

## Analysis of mobile learning philosophy based on ontological, epistemological, and axiological aspects

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### ABSTRACT

This study aims to analysis the philosophical foundation of Mobile Learning (M-Learning) through ontological, epistemological, and axiological perspectives using the Narrative Literature Review method on 11 indexed scientific articles. The data showed that the focus of the study was dominated by the axiological aspect with the frequency of occurrence of 7 articles (45.5%), followed by the epistemological aspect as many as 6 articles (36.4%), and the ontological aspect as many as 4 articles (18.2%). The results of the ontological analysis show that M-Learning is understood as a flexible, transformative, and ubiquitous learning reality, opening up the possibility of learning across space and time. Epistemologically, the findings confirm that M-Learning reinforces contextual, collaborative, and experiential knowledge constructions, although most implementations are still at the substitution stage and have not yet reached a full epistemic transformation. The axiological aspect appears as the biggest contribution, highlighting the value of inclusivity, equal access, learning motivation, and character formation as the main impact of M-Learning. The discussion shows that the three aspects interact with each other hierarchically, where ontological reality becomes the basis for epistemological processes, while axiological values function to direct and evaluate the ethical application of M-Learning. The conclusion M-Learning has a strong philosophical dimension, particularly in its axiological aspects, which emphasise value, access, and inclusivity, supported by epistemological and ontological aspects that demonstrate active and flexible learning. However, because it is based on only 11 studies, these findings cannot be generalised globally.

### INTRODUCTION

The development of digital technology has encouraged the emergence of new learning patterns that are more flexible and adaptive to the needs of students. The use of mobile devices in the learning process provides easy access to various sources of information, allows students to interact with learning materials in various situations, and creates a learning environment that is no longer limited by space and time (Suharno et al., 2022). This transformation brings a more

dynamic learning experience, where students can set the learning rhythm, choose relevant resources, and utilise various applications that support knowledge construction. In addition to expanding learning spaces, mobile technology also strengthens the potential for independent learning and active involvement of students, making it an important part of the ever-growing digital education ecosystem (Kousloglou et al., 2023; Manzoor et al., 2022).

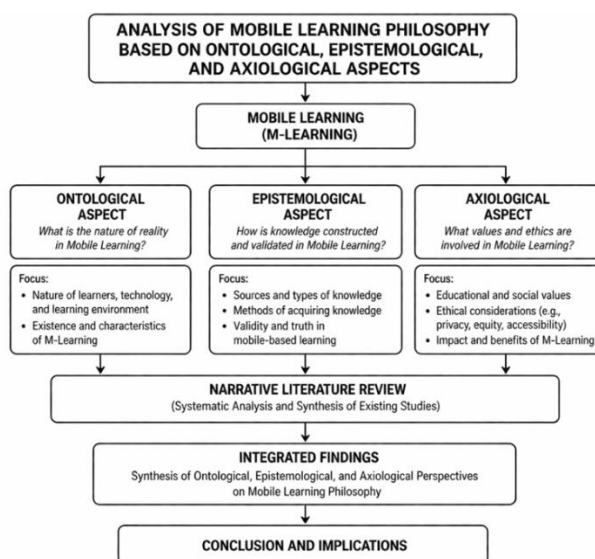
The use of mobile devices not only increases learning flexibility, but also provides ample opportunities for personalisation of the learning process. Students can adjust learning materials and strategies based on their abilities, interests, and preferences, so that the learning experience becomes more meaningful (Costa & Gonçalves, 2023). This approach contributes to the development of 21st century skills that include critical thinking, creativity, collaboration, and communication. In terms of equitable distribution of education, mobile technology-based learning offers opportunities for students from various backgrounds to access quality education without being hampered by geographical conditions or limited facilities. Teachers also benefit from the increasing opportunities to develop digital competencies and design learning that is more relevant to the demands of the modern era (Sefriani et al., 2022).

Technological advancements such as artificial intelligence, augmented reality, and virtual reality further enrich the learning experience through mobile devices. The integration of these innovations presents simulations, visualisations, and interactive activities that help students understand concepts more deeply (Kale et al., 2024). Its relevance is increasingly seen during the distance learning period, when mobile devices are an important means of connecting teachers and students to maintain the continuity of the learning process. In addition to supporting interaction and communication, the use of digital learning resources through mobile devices also contributes to continuing education practices by reducing reliance on printed materials. This transformation shows that mobile learning is not only alternative, but also has the potential to be a key approach in the development of future education (Sorgatz et al., 2024; Wang et al., 2025).

Despite the application of mobile learning showing various benefits, most studies still focus on technical aspects, such as the effectiveness of learning applications or the level of student engagement. Philosophical studies that review the essence, construction of knowledge, and the values that accompany the application of mobile technology in education receive limited scholarly attention. In fact, philosophical understanding is vital to examine fundamental changes in the relationship between teachers, students, knowledge, and the digital learning environment (Suhud et al., 2024). From an ontological perspective, mobile device-based learning needs to be understood as part of the new reality that is shaping the modern learning experience. From an epistemological perspective, it is required to examine the ways learners acquire, verify, and shape knowledge through digital media. Meanwhile, from the axiological aspect, mobile learning retains crucial values such as accessibility, justice, inclusivity, and sustainability (Kim et al., 2025; Valdez et al., 2023).

This study attempts to fill the gap by analysing mobile learning with a philosophical perspective, particularly from the cognitive, affective, and essential aspects that affect students' learning experiences. The literature review approach is used to gain an in-depth conceptual understanding of how mobile technology influences thought processes, motivation, emotional engagement, and the values that accompany the transformation of digital education. This analysis is expected to provide a comprehensive picture of the nature of mobile learning while strengthening the theoretical foundation for the development of more ethical, inclusive, and adaptive learning practices. This study made contributions not only to theoretical understanding but also to the optimal use of mobile technology to realise educational goals that empower and meet the needs of students in the digital era. The primary objective of this study is to analyse and

synthesise the philosophical basis of *Mobile Learning* (M-Learning) from an ontological, epistemological, and axiological perspectives through *the Narrative Literature Review* method.



**Figure 1. Theoretical framework**

Figure 1 depicts the conceptual framework of mobile learning philosophical analysis based on ontological, epistemological, and axiological aspects. This study formulates three primary hypotheses. First, the ontological aspect is suspected to have a significant influence on the conceptualisation of Mobile Learning as a paradigm, where an understanding of the nature of learning, learner characteristics, and the learning environment becomes the basis for its implementation. Second, the epistemological aspect has a significant influence on the process of knowledge construction and validation in the Mobile Learning environment, which includes sources, methods, and the validity of knowledge obtained through mobile devices. Third, the axiological aspect has a significant influence on the ethics of implementing and the value of the benefits of Mobile Learning, including in terms of ethics of use, accessibility, and the resulting social and educational impacts.

The following is the hypothesis outlined:

H1: Ontological aspects significantly influence the conceptualisation of Mobile Learning as a learning paradigm.

H2: Epistemological aspects significantly influence the construction and validation of knowledge in Mobile Learning environments.

H3: Axiological aspects significantly influence the ethical implementation and value of Mobile Learning.

## METHOD

This study adopts a qualitative approach with *the Narrative Literature Review* (NLR) method. This approach was chosen because it is considered most suitable for examining conceptual and philosophical relationships, as well as synthesising findings from the previous literature, and allowing for an in-depth interpretation of theoretical studies without a procedure as strict as a Systematic Review. The primary focus of this research is the exploration of meanings, relationships, and patterns of thought that emerge from various literature related to the philosophical foundations of Mobile Learning (M-Learning), which includes ontological, epistemological, and axiological perspectives (Irsan & Tamrin, 2024).

The main data sources in this study are scientific journal articles and reference books that directly discuss M-Learning in relation to ontological, epistemological, and axiological foundations. The literature was collected through four reputable scientific databases, namely *Google Scholar*, *PubMed*, *Springer*, and *ScienceDirect* (Ahzan et al., 2024a; Chang et al., 2020a; Schönfelder & König, 2025). The search process was conducted using a combination of keywords designed to ensure relevance to the research focus, such as "Ontological Mobile Learning", "Epistemological Mobile Learning", and "Axiological Mobile Learning". To sharpen the scope of the study and ensure the validity of the data, the source selection process is carried out by setting inclusion and exclusion criteria that function to limit the type of literature analysed so that only studies that are relevant, credible, and in accordance with the philosophical focus of M-Learning are used in this study, as shown in Table 1.

**Table 1. Inclusion and exclusion criteria**

Criterion	Inclusion	Exclusion
Form of publication	Scientific papers in full-text form (journals, books, proceedings)	Articles that are not available in full-text format.
Time range	Published in the range of 2015–2025.	Publications outside the 2015–2025 time frame
Focus topics	Discuss M-Learning from an ontological, epistemological, and/or axiological perspective	It does not discuss M-Learning from any or all three philosophical perspectives.
Main objects	Place Mobile Learning as the main object or context of research	Articles that don't use Mobile Learning as the main object.
Research methods	It can be in the form of quantitative, qualitative, or literature study.	There are no exclusion criteria based on the research method.

The NLR process in this study was carried out through five systematic stages (see Table 2), adapted from Booth et al. (2016), to ensure conceptual integration and accuracy of focus (Booth et al., 2016).

**Table 2. Stages of narrative literature review**

Phase	Operational description
Exploration of initial topics	Identified and conceptually defined three philosophical perspectives (ontological, epistemological, and axiological) to be used as the framework of M-Learning analysis.
Search for supporting literature	Conducted searches in four scientific databases with defined keywords.
Focus selection and refinement	Applying strict inclusion and exclusion criteria to search results, resulting in 11 selected articles (consisting of 2 national journals and 9 international journals) for further analysis.
Thematic synthesis and analysis	Conducted a critical review of 11 selected articles. The data was organised using a synthesis matrix that groups sources based on: methods, subject characteristics, and key findings related to ontological, epistemological, and axiological M-Learning.
Preparation of research results	Compiled the results of thematic synthesis and analysis into a scientific article format, focusing on the conceptual discussion and philosophical implications of M-Learning on learning practices.

Although this research is qualitative (*Narrative Review*), the data analysis process, focusing on 11 selected articles, was strengthened with quantitative calculation criteria in the form of *Descriptive Content Analysis* (see [Table 3](#)). This aims to provide a statistical overview of the distribution and frequency of occurrence of philosophical concepts in the literature studied.

**Table 3. Calculation criteria**

Quantitative variables	Operational definition	Measurement scale
Frequency of Emergence of Philosophical Concepts (FK)	The number of articles (from N=11) that explicitly discuss or integrate concepts: Ontological, Epistemological, or Axiological.	Ratio (Number of articles)
Frequency of Primary Theme Occurrence (FP)	The number of times a Primary Theme (based on qualitative Thematic Analysis) was mentioned as the main focus or key finding among the 11 articles.	Ratio (Number of appearances)
Topic Dominance Percentage	The percentage of articles that consider one perspective (Ontological, Epistemological, or Axiological) as the dominant (main) focus.	Percentage (%)
Keyword Cross-Correlation	The number of co-occurrences of two or more keywords (e.g., "Mobile Learning" and "Constructivism" in the Epistemological section) in a single article.	Ratio (Number of appearances)

## RESULTS

The results of the analysis are presented in a structured manner, starting with quantitative descriptive data from 11 selected articles, followed by a qualitative synthesis that produces conceptual themes that answer the focus of the research. The results of the narrative literature review are in [Table 4](#).

**Table 4. Narrative literature review "philosophical basis of m-learning"**

No.	Name	Subject	Method	Result
1	(Naveed et al. 2023)	A review of 80 international articles, with the theme Mobile learning in higher education.	Systematic Literature Review	M-Learning is inclusive, flexible, and transformative; removing the boundaries of space and time; increase accessibility and motivation to learn.
2.	(Crompton et al. 2016)	A study of 53 articles on the use of mobile learning in science education.	Systematic Review	M-Learning is adaptive; can be applied in both formal and non-formal contexts; Increase the effectiveness of science learning.
3.	(Ahzan et al. 2024b)	Axiological and ethical values in the application of M-Learning	Bibliometric Analysis & Axiological Study	M-Learning improves student access, motivation, and engagement; support inclusive and interactive learning.
4.	(Nurhayati et al. 2023)	Sources of knowledge in axiological perspective	Philosophical-conceptual studies	M-Learning strengthens social inclusion and diversity, and supports equitable access to education.
5.	(Sunarti & Wati, 2024)	Mohammad Sjafei's philosophy of education in an axiological perspective	Philosophical studies	M-Learning contributes to the formation of students' character, ethics, and religiosity.
6.	(Khery et al. 2019)	Application of the Mobile-NOS (Nature of Science) model in science education, in	Empirical studies (pre-post experiment)	The use of M-Learning increases epistemological awareness about the nature and process of scientific knowledge.

No.	Name	Subject	Method	Result
		27 Basic Chemistry II Students		
7.	(Chang et al. 2020b)	The application of Mobile Augmented Reality-based science learning in 8th grade students, a total of 47 students.	Empirical studies with the PLS-SEM approach	AR technology strengthens the understanding of complex concepts and the ability to think reflectively in the context of science.
8.	(Morales-García et al. 2022)	Study of 20 design learning tasks in the context of M-Learning	Analysis based on the SAMR model (Substitution, Augmentation, Modification, Redefinition)	Many M-Learning tasks are still in the substitution stage, not yet reaching a full epistemic transformation.
9.	(Ryu et al. 2015)	The implementation of scientific modeling practices with mobile internet in 10th grade students totaled 16 students.	Qualitative & observational research	The use of mobile devices encourages scientific discussion and complex arguments, deepening the understanding of concepts.
10.	(Hayhoe, 2018)	Mobile learning for blind students	Literature review & reflective	It found a discrepancy between theory and practice in the application of inclusive M-Learning.
11.	(Trede et al. 2019)	Learning based on epistemic fluency with mobile technology, by involving higher education professionals.	Theoretical review	Epistemic fluency helps students manage different forms of knowledge between humans and machines.

Based on the implementation of *Descriptive Content Analysis* in 11 selected articles (N=11), the Frequency of Emergence of Philosophical Concepts (*FK*) and the Percentage of Topic Dominance (*PD*) were calculated. The determination of dominance is based on the main focus that is explicit in the title or conclusion of the article.

**Table 5. Frequency and dominance of philosophical concepts**

Concept	Number of Articles ( <i>FK</i> )	Percentage of Articles ( $F_k/N$ )	Topic Dominance ( <i>PD</i> )
Epistemological	6	116≈54.5%	3 (27.3%)
Ontological	4	114≈36.4%	1 (9.1%)
Axiological	7	117≈63.6%	5 (45.5%)

Table 5 presents the results of the calculation, showing that the Axiological concept has the highest frequency of occurrence ( $FK = 7$ ) and the highest Topic Dominance Percentage ( $PD = 45.5\%$ ). This indicates that most of the M-Learning research in the sample focuses more on values, ethics, and social implications (such as accessibility and inclusivity). Meanwhile, Ontological issues (the nature of M-Learning reality) became the least dominant focus ( $PD = 9.1\%$ ). Of the 11 articles, the distribution of the methods used is as in Table 6.

**Table 6. Distribution of research methods**

Research Methods	Frequency	Percentage
Literature Review (SLR, NLR, Philosophical Studies)	7	63.6%
Empirical Research (Experimental, Qualitative, PLS-SEM)	4	36.4%

The literature emphasises that M-Learning redefines the boundaries of learning reality.

1. Sub-Theme 1: Transformation and Flexibility of Context (Naveed et al., 2023; Crompton et al., 2016): M-Learning is seen as a learning reality that removes the boundaries of space and time, making learning *ubiquitous* and applicable in both formal and non-formal contexts. (Articles 1, 2)
2. Sub-Theme 2: The Role of AR Technology Intermediaries (Chang et al., 2020): The implementation of technologies such as *Augmented Reality* (AR) shows that M-Learning serves as an intermediary that strengthens the understanding of complex concepts by blending physical and digital realities (Article 7).

M-Learning epistemology focuses on how knowledge is acquired and validated through *mobile devices*.

1. Sub-Theme 1: Improving Epistemological Awareness (Khery et al., 2019): The use of M-Learning, such as the Mobile-NOS model, empirically increases students' awareness of the nature and process of scientific knowledge obtained through *mobile devices* (Article 6)
2. Sub-Theme 2: Knowledge Construction Through Scientific Discussion and Models (Ryu et al., 2015): Mobile devices serve as tools to encourage scientific discussion, complex arguments, and modeling practices, which are at the core of constructivist epistemology (Article 9)
3. Sub-Theme 3: The Challenge of Epistemic Transformation (Morales-Garcia et al., 2022): Despite its great potential, the literature also notes that many implementations of M-Learning are still in the stage of substitution (replacing old tools), which fail to achieve a full epistemic transformation, that is, a radical change in the way knowledge is built (Article 8)

The axiological aspect of M-Learning focuses on the value and benefits it generates for individuals and society.

1. Sub-Theme 1: Inclusivity and Equitable Access (Ahzan et al., 2024; Nurhayati et al., 2023): M-Learning is consistently associated with the value of social inclusion, diversity, and equitable access to education, especially for hard-to-reach populations (Articles 3, 4, 10)
2. Sub-Theme 2: Increased Motivation and Engagement (Naveed et al., 2023; Ahzan et al., 2024): The high instrumental value of M-Learning is seen from its ability to increase student motivation and engagement thanks to its flexibility and interactive nature (Articles 1, 3)
3. Sub-Theme 3: Character Building and Ethics (Sunarti & Wati, 2024): Philosophically, M-Learning contributes to aspects of character building, ethics, and religiosity of students, emphasising the need for technology to be used to support positive values (Article 5)

Figure 2 visualises the interrelationship between ontological, epistemological, and axiological aspects in forming an integrated Mobile Learning (M-Learning) paradigm. From an ontological perspective, M-Learning is understood as a flexible learning reality, unlimited by space and time, and mediated by technology, thus supporting the first hypothesis (H1) that ontological aspects influence the conceptualisation of M-Learning as a learning paradigm. Furthermore, the epistemological perspective suggests that knowledge in M-Learning is actively constructed through digital interactions, discussions, and learner engagement, which strengthens the second hypothesis (H2) that epistemological aspects influence the process of knowledge construction and validation.

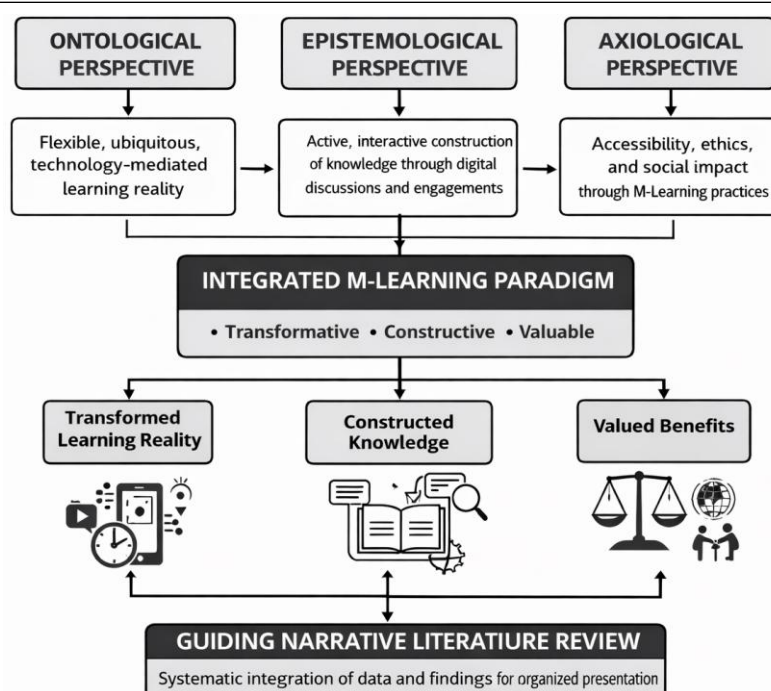


Figure 2. Visualisation of ontology, epistemology, and axiology perspectives

Conversely, the axiological perspective emphasises that M-Learning implementation contains essential values, including accessibility, ethics, and social impact, which directly supports the third hypothesis (H3) that axiological aspects influence the value and ethical application of M-Learning. These three perspectives are integrated to form a transformative, constructive, and valuable M-Learning paradigm. The results of this integration then produce three main outputs, namely the transformation of learning reality, knowledge construction, and valuable benefits, which then become the basis for the analysis process through a systematic and structured Narrative Literature Review approach.

## DISCUSSION

Narrative Literature Review of 11 selected articles, focusing on the philosophical foundations of Mobile Learning (M-Learning). Quantitatively, the descriptive content analysis showed that the Axiological aspect was the most dominant focus of research, having the highest frequency of occurrence ( $FK = 7$ ) and percentage of dominance ( $PD = 63.6\%$ ) in the literature studied (Table 3). These findings indicate a shift in focus on M-Learning research, from mere technical issues to broader value, ethical, and social impact implications. Thematically, the axiological focus is mainly on social inclusion and equal access (Nurhayati et al., 2023; Hayhoe, 2018), where M-Learning is recognised as having high potential to address the digital divide and provide flexible education to specialised or remote populations. In addition to the value of access, ethical issues, such as character formation and religiosity (Sunarti & Wati, 2024), are a decisive agenda, indicating that M-Learning is not only seen as a pedagogical tool, but also as a value-laden agent in educational transformation (Agbi & Yuangsoi, 2022; Holovatenko, 2023).

The Epistemological aspect ( $FK = 6$ ) occupies a second attention, focusing on the nature and acquisition of knowledge through *mobile devices*. The literature broadly places the epistemology of M-Learning within the framework of Constructivism and Connectivism, where knowledge is considered valid when it is actively constructed by students, is contextual, and supports *just-in-time learning*, such as the use of *mobile devices* to encourage scientific discussion and complex argumentation (Ryu et al., 2015). Nonetheless, there is a gap between theory and practice; on the

one hand, M-Learning is believed to increase epistemological awareness (Khery et al., 2019), but on the other hand, many implementations still dwell on the stage of technological substitution, failing to achieve a full epistemic transformation, i.e., a radical change in the way knowledge is constructed (Morales-Garcia et al., 2022).

The Ontological aspect ( $FK = 4$ ) had the lowest dominance ( $PD = 9.1\%$ ). Nonetheless, the literature acknowledges that M-Learning is a flexible, transformative, and *ubiquitous learning reality* (Naveed et al., 2023), effectively eliminating physical boundaries. Technologies such as *Augmented Reality* (AR) are further blurring the boundaries between physical and digital reality, positioning M-Learning as a mixed reality (Chang et al., 2020). This non-space-time bound ontological nature of M-Learning is a prerequisite that allows for epistemological change, since the flexible reality of learning demands that the way knowledge is constructed must be contextual and adaptive (Cahyana et al., 2024). Overall, the analysis confirms the existence of a hierarchical relationship between the three foundations: Ontological (nature of reality) determines the space of possibilities, Epistemological (the construction of knowledge) describes the processes in that space, and Axiological (values and ethics) serve as a guide and assessor to ensure that the entire M-Learning process provides positive and ethical benefits, explaining why the dominant focus now lies on the Axiological pillar (Gavronskaya et al., 2022; Huang et al., 2025).

## CONCLUSION

Mobile Learning (M-Learning) is a learning paradigm that is not only technological in nature, but also has a strong philosophical dimension, especially in the most dominant axiological aspect, which emphasises values, ethics, and social impacts such as increasing accessibility, inclusivity, motivation, and student learning engagement. The epistemological aspect reveals that M-Learning supports active, contextual, and interactive knowledge construction, although its implementation still faces challenges in achieving optimal epistemic transformation, while the ontological aspect confirms that M-Learning presents a flexible learning reality, not limited by space and time, and integrated with digital technology. However, because this conclusion is based on a relatively limited number of articles ( $N = 11$ ), generalisation of the findings to global and universal contexts needs to be done carefully, so further research is recommended to involve more diverse studies to produce a more comprehensive and representative understanding.

## Author contributions

Darlin contributed to the formulation of the research focus, the development of the ontology-epistemology-axiology philosophical framework, and the writing of the initial draft of the manuscript. Moch. Nursalim played a role in the development of the narrative literature review methodology, validation of theoretical concepts, and critical review of the manuscript. Ruqoyyah Fitri was responsible for the collection of literature sources, thematic analysis, and the preparation of the epistemology section. Hermanu Irawan was involved in the analysis of the Mobile Learning ontology concept and substantial revisions to the discussion section. M. Saleh Laha contributed to the analysis of the axiology aspects, integration of conceptual findings, and refinement of the argumentation. Nurlin played a role in the final editing, harmonisation of the article structure, and checking for compliance with scientific writing standards.

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The authors declare that there is no potential conflict of interest.

## Data availability statement

All data are available from the author.

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