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ARTICLE

Digital interventions to support morality: A scoping review

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Abstract

Background: Morality and moral reasoning develop over the course of life, but such development may encounter obstacles. Psycho-educational interventions could be designed to improve moral reasoning and attitude towards prosociality. In the last decades, many interventions employed digital technologies ranging from multicomponent online platforms to serious games and virtual reality, making use of interactivity and immersive properties that could make moral stimuli more engaging.

Aims: This study aimed at reviewing the literature on digital interventions to support morality and moral reasoning, carried out with subjects of all age groups.

Methods and results: Two electronic databases were searched with a systematic approach, and retrieved publications were scanned by authors against inclusion criteria. Twenty-three articles were reviewed. In general, the literature describes encouraging results of digital interventions to support morality. Moreover, a huge variety of morality conceptualizations emerged across various contexts (e.g., professional, school and sports) as well as various outcome measurements (e.g., change in attitudes and change in behaviour).

Conclusions: Effectiveness of digital interventions may relate to immersive and interactive simulations in particular, in that they allow participants not only to learn about moral rules and principles but also to actively exercise their own morality to make decisions. Future research may build on the present scoping review to analyse specific types of interventions' effectiveness with a meta-analytical approach.

KEYWORDS
digital technologies and learning, learning environments, moral education, support for learning, types of learning

INTRODUCTION

Morality can be defined as a system of values, practices, beliefs, norms and psychological mechanisms that allow people to overcome selfishness and make social life possible (Haidt, 2008). The level of morality is directly related to the well-being of individuals and the implementation of prosocial behaviours (Farhan et al., 2015; Hui et al., 2020). Promoting morality in communities and societies is essential to educate individuals who are responsible towards others. Morality has a central role in phenomena such as bullying (Menesini et al., 2013) and deviant or criminal behaviours (Antonaccio & Tittle, 2008; Paruzel-Czachura et al., 2023). The development of morality from a psychological point of view has been a topic of interest for researchers for decades. However, while the development of morality can be considered a natural capacity of human cognition, it is not always a smooth process. Moral development has to overcome a number of challenges over the course of life.

Specifically, while some consider moral intuitions universal (Haidt, 2008; Haidt & Bjorklund, 2008), individuals may develop moral reasoning at different paces based on individual characteristics and the social environment (Barnett et al., 1995; Kohlberg, 1968; Lifton, 1985), or they should learn how to adhere to moral principles that may appear in contrast with each other. Other approaches have highlighted that moral intuitions could differ across individuals based on contextual influences (Dubljević et al., 2018).

Furthermore, social psychology has demonstrated that the relationship between moral principles and behaviour is at least in part indefinite. In other words, people with strong moral beliefs may still act immorally depending on social and contextual influences (e.g., committing a crime because of peer group influence) (van den Berg et al., 2022; Zimbardo, 2011). Moreover, moral development is not immune to specific distortions associated with psychopathological conditions. For example, people with a diagnosis of narcissistic or antisocial personality disorder exhibit impaired morality or issues in mechanisms associated with it (e.g., empathizing with others or the control of aggression) (Blair, et al., 1995; McGuire et al., 2015). Finally, even when moral development has reached maturity, people could find themselves in a state of uncertainty regarding specific moral dilemmas faced in the everyday social context (FeldmanHall et al., 2012). In any case, especially in the psychological literature, the development of the ability to elaborate on moral issues (i.e., moral reasoning) has been considered desirable, and tied to the development of prosocial attitudes and/or the enactment of prosocial behaviour (De Caroli et al., 2014; Eisenberg et al., 2014; Miller et al., 1996).

For these reasons, the improvement of morality has been a topic of interest for philosophers and scientists for hundreds of years. Multiple interventions have been developed within social sciences to improve moral development, values and judgement. For example, Schlaefli et al. (1985) performed a systematic review with meta-analysis on 55 studies that used the *defining issues test* to improve moral development. Their main result was that the discussion of moral dilemmas and psychological development programs were effective; however, effect sizes were higher for adults participants than children. In addition, interventions of a certain length (around 3–12 weeks) were more effective. More recently, Cummings et al. (2007) conducted a non-systematic review of educational interventions to promote moral reasoning in in-service and pre-service teachers. Of the studies reviewed, most included peer counselling interventions, self-analysis, reflection, discussion of moral dilemmas and direct teaching of logical and philosophical concepts critical to the formulation of principled moral reasoning. Morality can be developed through various educational programs (Cloninger & Selvarajan, 2010). However, to truly promote better moral development, direct transmission of a predefined value model (in terms of 'lecturing' or persuasive contents) is not enough; to improve morality, it is necessary to experience situations in which one encounters moral situations and dilemmas, considering different perspectives, making choices and elaborating on their consequences at a personal level (Tuana, 2006). Specifically,

according to the literature, the moral evaluation of the appropriateness of behaviours includes the social information processing stages (Dodge & Schwartz, 1997). Individuals must first selectively attend to and interpret the appropriate cues within a situation, then determine their goals and how to best attain those goals. In other words, exercise and development of morality requires the active elaboration of a context one is involved in, not only passive reception of rules and principles. In recent years, thanks to new technologies, digital environments have become one of the main learning environments for the younger generations, especially in informal settings. New technologies support interest, motivation, collaboration and social interaction between individuals (Degner et al., 2022), and they can be considered facilitators for learning various skills and knowledge. Indeed, such environments allow content to be presented in a clear and multimodal and sometimes interactive way through multiple modalities such as video, image sharing and video gaming (Civantos et al., 2016). In this sense, it is particularly useful to include new media in moral education programs because they can be considered and developed as a 'moral laboratory' in which to experience, in a 'protected' virtual environment, the consequences of specific choices in morally complex situations (Krebs, 2013; Murphy & Zagal, 2013; Triberti et al., 2015). For this reason, several studies have also tried to use new technologies in order to promote the development of morality. That considered, it is still not clear which kinds of new technologies (as well as types of technology-driven interventions) could be more impactful in terms or moral development promotion. Indeed, while systematic reviews exist that address interventions to improve morality in specific populations (Cummings et al., 2007), it is still useful to describe the literature on technology-driven interventions for morality and to maintain a wider focus. Given that a thorough exploration of the field is still possible and we did not aim to confirm or disconfirm a specific hypothesis, we decided to perform a scoping review (Arksey & O'Malley, 2005) in order to map the literature dealing with technology-based interventions to improve morality. In other words, we were interested in gathering information about current methods to use digital technologies to improve moral cognition, moral behaviour and/or moral attitudes.

AIM

Previous research has emphasized that digital environments can be used for a variety of purposes that could possibly contribute to improve moral cognition (Gentile et al., 2009; Patil et al., 2014; Scuotto et al., 2024; Triberti et al., 2015). For example, they can be used in shared forms to improve the opportunity for learners to confront their opinions on moral issues and engage in peer education (Chowdhury et al., 2019). Secondarily, digital environments can provide interactive scenarios (e.g., virtual reality and video games) that go beyond the mere teaching of rules and values, while allowing learners to first-person address moral dilemmas to exercise their moral conduct and put it to the test (Niforatos et al., 2020; Patil et al., 2014; Triberti et al., 2015). One first aim while mapping the literature was to identify the most widely used digital technologies to improve moral cognition and behaviour.

Indeed, the results of the studies may be influenced by the specific type of technology utilized, as well as by several factors such as the focus on specific moral issues and context, population characteristics, measurement tool used to address change: for this reason, a secondary aim was to examine these factors.

One more practical aim was to identify guidelines based on the existent literature to support the future design and testing of digital technology-based interventions to support moral development.

METHODS

This scoping review was performed following PRISMA guidelines (Liberati et al., 2009) and recommendations specific to scoping review efforts (Arksey & O'Malley, 2005). A scoping review does not aim to respond to a specific research question in the sense of confirming or disconfirming hypotheses; rather, it aims at mapping a research field and providing general information that would support the development of

more specific sub-fields of research. The scoping approach was selected in order to capture the complexity and variety of variables, methods and technologies that have been associated with the improvement of moral cognition and behaviour.

Identification of the relevant studies

The selection of articles was based on the PRISMA statement (Liberati et al., 2009). The search strategy was intentionally broad, featuring key terms that would make it possible to identify heterogeneous but relevant contributions. Specifically, we conducted a systematic literature search on 14 March 2024 considering two databases (Scopus and Web of Science) with the following search string:

> 'moral*' AND 'digital' (OR videogame/cyber/game/internet/web/online/virtual/) AND 'improving' (OR efficacy/intervention) limited to the English language and the last 10 years to focus on technologies representing the current scenario. We also excluded contributions indexed as reviews, book chapters, editorials and theoretical articles. We did not register the protocol, as it is usually done with scoping reviews (e.g., Pawliuk et al., 2020; Prediger et al., 2020; Sisk et al., 2019). Records were imported from each database and screened for eligibility in two phases, first by title and abstract and then by full text. Each article was screened independently by two of the authors (CS and ST). In case of disagreement, a third author (MI) was consulted to make a final decision on whether the article should be included; anyway, there was complete agreement between the coders with Cohen's form of kappa KC = 1. Consistently with PRISMA guidelines, in the first screening phase, titles and abstract were searched; for the articles making it to the second phase, we performed full-text analysis of the retrieved contributions.

This review was focussed on the empirical research and therefore was limited to peer-reviewed journal articles. As stated in other studies (Barbagelata et al., 2021; Durosini & Aschieri, 2021; Heckel et al., 2019; Pan-Weisz et al., 2019) the authors placed a priori restrictions by excluding 'grey literature' (e.g., doctoral dissertations, conference abstracts and other non-peer-reviewed sources) to improve review manageability and to avoid the risk of including preliminary results. Although including grey literature is sometimes suggested for scoping review, many scoping review authors still prefer to not consider literature that is not peer reviewed, in order to prioritize rigorous research (Delgado & Der Ananian, 2021; Gonzales et al., 2022). Among the inclusion criteria, we considered studies that predicted an effect on morality understood, in general, as the ability to distinguish between 'right and wrong' by enacting behaviours aimed at the common good. For this reason, we excluded articles in which the word morality was present, but the term was not used as just described. For example, some articles on 'moral injury' were excluded because 'moral injury' refers to a condition that results from exposure to events that involve perpetrating or witnessing actions that violate one's core beliefs (Litz et al., 2009), or betrayal by a trusted authority (Shay, 2014). In addition, studies with participants with psychopathological disorders (e.g., subjects diagnosed with autism, or schizophrenia, or other) were excluded because the participants may show impaired moral development (Dempsey et al., 2020; McGuire et al., 2014; Zalla et al., 2011) that may affect or confound results.

Table 1 features a detailed description of inclusion and exclusion criteria. A total of 1125 articles were generated across the two electronic databases (852 after duplicates were removed). From the review of abstracts, 776 abstracts were excluded. Therefore, 76 full texts were analysed, and of these, 23 studies met the criteria of the study and were reviewed (Table 2).

A flow diagram with details pertaining to screening and reasons for exclusion is included in Figure 1.

RESULTS

The 23 studies in the final sample are interventions using different technologies to support moral development. The studies come from different countries (Europe: $N = 9$; USA: $N = 9$; Asia = 3;

TABLE 1 Inclusion and exclusion criteria in detail.

Inclusion	Exclusion
Population: Healthy human participants	*Population*: Non-human participants (animals, document analysis, etc.); Human participants with psycho-pathological disorders or intellectual disabilities;
Study design: Quantitative research and interventions	*Study design*: Qualitative research. Cross-sectional studies or descriptive-only analysis.
Publication type: Peer reviewed, research journal articles.	*Publication type*: Theoretical and review papers; grey literature (websites, master theses, PhD theses);
Language: English.	*Language*: Other than English
Tools: New technologies and digital tools	*Tools*: No technologies and digital tools
Interventions aimed at promoting morality by using digital tools	Papers not satisfying inclusion criteria for specific reasons, e.g.: • Studies that improved health or cognitive abilities but not moral behaviour/ attitudes/ • Studies that featured the word "moral" but in other senses (e.g., moral injury, a type of psychological trauma; Litz et al., 2009; Shay, 2014). • Studies that did not involve digital tools in the intervention.

Canada = 1; Australia = 1), demonstrating the growing interest in this topic worldwide. In particular, the development of morality through technologies seems to be a relevant field of enquiry especially for what regards research and intervention targeting the younger generations. The earliest published article meeting the inclusion criteria was published in 2013, and the most recent ones came out in 2023 (two papers). The majority of the articles included in this study were published after 2020 ($N = 14$), highlighting an increase for the topic in relatively recent years. For what regards the sample, most of the studies had high school or college students as participants ($N = 13$). Other interventions, however, aimed at professionals in various fields (such as nurses, e.g., Manning et al., 2017; Parchami et al., 2022) in which the enhancement of morality appears to be an indispensable factor for good professional and work management ($N = 3$); the remaining contributions targeted adults with no specifications about their professions. In addition, moral development interventions have focused on promoting morality in general ($N = 11$) or in relation to a specific context (e.g., doping, financial behaviour). Notably, the instruments used to test the effectiveness of the programs and interventions described were of various types. Eleven studies in the sample employed standardized and validated tests assessing aspects of morality such as, moral reasoning, moral disengagement, moral sensitivity and sociomoral attitude. The others instead assessed effectiveness of the interventions through tasks (e.g., moral dilemmas or simulations) or tools indicating knowledge, attitudes or behaviours towards a specific immoral conduct. Furthermore, the studies featured interventions with very different characteristics so they have been divided in three categories depending on the technology involved: Online educational programs ($n = 10$), video games, virtual environments and virtual simulations ($n = 8$) and other interventions ($n = 5$). These categories are analysed in more detail below.

Educational online programs

Ten online moral education programs were identified. This type of study refers to interventions that typically involved the use of multicomponent digital platforms with explicit educational purposes. Such interventions may involve one or more among transmission of knowledge/information related to morality (e.g., online lectures and informational pamphlets; $N = 9$), interactive exercises (e.g., simulated moral dilemmas and explicitly mentioned by two papers in the subsample), online group discussions about moral issues ($N = 6$). Duration of the educational online programs interventions varied, the shortest being a single two hours instance (Bautista et al., 2022) and the longest spanning over an academic year (Garaigordobil & Martínez-Valderrey, 2018). Most of the interventions, however, lasted

TABLE 2 Characteristics of the included studies.

Author (year)	Study design	Country	Sample	Intervention duration	Type of intervention	Study description (aim)	Outcomes of interest
Baghbani et al. (2022)	Single-blinded randomized-controlled trial (RCT	Iran	90 nursing students (Male = 43; Female = 47; Mean age: 33 ± 12) Group 1 (N = 30); Group 2 (N = 30); Group 3 (N = 30)	5 weeks	Educational online program	To analyse the effectiveness of an online educational program on ethical behaviours in two versions: electronic portfolio vs. online discussion forum versus controls	The online discussion forum version obtained higher improvement in ethical behaviour
Bautista et al. (2022)	Repeated measures	Spain	793 students of Higher Secondary Education (grouped into 33 classrooms. The number of participants per class ranged from 14–33)	One session (2 h)	Educational online program	To evaluate the effects of an online educational program. The procedure presented a moral dilemma focussed on a sexting-centred cyberbullying case. The procedure included an initial individual work phase and then a group work phase. The Thinkhub platform employed in the study finally presented the most popular responses to the dilemma to the participants	The results revealed a significant increase in individual levels of moral development after the group work
Beketov and Lebedeva (2022)	Repeated measures	Russia	658 medical students (Male = 54%; Female = 46%; Mean age of Group 1 = 22, 41 ± 0.63 and of Group 2 = 26, 31 ± 0.83)	60 h	Educational online program	Innovative course (frontal lessons and workshops) for building and improving knowledge on plagiarism	The number of students who believe plagiarism is a moral issue increased
Briones and Lara (2016)	Experiment	Spain, Chile	226 university students Training group = 147 students; Control group = 79 students	4 weeks	Educational online program	Use dialogic technique through new communication technologies between heterogeneous groups of students based on their cultural background with the aim to clarify the students' values, defining their own positions related to ethical dilemmas, developing argumentative strategies and an ethical commitment to their profession and contribution to society	Students who participated in the new teaching program showed better scores and positive assessments of both debate involvement and intercultural contact

(Continues)

TABLE 2 (Continued)

Author (year)	Study design	Country	Sample	Intervention duration	Type of intervention	Study description (aim)	Outcomes of interest
Captari et al. (2023)	Repeated measures (mixed methods)	USA	77 chaplains (Male = 21.1%; Female = 75.4%; Transgender = 1.8%; Genderqueer = 1.8%; Mean age = 49.32)	Five sessions every 2 weeks of 75 min	Five Zoom-based sessions cofacilitated by psychotherapists	Five-session spiritually integrated support group intervention facilitated via Zoom by psychotherapists who had advanced training in integrating spiritual and existential concerns to decrease isolation, address moral and spiritual distress, and promote resilience among chaplains	After the intervention there was a decrease in spiritual/moral struggles and an increase in the sense of resilience and prosperity
Carmichael et al. (2019)	Repeated Measures	USA	Study 1 = 104 students (Men = 36; Women = 63; Mean age = 19.55). Study 2 = 86 students.	One session	Classroom activity with digital resources (Educational program)	To demonstrate the effectiveness of an engaging classroom activity that facilitates student learning about Kohlberg's theory of moral development by using digital resources to foster active, experiential learning (study 1); In addition to hearing a standard lecture about moral development, students watched a video of a morally provocative incident, then worked in small groups to classify user comments posted in response to the video according to Kohlberg's six stages (study 2)	Students' scores on a moral development quiz improved after completing the activity (Study 1), and students who completed the activity in addition to receiving a lecture performed better on the quiz than students who received lecture alone (Study 2)
Doyle (2015)	Mixed methods study	Ireland	44 students. Group 1 = 23 students (Male = 70%; Female = 30%; Mean age = 26); Group 2 = 21 students (Male = 33%; Female = 67%; Mean age = 24)	13 weeks	Educational online program	Examine if online student-driven SULIS2 discussion of a range of ethical issues could enhance moral reasoning in higher level tax students	For what regards quantitative results, the online educational program did not improve moral reasoning of the participants
Fino et al. (2022)	Repeated measures	Jordan	59 students	3 months	Educational online program	To evaluate the utility of a tailored ethics education program (suite of didactic online lectures and skills-based workshops) in the pharmacy curriculum for students	After training it was found a development of moral reasoning and decision-making skills of students

TABLE 2 (Continued)

Author (year)	Study design	Country	Sample	Intervention duration	Type of intervention	Study description (aim)	Outcomes of interest
France et al. (2013)	Experiment	USA	673 college students (Men = 254; Women = 419; Mean age = 19.3) Group of study Website = 238; Group of standard Website = 233; Group of control Website = 202	One session (50 min)	Websites	Participants were randomly assigned to view a study Website designed to address common blood donor concerns and suggest specific coping strategies vs. a standard blood centre Website vs. a control Website where participants viewed videos of their choice in order to assess effectiveness of the first website in improving a number of attitudes and moral norm	The study Website produced greater changes in donation attitude, confidence, intention, and anticipated regret relative to both the standard and the control Websites, but only differed significantly from the control Website for moral norm and anxiety
Garaigordobil and Martínez-Valderrey (2018)	Repeated measures	Spain	176 adolescents (aged between 13 and 15 years old) Experimental Group = 93; Control Group = 83	1 year of school	Educational online program + Videogame	The proposal is structured around 25 activities to prevent cyberbullying and ends with a videogame. The activities are carried out in the classroom. The videogame ("Cybereduca") is a trivial pursuit game with questions and answers related to bullying/cyberbullying. This cybernetic trivial pursuit is organized around a fantasy story, a comic that guides the game	The study reports an increase of positive social behaviours, self-esteem, cooperative conflict-resolution strategies, and the capacity for empathy and a decrease in face-to-face bullying and cyberbullying behaviours
García-Martí et al. (2022)	Repeated measures	Spain	145 sport sciences students (Male = 73.1%; Female = 26.9; Mean age = 21.4 years)	5 months	Educational online program	To explore the impact of an anti-doping online education program about substances use and the moral issues related to doping use	Students' moral rejection of doping increased after the course
Grasse et al. (2021)	Repeated measures	California	60 university students (Male = 41; Female = 16; Non-binary = 3; Mean age = 20.6 ± 2.2)	4 total playthroughs	Videogames	To demonstrate the effectiveness of a specific interactive narrative game ('Academical') in teaching ethically complex topics and, consequently, in the impact on attitudes	The videogame *Academical* enhanced the Responsible Conduct in research (RCR) and a variety of important attitudes about RCR

(Continues)

TABLE 2 (Continued)

Author (year)	Study design	Country	Sample	Intervention duration	Type of intervention	Study description (aim)	Outcomes of interest
Kim et al. (2023)	Experiment	USA	311 adult participants (Male = 140; Female = 160; Non-binary = 6; Anonymous = 2; Mean age = 35.2). Four groups: awe (N = 80), flow (N = 73), amusement (N = 81) and control (N = 77)	One session	Emotional induction	To evaluate the effectiveness of interventions based on video and music to induce experiences of awe, flow, amusement and to analyse their relationship with moral aspects	It has been found that compared with control, inducing awe and flow improved ability to address interpersonal conflicts with wise reasoning (1); ability to acknowledge one's epistemic gaps (2); and willingness to improve one's general moral character (3)
Le Maux and Necker (2023)	Experiment	France/ Germany	1744 participants (Male = 57%; Female = 43%; Mean age = 38.5). Individuals are randomly assigned to one of six treatments	One session	Videogames	To assess the effectiveness of an online video game that featured honesty nudges and notification of honesty assessment to influence honesty in game decisions	Both aspects of the intervention (timing of nudges and notification of honesty assessment) are similarly effective in promoting honesty when they take place before an individual has made any decision or after individuals have played five rounds of the mind game
Manning et al. (2017)	Repeated measures	UK	98 children's nurses (Male = 1 Female = 93; Not specified = 4 Mean age = 33.2)	4 weeks	Educational online program	To evaluate the impact of a digital educational intervention on the knowledge, attitudes, confidence and behavioural intention of registered children's nurses working with children and young people (CYP) admitted with self-harm	After intervention changes were observed in some domains related to attitudes and clinical behavioural intention (belief about consequences, moral norm, beliefs about capability)
Newton et al. (2014)	Experiment	Australia	764 students from 10 secondary schools (Male = 60%; Female = 40%; Mean age = 13.1). Experimental Group = 397; Control Group = 367	Two sets of six 40-minute lessons (From 5 to 22 lessons)	Internet-based preventive intervention	To examine whether the internet-based program could reduce risk-factors associated with substance use in adolescents	Participants showed significant reductions in moral disengagement up to 12 months following completion of the intervention

TABLE 2 (Continued)

Author (year)	Study design	Country	Sample	Intervention duration	Type of intervention	Study description (aim)	Outcomes of interest
Panzone et al. (2021)	Experiment	USA	273 university students (84.6% were in the 18- to 25-year age range). Participants were randomly allocated in one of six experimental groups	3 weeks	Incentive-compatible online supermarket	Verify the effectiveness of an online supermarket that presents incentives to analyse the effect of a carbon-based choice architecture, presenting products to customers in high, medium and low carbon footprint groups, in reducing the carbon footprint of shopping baskets. The authors report this architecture of choice to two other policy interventions: (1) a carbon bonusmalus tax on all food products and (2) Moral goal baiting using an online banner noting the moral importance of reducing your carbon footprint	Choice architecture reduced participants' carbon footprint significantly in the third week by reducing the proportion of choices made in the high-carbon aisle. The carbon tax reduced carbon footprint in both weeks, primarily by reducing overall spend. The goal-priming banner led to a small reduction in carbon footprint in the second week only
Parchami et al. (2022)	Randomized controlled trial with one control arm and two experimental arms	Iran	189 204 intensive care nurses (Males = 17.6; Females = 82.4%; Ages = 30–40 years). 189 participants completed the study. Group written simulation = 6; Group control = 62; Group virtual patient computer simulation = 64)	From 2019 to 2021	Virtual patient computer simulation	To compare the effect of written simulation versus computer simulation of a virtual patient on the development of moral sensitivity of ICU nurses	No significant differences in moral sensitivity emerged Immediately after the intervention; follow up at 2 months revealed that both interventions (written and computer) were more effective than control
Sofia and Klimenko (2019)	Experiment	USA	236 undergraduate students (Male = 20%; Female = 80%) 7% freshman, 31% sophomore, 32% junior, and 30% senior students	One session	Videogames (a clip from a commercial video game)	College students enrolled in an online class were randomly assigned to either the experimental or the control group. Those in the experimental group was exposed to a clip of a moral dilemma from a popular video game, whereas those in the control group received no stimuli, in order to assess effectiveness of the first in increasing moral competence	Results showed that participants who indicated playing video games more frequently had a significantly greater increase in moral competence than those who indicated playing fewer or no video games

(Continues)

TABLE 2 (Continued)

Author (year)	Study design	Country	Sample	Intervention duration	Type of intervention	Study description (aim)	Outcomes of interest
Stransky et al. (2021)	Experiment	USA	148 chemical engineering students	Not available	Electronic survey + videogames	To assess and compare two interventions (electronic survey and an immersive videogame) to improve students' ethical decision making in a process safety context	It was observed that the videogame raised more realistic ethical responses
Tanner et al. (2022)	Repeated measures	Switzerland, Germany	345 university students (Male = 43.5%; Female = 56.5%; Mean age = 23 years). Group 1 = 87; Group 2 = 104; Group 3 = 89; Group 4 = 65	4h in about 2weeks	Videogames	1. To examine the effectiveness of a serious moral game—uFin: The Challenge—that was designed to promote moral sensitivity in business 2. To examine the role of metacognitive prompting and prosocial nudging in influencing learning effectiveness	The results show that intervention based on the Game has promoted moral sensitivity
Young and Durwin (2013) (experiment 2)	Experiment	USA	200 subjects (Men = 34; Female = 56; Mean age = 26.61)	One session	Online intervention	In Experiment 2, online participants primed with realism as opposed to antirealism reported being willing to donate more money to a charity of their choice	Priming a belief in moral realism improved moral behaviour
Zarglayoun et al. (2022)	Experiment	Canada	57 participants (ages of 12 to 17 years)	Not available	Videogames	To analyse the impact of two versions of a serious video game that presents realistic, everyday moral conflicts In the evaluation version, the participants' justifications were audio-recorded and coded manually to obtain a maturity score of moral reasoning. In the adaptive version (AV), customized feedback and social reinforcement were provided based on participants' responses	The results showed that those who played the adaptive version showed an improvement in moral maturity

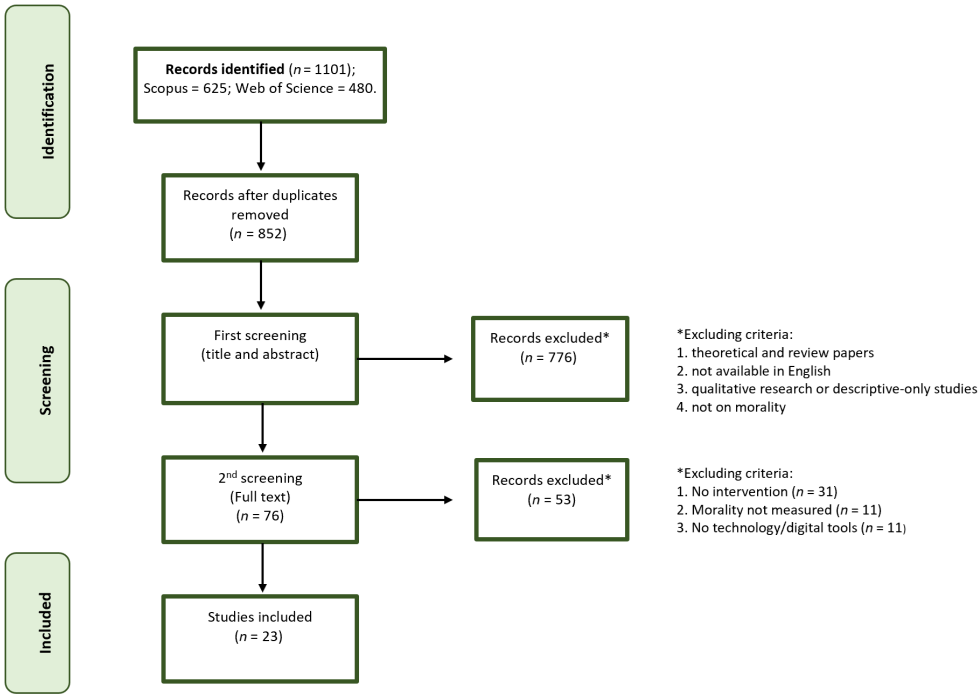

FIGURE 1 Systematic review flow.

for multiple sessions to give to the participants the opportunity to utilize the multiple components of the platform. Six educational online program interventions focussed on promoting morality in relation to a specific issue while the remaining represent interventions aimed at improving access to moral principles and moral reasoning altogether. In general, online educational programs were effective in positively influencing participants' moral attitudes and behaviours within specific contexts: for example, these complex internet-mediated experiences successfully supported anti-doping and anti-plagiarism education (Beketov & Lebedeva, 2022; García-Martí et al., 2022). They also improved knowledge and attitudes towards complex moral issues ranging from self-injury in health care contexts to cyberbullying in educational ones (Bautista et al., 2022; Manning et al., 2017; Newton et al., 2014). Many studies involving online educational programs highlighted that not only participants improved their knowledge and attitudes in terms of morality, but also their decision-making abilities and actual behaviour towards moral issues (Baghbani et al., 2022; Bautista et al., 2022; Briones & Lara, 2016; Fino et al., 2022). Only one study (Doyle, 2015), that employed primarily group discussions about moral issues, reported negative results in terms of moral reasoning improvement.

Video games, serious games and virtual reality

This section includes eight interventions that used video games or virtual reality experiences as interactive and experiential tools aimed at the advancement of moral development through the enactment of actions and choices within the simulations. These simulations were often associated with some kind of moral dilemma or issue the users had to engage with directly. More specifically, the tools used in the studies were online video games (developed ad hoc or commercial) ($n = 4$), serious games or games in which education is the primary objective rather than entertainment (Michael & Chen, 2005) ($N = 2$) and simulations based on immersive virtual reality ($n = 2$). Interestingly, almost all game-based interventions (video games and serious games) targeted adolescents or young adults ($N = 5$), perhaps reflecting the stereotype that games

would be appropriate intervention tools especially when dealing with young people, while many studies suggest they could be relevant to all age groups (Pallavicini et al., 2018; Villani et al., 2018). All game-based interventions highlighted the ability of interactive narratives both to promote morality learning through reflection on the engaging stimuli (Garaigordobil & Martínez-Valderrey, 2018; Grasse et al., 2021; Sofia & Klimenko, 2019; Zarglayoun et al., 2022) and adoption of moral stances and behaviour (Grasse et al., 2021; Le Maux & Necker, 2023). Indeed, games act not only as edifying representations of moral issues but they could also feature reinforcement devices to support behavioural change (e.g., score) (Tanner et al., 2022) and nudges that help to select the most desirable behavioural strategy (e.g., the 'moral reminders' used by Le Maux & Necker, 2023). While educational online programs stand out for the variety of integrated digital tools, game and virtual reality-based interventions may truly represent the interesting opportunities offered by new technologies to improve morality, thanks to interactivity, immersion and digital storytelling. Virtual reality and game-based interventions proved to be effective also for what regards the promotion of morality in very specific contexts, ranging from responsible research conduct (Grasse et al., 2021) to business (Tanner et al., 2022) and process safety ethical reasoning in engineers (Stransky et al., 2021).

Other interventions

Finally, we found five interventions that did not fall into the previous categories but involved the use of technologies aimed at increasing moral cognition or behaviour. Specifically, three studies used unique digital tools (ranging from video calls to websites) providing participants with specific stimuli (e.g., 'moral incentives') with the aim of stimulating moral behavioural choices. These interventions targeted very specific contexts, ranging from reducing the purchase of carbon-containing food (Panzone et al., 2021) to the predisposition to donate blood (France et al., 2013), to attitude towards donation to charity (Young & Durwin, 2013). In the case of Kim et al. (2023), however, a digital environment was designed with the goal of promoting advancement in moral and wise reasoning. The authors employed a peculiar type of emotional induction, inducing in participants the emotion of awe (watching a video involving vast natural scenery) and flow experience (composing a song using an online music creator) in order to test whether such experiences (as opposed to neutral or fun experiences) increased the level of wise reasoning and epistemic humility. The results showed that awe and flow improve willingness to enact moral behaviour. Finally yet importantly, Captari et al. (2023) designed a spiritually integrated support intervention for chaplains that consisted of five Zoom-based group sessions co-facilitated by psychotherapists. After the intervention, participants decreased their level of spiritual/moral struggles/moral distress and increased their resilience.

DISCUSSION

The present scoping review aimed at exploring the usage of digital technologies to improve moral cognition. A rich variety of approaches appeared in the sample. Indeed, moral development outcomes can be conceptualized (and therefore *measured*) in very different ways, ranging from behavioural change within a specific context to changes in beliefs and attitudes, performance quality in moral dilemmas and prosocial choices (e.g., donations). It is important to notice that also the contexts of the interventions were very varied: Some were educational in a strict sense (e.g., school), while others pertained to professional issues such as doping in sports, advertising and shopping, ethical business, health care and spiritual guidance.

Taking into consideration the variety of contexts and specific aims of the reviewed studies, it appears that digital technologies offer notable opportunities to improve moral cognition, and most of them obtain encouraging results across many different outcome measurements. It seems that digital technologies offer the opportunity to handle the morality materials. In other words, participants could confront with situated dilemmas, simulations, moral problems that allow them to engage with moral choices and reflect on the consequences. Consistently with the literature, the most effective interventions are those that go beyond the mere transmission or teaching of information about moral rules or systems of values (Krebs, 2013; Tuana, 2006).

Digital technologies make it easier for researchers and educators to build moral reasoning exercises that help participants to train moral reasoning, and to share experiences within discussion groups.

It could be said that interventions based on new technologies are able to improve cognitive, behavioural and emotional aspects associated with morality. Video games, serious games and virtual environments in general allow individuals to immerse in gamified ethical narrations (Tanner et al., 2022). Assigning scores and achievements, as well as making moral values salient by digital representations, help stimulate fine-grained reflection on the moral content. It could be important to tailor moral contents and gamified reinforcements (e.g., in-game rewards) on players' personal interests and motivations (Yee et al., 2016). The virtual rendition of realistic, everyday sociomoral conflicts improves the moral maturity of participants (Zarglayoun et al., 2022).

Interestingly, one study has not used group discussion or interactive storytelling, but emotional induction (Kim et al., 2023), based on the literature that shows how 'transformative emotions' tend to promote moral behaviour. Their positive results support the idea that experiencing transformative emotions could facilitate access to moral intuitions. Indeed, environmental features could stimulate the accessibility of moral intuitions and this way the likeness of prosocial behaviour (Tamborini et al., 2018). This study highlights that there could be new avenues for research interested in the promotion of moral cognition even beyond the most immediate and widespread applications.

Limitations of the review and future directions

The main limitation of the present review lies in its broadness of scope and the variety of outcome types. Indeed, moral cognition and behaviour could be measured in multiple ways and an effort to describe the literature with a comprehensive look find itself with various results that are difficult to resume in an integrated way. In any case, it is interesting to acknowledge that many uses could be prefigured for new technologies to affect users' morality. Future review efforts may employ systematic approaches and meta-analysis focussed on specific types of outputs or technology-based tools in order to assess research quality and treatment effectiveness more rigorously. Also, as the present review was focussed on healthy populations, it could be interesting to address the effectiveness of technology-driven interventions to develop morality within populations with psychological disorders. Furthermore, future reviews may explore the impact of individual differences. For example, the literature suggests that the development of morality is influenced by sex (e.g., women tend to be more empathetic and to feel more shame and guilt because of failure than men; Tangney & Dearing, 2002) and age (e.g., both the complexity of moral understanding and the tendency to put moral values into action increase with age; van Goethem et al., 2012). While the papers reviewed in the present contribution featured samples of various age and both sexes, comparison or analyses of moderating effects were not presented. Both future research and reviews may take into account the effect of such moderators on the development of moral abilities influenced by technological interventions.

Another potential limitation of the study relates to the complexity of terminology and theoretical constructs associated with morality. It is possible that relevant research exists that did not use the words 'moral' or 'morality' and therefore did not appear in our search (e.g., research on general decision-making abilities that could be relevant for moral reasoning too). The same could be said about the terms we used to identify interventions and studies that reported on improvement or change ('improving/efficacy/intervention'). Future reviews may explore different search strings in order to obtain a broader look upon a multifaceted and complex literature.

On the other hand, the present scoping review still explored interventions and quantitative research that reported on measurable changes in users' morality, attitudes or behaviour. While we excluded qualitative research, the complexity of the morality topic would benefit of taking into account more rich reports of participants' lived experiences of real-life moral dilemmas. Furthermore, user-centred qualitative research could be particularly useful to *design* digital tools based on the lived experience of the target population (Savazzi et al., 2018; Tan & Tan, 2022), so to be able to address real-life social conflicts and everyday social issues rooted in people needs and experiences.

Educational implications

The results of the present review show that video games, serious games and virtual environments that immerse participants in a moral decision-themed simulation seem particularly effective. They obtain positive results similar to those interventions that feature complex, multi-componential educational programs. Therefore, a recommendation for researchers and educators who aim at affecting participants' moral reasoning would be to prioritize simulation and immersion by implementing interactive digital storytelling, which may prove to be more effective than any mere transmission of information towards more or less passive receivers. While educators should still guide the utilization of such simulations, it is fundamental to give people the opportunity to interact with moral issues directly and to perform moral choices.

Digital tools could help promote moral cognition and prosocial behaviours. Specifically, virtual environments and videogames could help participants to experiment with moral choices. Video games are studied to identify their educational utility (Turkay et al., 2014). For what regards the moral development context, they constitute 'moral laboratories' that allow to experience choices situated within complex social contexts, and to witness their consequences differently from abstract moral dilemmas that take place in vacuum (Greitemeyer & Mügge, 2014; Murphy & Zagal, 2011; Triberti et al., 2015). Future interventions may explore these interactive aspects, not underestimating the importance of a simulated social context that gives meaning and realism to the presentation of a moral dilemma. Most of the studies that involved video games or serious games (e.g., Tanner et al., 2022; Zarglayoun et al., 2022) stressed the necessity to represent real-life and mundane social conflicts in order for participants to engage in realistic dilemmas. Other studies and reviews have demonstrated the impact of digital tools on empathy, emotion regulation and other psychological abilities that are also relevant to moral development (Hanima & Djunaedib, 2019; Hemenover & Bowman, 2018; Qu et al., 2023; Rose et al., 2017; Villani et al., 2018). For this reason, both future research and educational programs may explore multiple technology-based approaches to support not only moral development but also those abilities that allow people to manage their own experiences and other's feelings.

Finally yet importantly, group discussions appeared effective to help participants to understand multifaceted moral issues. The usage of new technologies should not be aimed at merely automatizing exercise procedures. Rather, the experiences mediated by digital simulations shall be used as an input for educational discussion and positive inter-peer influence. In other words, the utilization of technologies could represent the opportunity for participants to contribute directly to the learning environment, so that they become co-author of the learning process (Iavarone et al., 2017).

CONCLUSION

This scoping review offers a novel contribution useful for both researchers and educators. It represents a comprehensive look at the multiple ways we could use digital technologies (ranging from computer-mediated communication to video games and virtual reality) to affect people's ability to take decisions that deals with their own and others' safety and well-being. The included papers confirm that new technologies could improve moral reasoning and support moral development, both at a general level and within specific contexts characterized by unique moral issues. Humans improve in their access to morality especially thanks to the opportunity to engage directly with moral problems, making decisions, witnessing their consequences and sharing their experiences with peers and expert educators. New technologies offer such opportunity in many ways, the most promising one being probably the simulation of moral dilemmas within interactive digital storytelling. Digital technologies do not 'teach' us how to be good persons, but they could certainly act as sophisticated vessels for moral values, as well as for the opportunity to safely experiment with important choices while learning about morality in the process.

AUTHOR CONTRIBUTIONS

Chiara Scuotto: Conceptualization; writing – original draft; investigation; formal analysis; writing – review and editing. **Stefano Triberti:** Writing – original draft; investigation; methodology; writing – review and editing. **Maria Luisa Iavarone:** Methodology; validation; writing – review and editing. **Pierpaolo Limone:** Supervision; validation; project administration.

CONFLICT OF INTEREST

All authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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