kohlberg believed that human moral development does not occur automatically through improved cognitive abilities due to brain development, but rather through experiences of looking at moral issues through changes in perspective such as role adoption (Selman, 1971). Kohlberg's view is that role adoption improves moral reasoning, and moral reasoning leads to moral judgment. However, as empirical results showed that moral judgments do not always lead to moral actions, doubts about the synchronization function of moral judgments derived from rational reasoning inevitably grew. And because the moral judgment ability that Kohlberg originally wanted to cultivate relies on hypothetical moral issues that are divorced from everyday reality, he faced criticism that he was unable to properly describe the specific phenomenon of human moral judgment in reality.

Of course, Kohlberg wanted to empirically prove his belief in rational reasoning, which implies strong internal motivation while simply describing the process of human moral judgment through the integration of normative and empirical aspects of moral judgment, but in the field of moral psychology. In the various studies conducted, Kohlberg's assumptions ended up being quite shaky. Regardless of Kohlberg's firm belief in rational reasoning, several studies on the limits of rational reasoning have shown that the influence of reasoning in the human decision-making process is not as great as thought.

Empirical studies on the limitations of rational reasoning investigate the cognitive constraints and biases that affect human decision-making. These studies reveal instances where rational reasoning deviates from idealized models of logical thinking. Here are some key limitations of rational reasoning that have been documented in empirical research.

Numerous empirical studies have identified a range of cognitive biases that can hinder rational reasoning. Confirmation bias, for example, leads individuals to seek and interpret information that confirms their preexisting beliefs, while ignoring contradictory evidence. Other biases, such as anchoring bias and availability heuristic, similarly impact decision-making.

Also Human cognitive resources are finite, and empirical research has demonstrated that individuals often use simplified decision-making strategies to deal with complex situations. This bounded rationality can lead to suboptimal

choices and deviations from fully rational decision processes.

H. Simon, who recognized this fact, introduced the concept of bounded rationality(H. Simon, 1955). This suggests that human rationality is limited by cognitive constraints and information processing abilities. Empirical research has examined how individuals adapt within these constraints and make reasonably rational decisions. Many normative theories about moral decision-making were developed based on complete trust in human rationality. However, human rationality is limited, and therefore, as H. Simon argues, in order to understand human decision-making, we focus on "What decision will be made when the entire decision-making process is carried out rationally?" It may be better to focus on empirically explaining the actual decision-making process rather than normative analysis.

Empirical research on rational reasoning provides valuable insights into the complexity of human decision-making and the limits of rationality. And this insight created an opportunity to pay attention to the view that moral judgment and decision-making originate from human emotions.

Moral Intuition Based on Emotions

Haidt argues that emotional intuition rather than rational reasoning plays a leading role in the majority of moral judgment processes. According to the social intuitionist model he proposed, at least the first moral judgment is a product of automatic intuitive thinking. Emotional intuition allows us to make immediate moral judgments along with immediate emotional reactions, such as anger or disgust, to the moral situations we face.

Because human moral judgment is made immediately based on emotion, people are often unable to provide an appropriate rational basis for their initial judgment. This is because human moral judgment relies on emotional intuition rather than rational reasoning (Haidt, 2001). In this context, Haidt reveals that rational reasoning does not produce moral judgments, but rather functions as a postmortem tool to justify moral judgments (Haidt, 2001). Haidt's argument served as an opportunity to increase interest in moral intuition and to change the existing perception that the moral judgment process was considered a product of conscious, autonomous, and active rational activity. Haidt asked people the following questions and then analyzed their moral judgments and the reasons for making them.

Julie and Mark are brother and sister. They are spending their summer vacation traveling together in France. One night they were staying in a cabin near the beach. They think it would be fun to make love to each other in that place. At the very least, it will be a new experience for each person. Julie was taking birth control pills and Mark was using condoms to be safe. They both enjoy making love, but decide not to do it again. They kept that night a special secret and it made them feel closer to each other. What do you think about Julie and Mark's actions? (Haidt, 2001)

The majority of people who were asked the above question judged Julie and Mark's actions to be immoral. When asked why they made that judgment, people pointed to the psychological harm that incest can have on siblings. However, in this case, when it was pointed out that the siblings used contraceptives and that pleasure rather than psychological damage was produced, many people were unable to properly explain why the siblings' actions were immoral. Some people gave a variety of bad reasons to justify their moral condemnation of the siblings' actions. Some people admitted that they were unable to justify their moral judgments (Haidt, 2006).

Therefore, Haidt argued that from the fact that people were unable to provide rational reasons to justify their moral judgments, it is more reasonable to say that their moral judgments were produced by emotional intuition rather than

rational reasoning. In other words, people first make moral judgments using intuition, and then use reasoning to justify their intuitive judgments. This phenomenon serves as evidence that people's moral judgments rely on emotions rather than reason. Haidt explains his argument through the following diagram.

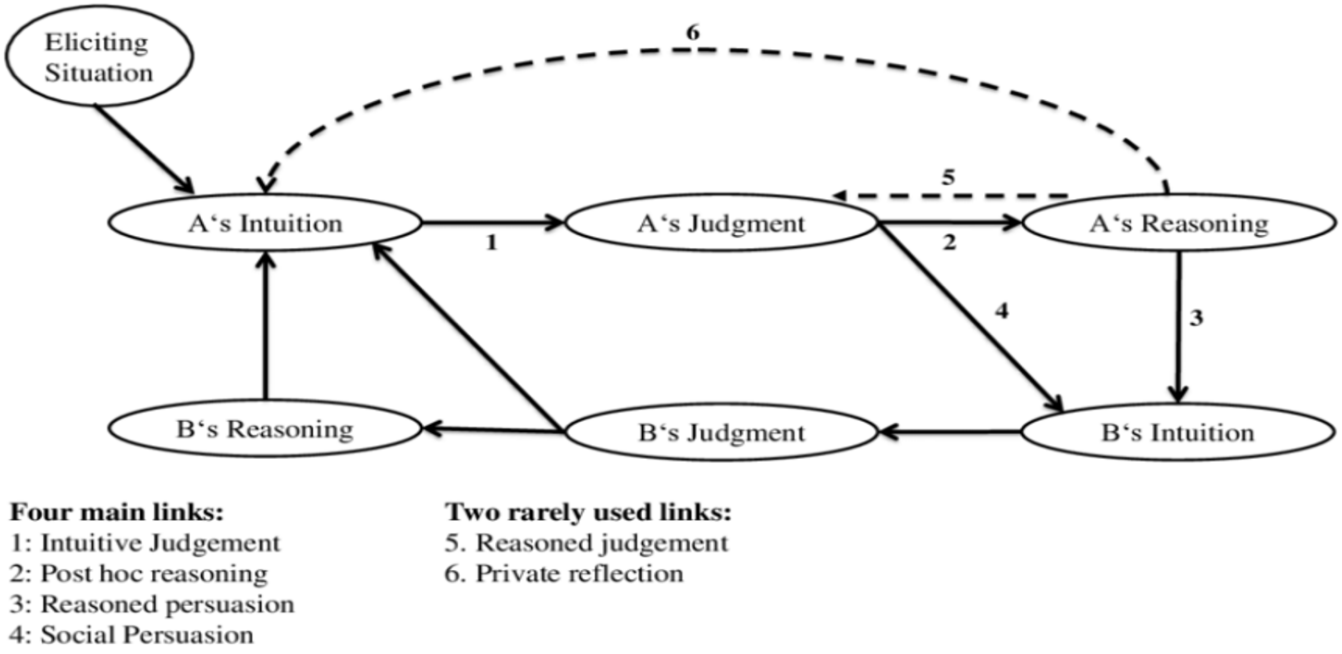

Fig. 1. Social intuitionist model (Haidt, 2001)

In the picture, (1) 'intuitive judgment' is a judgment that occurs automatically, and (2) 'post hoc reasoning' is the process of exploring related evidence to justify one's intuitive judgment. (3) 'Reasoned persuasion' is the process by which reasoning that justifies one's own intuitive judgment influences the intuitive judgment of others, and (4) 'social persuasion' is the process by which one's judgment is influenced by others without an explicit attempt at reasoning. It refers to the process of influencing a person's judgment by modifying his or her intuition. (5) 'Reasoned judgment' is making a moral judgment based on rational logic beyond initial intuition, and (6) 'Private reflection' is modifying one's initial intuition through role-taking and reasoning. This affects one's judgment, but (5) and (6) appear very rarely. Because reasoning is rarely used to ask questions about one's attitudes and beliefs (Haidt, 2001). These moral intuitions are common to all cultures, and the common denominators of moral intuitions are categorized into five categories: harm/care, fairness/reciprocity, authority/respect, purity/sanctity, and in-group loyalty. It is revealed that these five moral intuitions are based on moral modules influenced by 'evolution' and also serve as a basis for acquiring more modules (Haidt & Bjorklund, 2008). In this way, social intuitionism explains moral development as a process in which five innate moral modules are expressed by meeting socially constructed virtues. Although there are virtues related to harm/consideration and fairness/reciprocity in common in all cultures, the degree to which they constitute virtues related to loyalty to the in-group, authority/respect, and purity/sanctity varies greatly depending on the culture (Haidt & Bjorklund , 2008).

Haidt defines 'moral judgment' as "an evaluation of the rightness and wrongness of an action or a person's characteristics" that is formed by respect for virtue as a responsibility of a culture or subculture (Haidt, 2001, 817). He

also defines moral reasoning as "the conscious, mental activity by which humans transform given information to reach moral judgments" (Haidt, 2001).

In the end, in Haidt's social intuitionist model, morality is something that emerges from within according to the child's developmental period, but is also formed from a specific culture. In other words, moral intuition is both innate and enculturated (Haidt, 2001). Regarding the question of when is the most appropriate time to acquire virtue as moral intuition from the perspective of moral education, Haight said that the period from the age of 7 to 15, when the frontal lobe is myelinating, is the time when it is easiest to learn the morality that permeates culture. It is claimed to be a sensitive period. Children are partly born with moral intuition, and develop morality through the influence of the culture they belong to.

Haidt's social intuitionism has contributed significantly to our understanding of moral psychology, but like any theory, it has its limitations. Here are some of the key limitations and criticisms of Haidt's social intuitionism.

First, While emotions are undoubtedly important, some critics argue that this emphasis might downplay the significance of conscious, rational moral reasoning. They believe that people can engage in reflective, reasoned moral thinking, and Haidt's theory does not fully account for this.

also, Critics argue that while intuitions may play a significant role, reasoning and deliberation can also be essential in resolving complex moral issues. They contend that not all research findings in moral psychology align with social intuitionism, and a more balanced view should be considered.

An experiment by J. Paxton and his colleagues shows that even if an intuitive moral judgment is produced by a strong emotional response, inference can influence the moral judgment after the initial emotional response weakens (Paxton et al., 2012). Paxton asked subjects who made an intuitive judgment about a case of brother-sister incest to hold off on responding for two minutes, and then asked them to judge the case again after two minutes. As a result, subjects who were exposed to plausible arguments for two minutes responded more leniently to the siblings' behavior. Paxton's interpretation of this is that as the subject's negative emotions subsided over time, the bias weakened, and initial intuition and later inference competed, ultimately influencing the change in intuition.

Second, intuitive judgments may be the result of 'automation' of previously made inferential judgments. When faced with a situation we have never encountered before, we often take our time and think it over slowly. People who are new to driving learn to drive slowly and carefully by operating the accelerator, brake, and steering wheel. However, once you get used to driving, you will start operating the device automatically. In other words, if you have created a precedent, you can make a moral judgment more quickly based on that precedent if a similar incident occurs in the future. This means that reasoning is not necessarily limited to the role of ex post justification of intuition, but can play a pivotal role in creating previous precedents that serve as the basis for intuitive judgment.

third, Haidt's social intuitionism is primarily descriptive and does not offer clear prescriptive guidance for individuals, educators, or policymakers seeking to improve moral decision-making. Critics argue that it falls short of providing practical methods for resolving moral dilemmas or developing moral judgment skills.

Dual Process Theory as A Mixed System of Reason and Emotion

Neuroscientific Interpretation of The Trolley Dilemma and Footbridge Dilemma

The Trolley Dilemma and the footbridge Dilemma are classic moral thought experiments used in ethics and philosophy. Neuroscientific studies have explored the neural processes and decision-making mechanisms underlying these dilemmas to gain insights into the moral reasoning of individuals. Fig. 2 shows the trolley dilemma and overpass dilemma. Greene asked experiment participants the following questions about the trolley dilemma and overpass dilemma.

Fig. 2. Trolley dilemma and footbridge dilemma

Trolley Dilemma Experiment: A broken trolley is running on the tracks. If you continue to rush like this, five people who have no time to escape from the track will be hit and killed. The only way to save these people is to pull the switcher and change the tracks. However, if you change the track, one person on the next track will die instead of five people. Should I pull the line converter?

Footbridge Dilemma Experiment: A speeding trolley threatens the lives of five people on the tracks. But this time you are standing on a footbridge over a track and there is a big, fat man standing next to you. The only way to save the five lives is to push the man off the bridge and onto the tracks. The man will die, but his body will delay the trolley, saving the lives of five people. In this case, should you push the person away?

In the trolley dilemma experiment, 85% of the subjects responded that changing tracks was morally acceptable, and in the footbridge dilemma experiment, only 12% responded that pushing a large person down was morally acceptable. These reactions were common regardless of gender, educational differences, and cultural differences.

Utilitarians, a representative consequentialist, can explain the trolley dilemma in terms of the principle of greatest happiness for the greatest number, but have difficulty explaining the response to the footbridge dilemma. On the other hand, Kantian scholars say that the difference between these two cases is that in the footbridge dilemma, a fellow human being is literally used as a means to some independent end, whereas in the trolley dilemma, one person was unfortunate

enough to be standing on the next track. They believe that it is wrong to treat one innocent person as a means, and in the case of the trolley dilemma, they accept saving five people as a side effect(Park, 2011). In response to these results, Greene conducted a neuroscientific experiment to investigate the psychological characteristics of deontology and consequentialism, focusing on their functions rather than their philosophical definitions.

Experiment result, in the brains of subjects who encountered the trolley dilemma, brain regions related to rational reasoning functions, such as working memory, were activated, while brain regions responsible for emotions were less activated. On the other hand, in the footbridge dilemma, brain regions related to emotions were more activated, and brain regions related to rational reasoning were less activated (Greene et al., 2001). These experimental results show that consequentialist judgments and deontological judgments result from different types of thinking. In other words, the consequential judgment that produces the greatest happiness for the greatest number is a function of rational reasoning, and the deontological judgment that stopping a trolley by dropping a person on a footbridge is wrong because it treats the person as a means rather than an end. It can be seen that it is a function of emotional intuition. In other words, it can be said that deontological judgments are based on emotions rather than reason and are produced through quick intuitive judgments.

In addition, these experimental results and interpretations can be said to raise significance to the traditional perspective on deontology. This is because in traditional normative ethics, deontological judgments are accepted as the product of rational reasoning. Through practical reason, Kant argues that universal moral laws should be followed simply because it is a duty. In other words, from the perspective of traditional deontology, thinking about what humans should do and doing it with their own will is a product of practical reason. Based on the results of these experiments, Greene interprets that deontological judgments are actually the product of emotional intuition rather than rational thinking, thereby challenging the traditional view that deontology is a product of reason.

In this way, the neuroscientific approach to moral judgment shows that both reason and emotion are used in the moral decision-making process, and also shows that the brain area responsible for emotion and the brain area responsible for reason compete when making moral judgment (Cushman & Greene, 2012). J. Greene also presents a neurological interpretation of the process by which people judge the ‘crying child dilemma.’ The crying child dilemma is as follows.

“As the war progressed, people living in the same village as you hid in the basement to avoid the enemies. Your baby starts crying. You are covering your baby's mouth to prevent sounds from escaping. If you take your hand away, your baby will cry loudly and your enemies will hear it. Then the enemies will find you and everyone else and kill everyone, including you and the baby. If you don't remove your hand, your baby will suffocate to death.”Is it okay to let a baby suffocate to death in order to save yourself and the village people?(J. Greene, 2008).

According to J. Greene's experiment, people who decided that they could not kill the child had brain regions related to emotions activated and decided that the child should be killed. In lean people, the brain region responsible for reason was activated. And people who decided they should kill the child spent more time than those who decided they couldn't(J. Greene, 2008). This is a similar result to the previous trolley and footbridge dilemma in that judgments based on emotions, that is, deontological judgments, appear as intuitive judgments, and judgments based on reason, that is, consequential judgments, appear as deliberative judgments.

J. Greene proposes a dual process theory based on these experimental results. According to the dual-process theory of moral judgment proposed by Greene, automatic emotional reactions and conscious reasoning have a complex effect on moral judgment. Activation of the amygdala and ventromedial prefrontal cortex (vmPFC), which are associated with automatic emotional responses to moral dilemmas, induce deontological moral judgments. On the other hand, activation of the dorsolateral prefrontal cortex (DLPFC), which is associated with conscious reasoning, leads to consequentialist moral judgments (Greene, 2014).

This fact was similarly discovered in experiments conducted on brain-damaged patients. Subjects with damage to brain regions that control emotions tended to make consequential moral judgments (Koenigs et al., 2007), relatively emotional people tended to make deontological moral judgments (Conway, 2013). It has also been found that psychopaths with very low empathy or emotional abilities are more likely to make consequential moral judgments (Koenigs et al., 2012). And regarding the time spent on moral judgment, in many cases, quick judgments appeared as deontological moral judgments, and inferential judgments appeared as consequential moral judgments (Suter & Hertwig, 2011).

Limitations of Neuroscientific Approaches to Human Moral Judgment

Neuroscientific approaches to human moral judgment have provided valuable insights into the neural underpinnings of moral decision-making. However, they also come with several limitations and challenges that researchers and ethicists need to consider. Here are some of the limitations of neuroscientific approaches to human moral judgment.

First, Many neuroscientific studies on moral judgment are conducted in controlled laboratory settings, which may not fully capture the complexity and nuances of real-world moral dilemmas. Participants in these studies often face simplified and abstract moral scenarios, which may not accurately represent the multifaceted moral decisions people make in their daily lives.

Second, Neuroscience research on moral judgment typically relies on correlations between brain activity and specific moral decisions or dilemmas. Although these correlations can provide valuable insight, they do not establish a causal relationship between moral judgment and neurological changes. This is because it is very difficult to determine whether the observed neural activation is a cause or a consequence of moral judgment.

Third, Moral philosophy and ethics involve intricate philosophical debates about the nature of morality, moral principles, and normative ethics. But, Neuroscientific research may not address these philosophical complexities and may focus more on the descriptive aspects of moral judgment.

fourth, Deciphering the precise meaning of neural activations in the context of moral judgment is a challenge. Researchers may interpret brain activity differently, and the same neural regions can be involved in multiple cognitive processes. This can lead to varied interpretations of the results.

There is a risk of overemphasizing the role of the brain in moral judgment, which can lead to a form of neurodeterminism. This view suggests that moral choices are predetermined by brain activity, neglecting the role of free will and conscious moral deliberation. In the same context, Neuroscientific approaches may oversimplify the complex nature of moral reasoning. Reducing morality to brain activation patterns can lead to a reductionist view of ethics,

neglecting the influence of social, cultural, and individual factors on moral decision-making.

While neuroscientific approaches have made valuable contributions to the understanding of human moral judgment, these limitations underscore the need for interdisciplinary research that integrates neuroscientific findings with insights from psychology, philosophy, anthropology, and sociology to provide a more comprehensive understanding of morality and ethics.

Implications for Moral Education

The following moral education implications can be discovered through research results in neuroscience on moral intuition and reasoning.

First, we can explore ways to utilize the bias caused by intuitive judgment in moral education. The current moral education approach to moral intuition and reasoning is to minimize the possibility of bias in intuition through reasoning. Considering that biased thinking can produce errors, hinder accurate utility calculations, and impede fair judgment, this approach can be said to be both valid and essential. However, considering that bias due to intuition is unavoidable due to the limited rationality of humans, it is possible to explore ways to utilize students' bias as a means of providing opportunities for moral practice in the area of life guidance. In terms of life guidance, a representative method that can be used for moral education is nudge, which was developed in behavioral economics. Taking advantage of the broad spectrum of emotion-based moral intuitions and biases derived from them, companies have been using human biases and nudges based on them as a marketing tool to induce consumers to make specific choices. Therefore, if we design a nudge that utilizes human bias to induce students to make choices that are in line with the public interest, it can have meaningful effects in moral education. Sunstein states that rather than defining people as ‘irrational beings’, it is socially more useful to recognize them as normal human beings and develop various nudges that utilize such biased aspects (Sunstein, 2015) . Human biases can be exploited, but they can also be used correctly to guide students' decision-making in a way that is consistent with educational goals or the public good. This is because education is also an intentional activity and an activity aimed at the public good.

Typically, a default rule is a rule that ensures that the first choice is automatically adopted if people maintain the status quo. Once a specific option is selected, the choice for that option continues unless the individual actively changes it. In Denmark, the Netherlands, the United Kingdom, and Germany, which adopt the 'opt-in method' that requires people who want to donate organs to fill out consent forms, the organ donation rate is very low, while refusal is expressed to people who do not want to donate organs. Austria, Belgium, France, Hungary, Poland, Portugal, and Sweden, which have adopted the 'opt-out method', show high organ donation rates. This default strategy can be used in school uniform or textbook donation campaigns held at schools. In fact, many schools plan these donation campaigns as annual events at the end of the school year, but most of them adopt an opt-in method, making it difficult to encourage active participation from students (Moon, 2018). Therefore, if you use an opt-out strategy that sets donation as the default choice and receives rejection requests, students will automatically donate their school uniforms or textbooks upon graduation. This strategy can have the educational effect of arousing students' moral interest by providing students with the experience of

practicing donations and at the same time establishing a culture of sharing and consideration in the school field outside of the scope of curriculum guidance. In addition, we can actively seek ways to apply nudges, which are already widely used in public places, to the school environment. The method of inducing students to comply with public order and school rules by devising design or facility nudges can in itself provide students with opportunities for moral practice and reflection.

Second, in the area of moral teaching, active use of stories or visual materials that induce emotional intuition can strengthen students' moral motivation. The narrative approach, which maximizes educational effectiveness by arousing students' interest, has previously been proposed as a major educational method. According to a study on differences in people's helping behavior depending on how the message was presented, those who read messages based on the beneficiary's life story were more likely to read messages based on statistics about people in need of donations and an explanation of the donation process. People's willingness to donate was found to be higher (J. L. Studts et al, 2010). While numbers such as statistics fail to elicit donation behavior because they are difficult to attract people's hearts, vivid narratives containing the suffering in the lives of recipients in need of donations give individuals feelings of sympathy and empathy. It can be seen that it had a more effective effect on changing students' attitudes than statistical data, which is more objective and useful information about the need for donations. This is because events that are vividly described feel like they occur more frequently than events that are simply explained, and the human brain's intuitive system accepts vivid examples more easily than statistics or probability. In this way, teaching materials that utilize the pain of people in need or vivid stories of the socially disadvantaged can be more effective.

And active use of visual materials can enhance students' moral sensitivity. Typically, specific numbers or statistical data are used when a decision must be made through rational and logical thinking. On the other hand, photos or videos can be used to stimulate emotional thinking and make intuitive decisions. So far, the use of photos and videos in class has been approached from the perspective that it matches the tendencies of today's video generation students and increases their interest. However, from a neuroscience perspective, the use of visual materials is useful in moving students' emotions and guiding their intuitive judgment in the right direction. According to related research, specific descriptions or visual materials of people in need of help arouse a greater desire to help others and induce helping behavior rather than dry explanations such as statistics (Gilovich et al, 2013).

Therefore, when teaching the values of justice and peace in moral classes, the class first induces intuitive judgment through images of unjust reality and people who have been victims of war, and then explores rational and logical problem solving. If you proceed, you can bring out students' moral sensitivity and judgment in harmony. If a textbook presents social issues based on various statistical data, teachers need to produce and use specific videos or photos that support such statistics as auxiliary materials. Ultimately, the organization of texts on moral issues needs to be strategic and systematic at the same time. Even if the formation of moral attitudes is strategically led through visual materials that lead to intuitive judgments, cognitive understanding must be carried out systematically in order to ensure sustainability and lead to action.

Third, by providing opportunities for rational justification of intuitive judgments, students should be able to strengthen their moral judgment and increase their cognitive grasping power to increase moral consistency. According to the

elaboration likelihood model, one of the psychological theories of persuasion, an individual's attitude is formed as a result of information processing through the central route and peripheral route. When information is important to an individual or has a high level of involvement, the central route is used to process the information. In this case, we want to process the information by cognitively considering it. On the other hand, if the information is not important to the individual or the individual's level of involvement is low, the information is processed through the peripheral route. Information processing through the peripheral route occurs with less cognitive motivation, requiring cognitive effort and deliberation. We try to avoid it and end up processing information using 'mental shortcuts.' At this time, judgments through the central route result in long-lasting changes in attitude due to high-level mental processes, but judgments through the peripheral route depend on tuning in to the surroundings or the change in attitude is temporary (Petty & Cacioppo, 1986). This can be expressed graphically as follows.

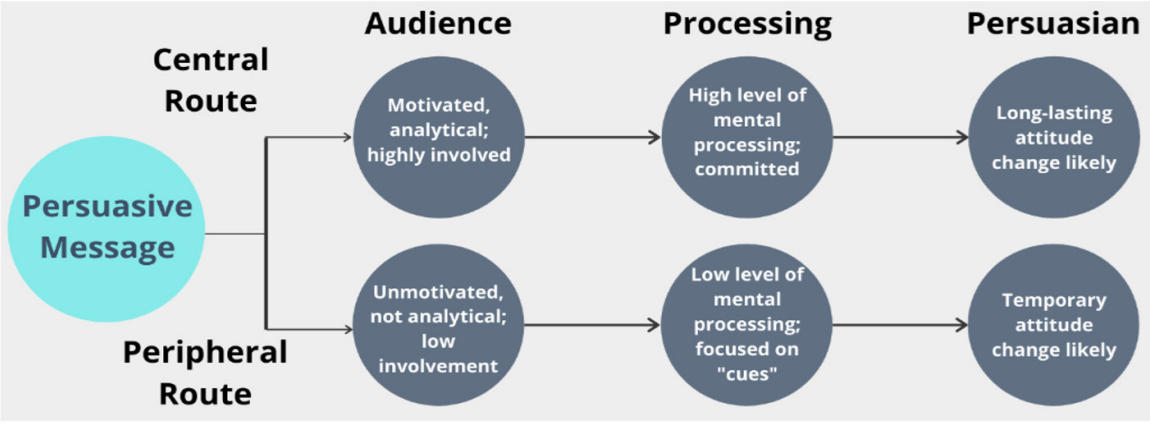

Fig. 3. Elaboration likelihood model (Petty & Cacioppo, 1986)

According to Petty and Cacioppo, decisions through the central route are mainly made based on cognitive reasons, and decisions through the peripheral route are mainly made based on intuitive reasons. Cognitive evidence is mainly used when objectively deriving results according to the situation, and intuitive evidence is used when considering the relational context between people who are affected by an individual's decision. In other words, cognitive evidence is used in rational and logical thinking, and intuitive evidence has a lot of potential to be used in emotional and relational thinking. Attitudes formed as a result of processing information through the central route are more stable than attitudes formed by processing information through the peripheral route. Therefore, even if we provide the experience of making correct judgments by inducing moral intuition, there is a need to help students strengthen their moral judgment and secure moral consistency by providing opportunities for rational justification for such intuitive judgments.

Table 1. Moral education using moral intuition and reasoning

Education area	Used in moral education
life guidance	◦Designing a moral nudge using intuitive bias◦
	◦Donation campaign utilizing status quo bias
	◦Nudge designs or facilities that generate interest
	◦Strengthening students' moral execution ability
subject guidance	◦Present educational materials utilizing emotional intuition
	◦Production of educational materials using narratives
	◦Utilize specific and vivid visual materials
	◦Improvement of moral sensitivity and motivation of students
	◦Providing opportunities for moral justification through rational reasoning
	◦Strengthening moral grasp through sophisticated cognitive processing
	◦Cultivating a stable moral attitude
	◦Improvement of students' moral judgment and consistency

Conclusion

In this study, the two types of moral judgment, rational reasoning and emotional intuition, were analyzed with a focus on neuroscientific interpretation of human responses in the trolley dilemma and footbridge dilemma. Based on such analysis, the cognitive approach required to make correct moral judgments was sought with a focus on establishing the relationship between reason and emotion. And the implications of this neuroscientific approach for moral education were derived.

Moral judgment is a complex process that involves the interplay of reason and emotion. Researchers in the fields of psychology, philosophy, and neuroscience have explored how these two factors influence moral decision-making. Traditionally, rational reasoning was considered the core of the moral judgment process. Reasoning play a role in moral decision-making by allowing individuals to engage in conscious deliberation and analysis of moral issues. This involves considering the consequences of actions, principles, and ethical theories. This Reason is often used to apply moral principles and rules to specific situations. Ethical reasoning can lead to moral judgments based on principles such as fairness, justice, or respect for individual rights. Therefore, it was natural that rational reasoning was considered the core of moral judgment, especially in the field of philosophy.

However, recently, in the fields of psychology and cognitive science, attention has been paid to the wide-ranging influence of emotions on moral judgment, and various research results have been revealed. Emotions often provide quick, intuitive responses to moral dilemmas. This is known as emotional intuition, where individuals make moral judgments based on their immediate emotional reactions. Emotions lead to immediate moral judgment, but as they lead to quick judgment, there is a hidden possibility of error or bias. For example, feeling disgust toward a particular action may lead to a negative moral judgment without extensive rational deliberation.

nevertheless, Emotions like empathy, guilt, shame, and compassion play a significant role in moral judgment. Empathy, in particular, allows individuals to understand and resonate with the feelings of others, influencing their moral decisions. thus Many scholars suggest that moral judgment involves a dual-process model, where both emotional intuitions and conscious reasoning interact.

In summary, moral judgment involves a dynamic interplay between reason and emotion. Emotions immediately and automatically drive our moral judgments. These judgments sometimes involve concerns about bias, but in many cases,

they produce responses that are consistent with our inherent moral concepts. Reasoning allows for more deliberate and reflective moral judgments, considering ethical principles and consequences. The relative influence of reason and emotion can vary among individuals and may be context-dependent, but both are integral components of the moral decision-making process. Rational reasoning provides the foundation for more sophisticated and accurate moral judgment through deliberation.

Recently, many neuroscientific research results have emerged supporting that emotional intuition leads to deontological judgments and rational reasoning leads to consequentialist judgments. Therefore, in moral education, it is necessary to take this into consideration and pay attention to finding educational methods that promote the harmonious development of students' reason and emotions.

References

Conway, P. (2013). The Process Dissociation Of Moral Judgments: Clarifying The Psychology of Deontology and Utilitarianism (Unpublished Doctoral Dissertation). The University of Western Ontario, Ontario, Kanada.

Cushman, F. A., & Greene, J. D. (2012). Finding faults: How moral dilemmas illuminate cognitive structure. Social Neuroscience, 7, 269-279.

Gilovich, T., Keltner, D., Chen, S., & Nisbett, R. E. (2013). Social Psychology (3rd ed.). NY: Norton & Company.

Kim, D. S. (2017). Latitude within judgement and virtue. Philosophia, 142, 1-25.

Moon, K. H. (2018). Consideration on the possibility of using nudges in moral education. Teacher Education, 34, 193-215.

Park, J. H. (2011). Neuroscientific Challenges to deontological theory: Implications to moral education. Journal of Ethics, 82, 73-125.

Park, J. H. (2019). Kant's perspectives of ‘moral emotion’ and education. Ethics education Research, 51, 42-472.

Jung, C. W. (2011). Recent trends in moral psychology research and implications for moral education. Elementary Moral Education, 37, 95-130.

Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An fMRI investigation of emotional engagement in moral judgment. Science, 2107-2108.

Greene, J. D. (2008). The Secret Joke of Kant’s Soul in W. Sinnott-Armstrong (ed.), Moral Psychology vol. 3 The Neuroscience of Morality: Emotion, Brain Disorders, and Development (pp. 35-79). Massachusetts: The MIT Press.

Greene, J. D. (2014). Beyond point-and-shoot morality: Why cognitive (neuro) science matters for ethics. Ethics, 124, 695-726.

Haidt, J. (2001). The emotional dog and its rational tail: A social intuitionist approach to moral judgment. Psychological Review, 108, 814-834.

Haidt, J. (2006). The Happiness Hypothesis. London: Arrow Books.

Haidt, J., & Bjorklund, F. (2008). Social intuitionist answer six questions about moral psychology. Moral Psychology 2: The cognitive science of morality. MA: The MIT Press.

Koenigs, M., Young, L., Adolphs, R., Tranel, D., Cushman, F., Hauser, M., & Damasio, A. (2007). Damage to the prefrontal cortex increases utilitarian moral judgments. Nature, 446, 908-911.

Koenigs, M., Kruepke, M., Zeier, J., & Newman, J. P. (2012). Utilitarian moral judgment in psychopathy. Social, Cognitive, and Affective Neuroscience, 7, 708-714.

Narvaez, D., & Lapsley, D. K. (2005). The psychological foundations of everyday morality and moral expertise in D. K. Lapsley & C. Power (Eds.), Character psychology and character education (pp. 140-165). Notre Dame: University of Notre Dame Press.
Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. Advances in Experimental Social Psychology, 19, 123-205.
Selman, R. L. (1971). The relation of role-taking to the development of moral judgment in children. Child Development, 42, 79-91.
Simon, H. A. (1955). A Behavioral Model of Rational Choice. Quarterly Journal of Economics, 69, 99-118.
Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate. Behavioral & Brain Sciences, 23, 645-726.
Studts, J. L., Ruberg, J. L., McGuffin, S. A., & Roetzer, L. M. (2010). Decision to register for the National Marrow Donor Program: rational vs emotional appeals. Bone Marrow Transplantation, 45, 422-428.
Sunstein, C. R. (2015). Nudging and choice architecture: ethical consideration. Yale Journal on Regulation, 809, 1-51.
Suter, R, S., & Hertwig, R. (2011). Time and moral judgment. Cognition, 119, 454-458.
Paxton J. M., Ungar, L., & Greene, J. (2012). Reflection and reasoning in moral judgment. Cognitive Science, 36, 163-174.

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