REVIEW ARTICLE

How to capture moral behaviors: From laboratory to everyday life

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ABSTRACT

Morality is an eternal topic that has been contemplated and pursued by both philosophers and lay people alike for thousands of years. Psychologists have found that individuals' moral judgments, moral emotions, moral intentions, moral motivations, moral reasoning and moral behaviors are not internally consistent. Among these, moral behavior is most relevant to everyday life. Given that moral behaviors are influenced by various factors such as personality traits (*e.g.*, virtue), social situations (*e.g.*, time pressure), and social desirability (*e.g.*, moral image), it is quite challenging to effectively and accurately measure moral behaviors both in the laboratory and in real-life social situations. Our current work synthesizes differing concepts of moral behaviors and their conceptual distinctions from diverse disciplinary perspectives. We then offer a selective review on differing paradigms such as scale method, laboratory experiment, virtual reality, field experiment, big data approaches and experience-sampling method. It is our hope that this work would inspire researchers to better capture and explore the complex and dynamic moral behaviors, and provide potential future prospects to the emerging trends of novel thoughts, theories, methods, paradigms and applications for unveiling moral behaviors and their underlying processes.

Key words: moral behavior, measurement paradigm, big data, virtual reality, experience-sampling method

INTRODUCTION

As the famous German philosopher Immanuel Kant once said: Two things awe me most, the starry sky above me and the moral law within me. Morality is an eternal topic that philosophers, psychologists and the general public have been contemplating, arguing, and debating for thousands of years. In recent years, the field of moral psychology has developed vigorously, covering divergent theories and methods from various domains such as social psychology, behavioral economics, neuroscience, experimental philosophy, and cultural anthropology (Haidt, 2007; Hu *et al.*, 2018). Philosophy has a long history of intellectual discussions about morality, from Aristotle's virtue ethics to Kant's rationalism, Hume's emotionalism, *etc.*, these metaphysical philosophical thoughts have profoundly influenced psychological perspectives on morality (Peng *et al.*, 2011b; Yu *et al.*, 2011). In the early stages of psychology, influenced by Kantian rationalism, it mainly focused on the stages of moral development, moral inferences, and other cognitive factors (Kohlberg, 1994). Later, influenced by emotional revolution, it began to study non-cognitive factors such as moral emotions and moral intuitions (Carlo, 2014; Greene *et al.*, 2001; Haidt, 2001). We argue that, regardless of theoretical perspectives, morality research should ultimately center on describing, explaining, and promoting individuals' authentic moral behaviors in daily life contexts. Our current work seeks to synthesize differing moral paradigms to capture moral behaviors, which may be beneficial to inform moral education and moral

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enhancement both in theory and in practice.

A large amount of literature shows that there are blatant inconsistencies between moral identity, moral judgments, moral intentions, moral motives, moral reasoning and moral behaviors. For instance, Bandura proposed a theory of moral disengagement to explain how and why people mentally defend themselves to avoid moral punishment (Bandura *et al.*, 1996). Therefore, most extant moral indicators cannot accurately reflect and predict actual moral behaviors (Batson *et al.*, 2002; FeldmanHall *et al.*, 2012; Teper *et al.*, 2011). Although there are factors such as emotional states that can partly explain these inconsistencies (Teper *et al.*, 2015), we contend that researchers cannot use moral intentions or moral motives to replace moral behaviors. Moral behaviors derive from a complex interplay between personality traits such as moral personality and social situations such as normative social contexts (Hu *et al.*, 2018). In addition, there is a close relationship between moral behaviors and culture. The nature of a particular behavior may vary across cultures; an action considered immoral in one cultural context may be regarded as morally acceptable in another (Fiske & Rai, 2014). Using artificial stimuli to induce unethical/immoral behaviors in laboratory settings is currently the mainstream paradigm for measuring moral behaviors (Hofmann *et al.*, 2014), but we must be alert to the extent to which these behavioral paradigms can effectively simulate moral behaviors in our everyday life. To tackle this issue, our current review does not aim to provide a comprehensive overview of all types of moral behaviors, but rather to synthesize representative and diverse types of moral paradigms and their relative strengths and weaknesses. We also attempt to envision emerging trends of future directions of paradigm shift on moral behavior research, which ultimately inspire future work to better capture the complex and dynamic moral behaviors in real life settings.

DEFINING MORAL BEHAVIORS

Although moral behaviors have been widely concerned and studied, there is currently no consensual and unified definition. In addition to psychology, disciplines such as philosophy, economics, sociology, anthropology, and biology each have differing opinions and understandings to conceptualize moral behaviors. Biology emphasizes the survival and reproduction functions of moral behaviors, which are considered to be selfless and altruistic behaviors that can be observed among social animals (Ellemers *et al.*, 2019). Evolutionary biologist Ayala (2010) defines moral behaviors as whether an individual considers the impacts of his/her behaviors on others in a compassionate way. If it is just immoral thoughts or behaviors that violate local ethical customs, such as eating pork, he didn't include it in the category of moral behaviors. Philosophy, law, and psychology put more emphasis on the social signaling functions of moral behaviors, focusing on how specific behaviors conform to different moral principles (Churchland, 2011), the relationship between moral cognitions and moral behaviors (Blasi, 1980), and strive to distinguish moral behaviors from animal moral behaviors (Ellemers, 2018). Hertz and Krettenauer (2016) conducted a meta-analysis of 111 studies on moral behaviors, and defined moral behaviors as avoiding harm to others, or actively promoting the happiness of others by helping, sharing, and caring for others. They divided moral behaviors into three categories: Avoidance of antisocial behaviors such as aggression; prosocial behaviors, including volunteering, and other ethical behaviors. Liu (2008) believes that moral behaviors are actions that conform to social norms under the domination of moral will. We adopt a synthesized definition of moral behaviors that both emphasizes the observable moral behaviors and mental aspects of the moral agent, as well as is sensitive to social norms. In other words, whether an action is moral or not depends not only on whether the act itself is a conscious effort by the agent to cause harm to others, but also on the local social norms (Ayala, 2010). Therefore, moral behaviors are closely tied to the orderly operation and prosperity of human society. Moreover, there is an inseparable connection between morality and well-being. Rooted in the tradition of ancient Greek philosophy, virtue is regarded as the foundation of a good life, and well-being is seen as a lasting state of happiness that arises from living a life guided by moral reasoning (Dhiman, 2020). Moral behaviors promote both the well-being of others, and exert positive effects on the individual, helping to enhance well-being and improve mental health (Hoyda & Jarry, 2024).

MEASURING MORAL BEHAVIORS

Scale methods

The moral behavior scale does not capture the observable behavior in real life, but rather focuses on the participants' self-reported intention to behave morally or immorally (Krylova *et al.*, 2017). For example, the Self-Reported Inappropriate Negotiation Strategies scale (SINS) is a classic scale for measuring immoral behavior, which measures whether participants are willing to adopt unethical negotiation strategies, such as "deliberately distorting factual information to support your negotiation arguments or positions" (Hershfield *et al.*, 2012). In addition, some researchers have recently developed a more general daily moral behavior scale. Myyry *et al.* (2021) developed the three-point Morally Relevant Behaviors scale to evaluate the ethical or unethical behaviors of college students in their daily

lives. Although some researchers try to overcome the shortcomings of the scale method, moral behaviors are easily influenced by social norms and judgmental standards, it naturally has a strong color of right and wrong (Ellemers *et al.*, 2019) and easily influenced by the social pressure (Graham *et al.*, 2016), so the self-rating scale is easily affected by social approval and demand characteristics. There are many examples of moral contradictions in individuals who show a discrepancy between what they say they will do and what they actually do (FeldmanHall *et al.*, 2012). For example, there is an inconsistency between immoral behavior measured by the scale and measured implicitly (Pozzoli *et al.*, 2016). Therefore, most current research seldom uses scales and surveys to measure moral behaviors.

Behavioral experiments

Cheating and lying behaviors

Because moral behaviors include the avoidance of antisocial behavior, the creation of artificial stimuli to measure participants' cheating or lying behavior in laboratory situations has become the dominant paradigm in current behavioral experiments (Graham, 2014). Cheating or lying behavior falls under a specific form of immoral behavior, which overstates individuals' performances to earn more money rewards, but it can undermine an individual's moral self-concept and may have long-term costs (Gino & Mogilner, 2014).

These paradigms are standardized and simple to operate, and participants' responses to stimuli are natural and authentic. Moreover, it's unquestionable that moral behaviors can be influenced by cultural elements, including languages, social contexts, social norms and so on (Graham *et al.*, 2016). Using behavioral experiments can mitigate the influence of culture on moral behavior to some extent because it contains a collection of "moral rules and mathematical functions", which are independent of the cultural context and the natural language.

There are many kinds of paradigms to evaluate cheating or lying behaviors, such as anagram task (Wiltermuth, 2011), computer-glitch cheating paradigm (Lu *et al.*, 2017), and so on. Ellemers *et al.* (2019) studied all the literature on moral psychology from 1940 to 2017 and obtained the three most influential papers in the field of moral behavior, and we will present the paradigm used in one of them to measure deceptive behavior: The number-search matrix task. It provides participants with 20 matrices consisting of 12 three-digit numbers. The participants need to find as many numbers as possible in the matrix that add up to 10 within a limited time. At the end of the five minutes, each participant needs to report the number found, fold the answer sheet and throw it into the wastebasket containing the answer sheets of other participants. The whole process is completed without supervision. Therefore, the participants think that this is an anonymous answering process. But in fact, the last number of the last matrix in the participant's answer sheet corresponds to the participant's Identification number (Gino & Mogilner, 2014). Therefore, researchers can compare the number of self-reported participants with the actual number to determine whether the participant has committed a deceptive behavior.

However, these paradigms are limited to the laboratory settings and two specific immoral behaviors, and it's unsure that the laboratory paradigms can capture the psychological processes underlying the moral situations that people actually face in real life (Bauman *et al.*, 2014), the results thus cannot be overly generalized to other moral domains or outside the lab.

Economic Games

Game theory has become a popular paradigm in behavioral and evolutionary research to study how this social control makes groups do better (Fehr & Gächter, 2002), with the central idea that groups can benefit from enforced fair norms, but on the other hand, it is expensive for the individuals enforcing the norms (Eriksson *et al.*, 2017). These games simulate real-life social dilemmas that can only be solved through collective action. Thus, preconceived beliefs about fairness, justice, harm, and other moral concerns about right and wrong are likely to influence participants' decisions (Clark *et al.*, 2017). The ultimatum game was first introduced by Güth *et al.* (1982). The task consists of a proposer and a responder, the former has the right to propose an allocation plan for a certain amount of money, and the latter has to make a decision to accept or reject the plan. If the responder chooses to accept, both parties will receive the corresponding amount of money in the allocation plan; if the responder chooses to reject, both parties will gain nothing. Whether the responder rejects is the result of a trade-off between perceived fairness of the money-sharing strategy and financial harm to the proposer (Oosterbeek *et al.*, 2004). Using the ultimatum game, Crockett *et al.* (2010) found that participants with more serotonin were less likely to reject unfair offers.

However, economic games' disadvantages are also very prominent. Explicit and implicit factors may have impacts on the bargaining games, such as culture, expectations, property rights, *etc.*, which may lead to diverse behaviors (Hoffman *et al.*, 1994; Oosterbeek *et al.*, 2004; Suleiman, 1996). And this kind of paradigm fails to take into account social situations, specific norms, and emotional experiences that have a significant impact on moral or unethical behavior in real life (Ellemers *et al.*,

2019). It is thus deemed as artificial forgery and the findings cannot directly capture, explain and predict the complex and dynamic real-life moral behaviors.

Cooperation paradigms

Buchan *et al.* (2009) developed a multilevel sequential contribution (MSC) paradigm to measure the impacts of globalized experiences on cooperative behaviors, which was born out of the multilevel public-goods experiment paradigm but the difference is that in the MSC paradigm, the decisions made by the participants do not affect the group they belong to, but affect themselves and others in the future. Participants would receive 10 tokens at the beginning of the experiment. The actual value of one token is equivalent to 0.5 United States dollars. There are three accounts: Personal Account, Local Account and World Account. Each token invested in a personal account is equivalent to the value of a token for the participants; each token invested in a local account would be equally divided among three local anonymous individuals, except for the participants. The token value would be doubled by the experimenter, that is, for every token invested in the local account, half of the token value would be lost; each token would be invested in the world account, and the examiner would triple the token, but participants can only get one-twelfth of it, and the remaining tokens would be divided equally into three other anonymous participants from the same area as the participant and two groups of four from different countries (the participant was not told the specific country, they only know they are from any of the four continents where the research is conducted), that is to say, for every token invested in the local account, the participant would lose three-quarters of the token value. The tokens allocated to the local account and the world account represent the moral behaviors of the participants, but the difference is that the representatives allocated to the local account can only represent the participants' cooperation with narrow local groups, while the tokens allocated to the world account expand the boundaries of cooperation to include local and non-local individuals. This paradigm is an experimental paradigm for studying the boundary effects of cooperative behaviors that is worthy of advocacy and promotion, because it distinguishes different levels of cooperation objects, which makes it possible to examine people's moral inclinations towards themselves, ingroups, and outgroups. These findings are inspiring to induce more open questions: Given that we all live in a multicultural world (Hu *et al.*, 2020), do people's divergent experiences of globalization expand cooperation with outgroups members or solidify their initial preferences for ingroups members. What might be the mediation mechanisms and boundary conditions? Are they affected by moral values? Are they affected by differing psychological strategies to cope with globalization, such as multicultural acquisition and ethnic protection (Hu *et al.*, 2020; Hu *et al.*, 2021)? These are still open issues to be explored by future work.

Virtual reality (VR)

Virtual social psychology is a new paradigm in which has emerged in recent years (Peng *et al.*, 2011a). Due to ethical reasons, laboratory experiments could not expose participants to dangerous situations, which affects the validity of social behaviors. For example, risk-taking behavior refers to the behavior that helpers protect and save others even at the cost of their lives. This kind of risk-taking behavior is highly dangerous and will deplete one's own interest, but it has obvious potential benefits (Farthing, 2005). Due to the high risk of this behavior, relevant empirical studies have avoided exposing the participants to the crisis situation itself, but this may have psychological impacts on the participants and interfere with the authenticity of the situation (Slater *et al* ., 2013). However, the latest developments in immersive virtual environment technology enable these behaviors to be performed in an artificial but real 3D digital world. Studies have found that behaviors observed in VR experiments are highly consistent with behaviors observed in a typical laboratory environment (McCall *et al.*, 2009). For example, Slater *et al.* (2006) found that using VR technology to repeat Milgram's classic obedience study, the participants' responses were consistent with those in the original experiment, even when only faced with virtual participants and electric shocks. Therefore, some researchers used VR technology to measure people's true reactions to the trolley problem, and found that most of the participants showed moral utilitarianism instead of both the utilitarian and deontological behaviors in the original moral dilemmas (Francis *et al.*, 2016; Navarrete *et al.*, 2012). Therefore, VR, as a research paradigm that combines the advantages of laboratory experiments and real situations, achieves a certain balance between internal validity and ecological validity, it is worthy of further advocacy and promotion. The results, however, show that not all social situations in real life can be well simulated, for instance, the present VR moral researches address single virtual reconstraction of the moral dilemma (Francis *et al.*, 2016), so it needs to be included to consider constructing multiple personal moral dilemma and cross-validated with field experiments or real life moral behaviors.

Field experiments

The field experiment has been applied in social psychology for a long time, its conditions are open and dynamic, containing various factors that are much more complex than the laboratory condition, thus providing conditions for studying complex mental processes in real life. Although the internal validity of field experiments is

not as good as that of laboratory experiments, a well-designed field experiment can make up for this defect to a certain extent and bring out the advantages of high ecological validity. Cohn *et al.* (2019) measured integrity behaviors of more than 17,000 participants in 355 cities of 40 countries. They randomly selected a experimenter from 11 male experimenters and 2 female experimenters to pretend that he/she found the wallet on the street corner, but he/she was in a hurry, and hoped that the chosen participant would take care of the wallet. The wallet contains a small amount of cash and the owner's email address. The operational definition of integrity behavior is whether the participant will contact the owner's email address within 100 days. In this study, it is surprising that China has the lowest integrity behavior of all countries. This may be because "take care of" is translated as "custodial" in the Chinese context, which hinders the Chinese participants from returning their wallets. It was also found that in an 11-week field experiment in a supermarket where eye images or control images were displayed on charity collection buckets, there was a 48% increase in donation behavior for the presence of eye images compared to control images (Powell *et al.*, 2012).

In recent years, the field experiment method has been more favored and adopted in the fields of social psychology and organizational behavior (Hansen & Tummers, 2020), however, field experiments still have many drawbacks (Heiman, 1995), such as the lack of adequate control over additional variables in the environment, which reduces internal validity; the lack of response control in field experiments because no guide is provided to instruct participants, whose responses may be very broad; the difficulty of consistently manipulating an independent variable in field situations, where experimental assistants are usually used to set up a situation, and the assistant's behavior may not be consistent and may involuntarily respond to a more natural behavior of the participant; the sample of field experiments lacks representativeness, and participants are often not randomly selected under field conditions; a final issue is the ethics of field experiment, in some contexts, the research procedure may be considered an invasion of privacy (Carrier, 1999). This reveals to us that the influence of other interfering variables, such as time, space, language expression, *etc.*, should be reduced as much as possible to improve the field experiment's precise control, so as to get more rigorous research conclusions.

Big data approaches

Big data psychology has become a research hotspot and paradigm shift in recent years (Yu *et al.*, 2015). The measurement paradigm of moral behaviors is mostly confined to laboratories without social contexts, and the rise of big data technology provides a more ecologically valid method for capturing moral behaviors in real life. Researchers believe that language can infer the human psyche (Braun & Clarke, 2006). Therefore, extracting semantic information from social platforms allows researchers to infer the relationship between natural language and psychological phenomena. This method is called natural language processing which originated in the 1950s (Dostert, 1955). The implementation of Natural Language Processing (NLP) differs greatly between different methods. In order to clarify the concept, Iliev *et al.* (2015) divide NLP methods into three categories. Here is a brief description of the differences between the three methods.

The first method is called user-defined dictionaries (UDD), which relies on a dictionary developed by experts. It includes words related to the dimension of interest. The purpose is to classify the semantic content of the text according to a given dimension. The method is to sum the number of occurrences of words related to the dimension specified by UDD in the text (Pennebaker, 2011; Tausczik & Pennebaker, 2010). Yu *et al.* (2020) and others used a similar method to describe how the Chinese people's moral motivation changes dynamically within 24 h a day. They found that people have the highest moral motivation in the morning, followed by a decline in moral motivation in the afternoon and evening. Among them, eating time and sleep time would restore moral motivation (Yu *et al.*, 2020). The second method is called feature extraction, which relies on machine learning algorithms to extract features from text and can predict variables of interest. The algorithm needs to be trained on a subset of the text related to the variable, and then it can be applied to the target text after passing the test. Both of these methods only consider the occurrence rate of words and ignore the context in which the words appear. The third method is the word co-occurrence method, which tries to make up for this shortcoming by capturing the contextual connections between words. This method usually goes through several steps, and the specific steps have differences among differing methods (Hoover *et al.*, 2018). Researchers have used big data methods to examine ethical issues. For example, Graham *et al.* (2009) found that liberals' corpus of sermons (corpus of sermons) pay more attention to harm and fairness, while conservatives pay more attention to sacredness and authority. This conclusion was consistent with their previous research. Big data methods are widely used and are most closely related to people's natural behaviors, and behavior trends based on massive data can describe more universal moral behaviors. Its disadvantage is that the relevant models cannot explain causality and cannot exclude the subtle influence, even the word co-occurrence method can only take into account the

context in which the two words occur together, not the dynamic and subtle contextual connections. Therefore, although it is worthy of advocacy and promotion, it should be cautiously inferred in the research process and form a corroborating relationship of complementarity with other moral paradigms.

Experience-sampling methods

Experience-sampling methods were first created by Rexford Hersey in 1932 to measure the daily work experience of 12 men (Beal, 2015). In recent years, the experience sampling method (ESM) has been widely used in the field of organizational behavior, and related studies have obtained repeated measures (daily, multiple times per day) of employees' perceptions of various structures, with the aim of obtaining employees' lived day-to-day experiences (Gabriel *et al*., 2019). However, it was not until 2014 that Hofmann *et al.* (2014) published in *Science,* pioneered the application of ESM to morality, extending the scenario of moral behaviors to any place where people are at the time of the cell phone ring notification and any ethically relevant behaviors they exhibit, maximizing the ecological validity of the study. They selected 1252 adult participants aged 18-68 years in the United States and Canada and sent a questionnaire on moral behaviors and nine different moral emotional (*e.g.*, guilt, disgust) state scales to participants at random five times a day for three days from 9 am to 9 pm. The questionnaire on moral behaviors recorded whether the participants had, in the past hour acted ethically or unethically, whether they were the recipients of moral behaviors, or whether they witnessed or heard about the moral/immoral behaviors. While previous moral psychology has focused more on immoral behaviors, this study also shows that people regularly encounter a variety of caring, generous, and well-intentioned behaviors in their daily lives. This study validates some conclusions obtained in the laboratory, such as moral license and moral contagion (being the subject of moral behaviors increases the likelihood of subsequent moral behavior), but also rejects some conclusions that were regarded as norms in the past, such as the absence or presence of religious beliefs has no significant effects on the performance of moral behaviors. Following this, a body of literature has emerged that uses ESM to study ethical behavior. For example, Meindl *et al.* (2015) tested the consistency of real world morality *via* two experience sampling studies; Prentice *et al.* (2020) used the ESM to study the relationship between moral need satisfaction, ethical behavior, and psychological flourishing.

Although the empirical sampling method is effective in capturing real-life ethical behavior, it remains a form of self-reporting and faces some unavoidable challenges that sometimes limit its usefulness, such as repeated assessments, missing data, internal validity, and other issues (Beal, 2015). Ellemers *et al.* (2019) argue that most of the current moral research is limited to the interpersonal level and that more intragroup or intergroup moral behavior should be considered in the future by conducting a meta-analysis of 1278 moral psychology-related papers. Unfortunately, however, the ESM is still a within-person level approach that cannot assess group morality (Gabriel *et al*., 2019).

Comparisons of different moral behaviors measurements

As shown in Table 1, each measurement method has its own advantages and limitations, making it suitable for different research contexts. The scale method is easy to administer, but is rarely used due to the influence of social desirability and the deviation of measured intentions from actual behavior. The three types of behavioral experiments are standardized and have good internal validity, but their ecological validity is not sufficient due to the limitations of the laboratory context. Methods with higher ecological validity, such as virtual reality, field experiments, big data approaches, and experience-sampling methods, are able to capture real-life moral behaviors, but they also face different challenges such as technological constraints, difficulties in controlling variables, and ethical concerns. Notably, other factors also influence the applicability of these measurement methods. For example, cultural factors may affect economic games and cooperation paradigms, while technological advancements are expected to further promote the use of methods such as VR and big data approaches.

In summary, there is no single optimal method. Future research should integrate methods based on research needs, combining multiple paradigms in order to more fully capture the complex and dynamic nature of moral behaviors in real life.

DISCUSSION AND FUTURE PROSPECTS

Moral behaviors are core components of human beings' psychological processes and behavioral patterns. Moral phenomena permeate all aspects of the social field and partly constitute people's rapidly changing social life (Hoover *et al*., 2018). In ancient and modern times worldwide, for a long time, the study of ethics was mainly in the hands of philosophers who contemplated about ethical issues in discursive forms,. For psychology, as an empirical science, the adoption of rigorous and sophisticated experimental paradigms to verify or falsify metaphysical ethical disputes is highly symbolic and transformative, which has gradually emgerged as a new and flourishing field of study: Experimental ethics (Peng *et al*., 2011b).

Table 1: Comparison of different moral behavior measurement methods

Method category	Advantages	Limitations	Applicable contexts
Scale method	Clear standards; easy to administer	Susceptible to social desirability bias; low ecological validity	Suitable for preliminary investigation; this method is rarely used in current research
Cheating and lying paradigms	Standardized; easy to operationalize; less influenced by cultural factors	Limited generalizability; specific to certain behaviors	Measuring two specific immoral behaviors
Economic games	Structured; highly controllable; simulates social dilemmas	Influenced by culture and expectations; lacks real-world behavior validity	Applicable for simulating collective action in resolving social dilemmas
Cooperation paradigms	Differentiates different levels of cooperation targets; reveals boundary effects	Mechanisms are complex; culturally sensitive	Suitable for examining cooperation across relationships
Virtual reality	Balanced control and realism; captures high-risk moral behaviors	Limited scenarios; technology-dependent	Ideal for simulating high-risk or ethically difficult real-life settings
Field experiments	High ecological validity; close to real life	Difficult to control variables; ethical issues; low internal validity	Applicable in studying moral behaviors in natural, uncontrolled environments
Big data approaches	Analyzes large-scale natural behavior; shows widespread trends	No causal inference; sensitivity to contextual semantics	Best for uncovering universal moral behavior patterns
Experience-sampling Methods	Captures real-life moral behavior; has strong ecological validity	Self-report bias; missing data issues; difficult to assess collective or group-level morality	Excellent for tracking individual-level dynamic moral activity in real-world context

Among differing aspects of morality, moral behaviors are undoubtedly the most important and practical constructs because it's the ultimate standards of moral psychology research (Ellemers *et al.*, 2019). The study of moral behaviors can provide us with guiding ideology and practical strategies for conducting effective moral education, leading moral progress, and shaping better ethical environments. Our selective review distinguishes different definitions of moral behaviors, and emphasizes the importance of moral principles and moral will. Secondly, we review the existing paradigms of measuring moral behaviors, mainly from the directions of scale method, experimental method, VR, big data and empirical sampling method, which are classic paradigms in social psychology in an ecological validity incremental manner. We did not list all the indicators that measure ethical behavior, such as moral neuroscience, because the field is currently immature and still controversial (Abend, 2013). By reviewing and explaining in detail the various paradigms of moral behaviors and their relative strengths and weaknesses, we actually hope to provide a representative academic landscape for researchers in the field of morality to better detect and capture authentic moral behaviors. Our research reviews the major current paradigms for measuring moral behavior, but it is important to note that cultural differences may influence the applicability and validity of these methods. Cultural norms can shape how individuals interpret moral behavior, meaning that the same measurement tool may yield different standards and interpretations across cultural contexts. For example, individuals from collectivist cultures are more likely to respond in the direction of societal expectations (Lalwani *et al.*, 2006), making the scale method more susceptible to social desirability bias in such contexts. Moreover, individuals from Western, Educated, Industrialized, Rich, and Democratic cultures tend to value individual autonomy, while those from other cultures emphasize collective responsibility and social obligations (Graham *et al.*, 2016). So experience-sampling methods may differ in their focus on analyzing moral events in different cultural contexts. Therefore, we should fully consider cultural factors when choosing measurement paradigms and interpreting measurement results. It is also our hope that future researchers can learn from the advantages of various paradigms, take cultural and other factors into comprehensive consideration, and create more natural paradigms to capture people's authentic moral life.

Future considerations of moral paradigms should emphasize their inclusiveness, contextuality, universality, and technological adaptability. First, the moral domain should be expanded. According to the moral foundation theory proposed by Haidt and Joseph (2004), morality can be divided into five basic categories: Care, fairness, loyalty, authority and sacredness. The current mainstream laboratory paradigms mostly focus on investigating one or two moral categories (such as care and fairness). Future research should include broader moral categories and draw on traditional paradigms in other disiplines, such as experimental philosophy (Knobe *et al.*, 2012), Fei Xiaotong's notion of "Cha-Xu-Ge-Ju" (Yu & Xu, 2018a), helping behaviors, aggressive behaviors, developmental psychology, educational psychology, organizational behavior, artificial intelligence (AI; Yu & Xu, 2018b) and other theories and methods. Second, the profound impacts of culture on moral behaviors are deeply ingrained (Graham *et al.*, 2016; Hu *et al.*, 2018; Hu *et al.*, 2018; Hu *et al.*, 2020). Because the cultural roots of "human nature is inherently good", Chinese people pay more attention to moral evaluation and normative contextual influence, and have a higher concealment for the appearance of moral behaviors (Zhang & Wang, 2010). Research shows that Chinese

people exhibit less unethical behavior in the presence of a third party, compared with counterparts from Western culture (Seo *et al*., 2020). Therefore, whether the moral paradigms derived from Western moral psychology discourse can properly capture the moral behaviors of 1.4 billion Chinese people is still questionable. Therefore, we emphasize the necessity of incorporating a cultural perspective into the measurement of moral behavior to ensure that future research paradigms are more culturally adaptive. Third, future research should explore the antecedents and consequences of moral behaviors. For example, what vital roles does time, space, and social interactions play in the dynamic constructions of moral behaviors, how do moral behaviors differ across various types of social relationships such as family, friends, strangers, ingroup, outgroup, AI *etc*., and whether people with virtues are happier than people without virtues (Yu *et al*., 2014). Taking well-being as a typical example, it has been shown that engaging in moral behaviors is associated with increases in happiness and sense of purpose (Hofmann *et al*., 2014). At the same time, acts of kindness have a positive impact on life satisfaction and can enhance individual well-being (Buchanan & Bardi, 2010). The close connection between moral behaviors and well-being suggests that future research could consider moral behaviors as a potential pathway through which well-being can be improved. Fourth, the impact of advances in emerging technologies such as AI on the study of moral behaviors deserves further attention. With the rapid development of AI technologies, tools such as deep learning and natural language processing have begun to be integrated into moral psychology. For example, AI can be used to identify and classify immoral content in social media (Shah *et al*., 2022); in the field of digital forensics, machine learning has also been used to analyze large datasets and to predict crimes and frauds (Qadir & Varol, 2020). AI not only facilitates the development of big data approaches in moral behaviors research, but can itself be used as an object of moral judgment to study the mechanisms of human responses to immoral requests (Lanz *et al*., 2024). Therefore, future research should reflect on effective ways to integrate AI into the measurement and modeling framework of moral behaviors to build a more practical research paradigm.

Taken together, future directions of moral behaviors research include (but not limited to) the following themes: First, how to use well-integrated paradigms to detect and capture real-life moral behaviors of Chinese people (and more nuanced cultural subgroups such as differing social class, geographical regions, and ethnic groups); second, how to describe, explain, and predict the moral diversity of Chinese society (such as mainstream culture and subcultures); third, how to implement effective moral education strategies for different social groups based on empirical evidence, *etc*; fourth, it is essential to explore how AI technologies can be used to develop more effective research tools for moral behaviors, in order to capture individuals' authentic moral experiences and promote the further advancement of AI moral psychology. Future work should further advance basic research, applied research and translational work to advance our understanding of these vital moral issues, unveil their underlying mechanisms and inform better policy-making in the moral domain.

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Author contributions
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Not applicable.

Conflict of interest
The authors declare no competing interest.

Use of large language models, AI and machine learning tools
This study used GPT-4 to polish the English expressions and improve the readability of the text. The authors take full responsibility for the content and interpretations.

Data availability statement
Not applicable.

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