

Retraction

Retracted: PKPM Architectural Engineering Software System Based on Architectural BIM Technology

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] Y. Fu, "PKPM Architectural Engineering Software System Based on Architectural BIM Technology," *Journal of Sensors*, vol. 2022, Article ID 5382026, 7 pages, 2022.

Research Article

PKPM Architectural Engineering Software System Based on Architectural BIM Technology

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In order to solve the problems in practical application of Building Information Modeling (BIM) as an innovative tool and production method, the author proposes a method for simulating modern buildings using the Ecotect software. This method establishes a digital BIM parametric model, the digital information technology is directly applied to the whole life cycle of the construction project, and then the effectiveness of the method is verified by examples. The result obtained is as follows: The authors' method is designed with the assumption that Construct III is below the standard limit throughout the year, in order to meet the requirements of energy-saving design; it is recommended to change the type of external window in the engineering design scheme and make the energy consumption of buildings meet the requirements of energy-saving standards. The method proposed by the author saves about 20% of the construction cost compared with the traditional method. It is proved that the author's method can make architectural designers correctly understand the feasibility and applicability of the Ecotect software in building energy conservation and promote BIM technology and software; BIM technology can be widely used in engineering projects, allowing architects to select the right and suitable software for various energy conservation simulations and build energy-saving building solutions.

1. Introduction

Energy is the pillar and driving force of the country's economic development related to community security, traditional employment, national security, sustainable development of ecological environment, and the survival and continuity of future generations [1, 2]. As science and technology improve, communities and businesses around the world develop rapidly, and demand for energy increases.

According to statistics, global electricity demand is growing by two percent annually. This example estimates global demand for electricity, and by the middle of the 21st century, global electricity consumption will be four times the total electricity consumption when the battery life of the 1970s. Since the oil crisis, global energy shortages have made commodity prices heavier, and more and more countries are estimating greater energy savings and consumption [3, 4]. The concept of sustainable development is a viable

answer to environmental and energy issues in the 21st century human development strategy [5]. The concept of the idea of sustainable development is recognized by every country of the world, the problem of energy scarcity should not be ignored, and energy conservation has become a long-term goal of national development [6].

BIM (building information model, for example, building information) technology has been used in the construction industry in many countries around the world according to information releases. New and advanced BIM technology has proven to save development time and reduce construction costs. Rates reach different levels [7, 8]. Developing countries in Europe and the United States have developed and developed BIM research centers. In the future, our country will follow the promotion and use of information of construction companies and make the introduction of new technologies in engineering, such as data center design (BIM).

2. Literature Review

Since the beginning of the global catastrophe in the 1970s, power generation has been gaining traction, and more and more scientists are studying it to reduce energy consumption at home and achieve some achievements [9, 10]. Since the inception of BIM technology, BIM heat wave has appeared in the development of the world, and the use of BIM technology in every cycle of home life has been popular. And scientists have begun to study the use of BIM technology in construction. In energy conservation abroad, BIM research covers the entire life cycle of a home, and the study of energy conservation in the home often includes the following.

Ahmed et al. divide sustainable development into manageable components: Air quality, biodiversity, solid waste, wastewater, etc. In order to solve the problems arising from these parts, this study examines the utilization of drinking water and wastewater according to the requirements of sustainable systems, uses BIM to carry out overall parametric settings such as equipment, systems, and materials to control drinking water, and applies BIM to modeling of urban water use; simulation calculation can utilize wastewater and rainwater collection, design rate roof, calculate water runoff, etc. [11]. Moghadasi et al. explored the interoperability of BIM with the environmental simulation software [12]. Ma et al. used BIM for energy analysis in the conceptual design stage of construction projects and used BIM technology to build a model of a community emergency service station, the model was used to explore the early effects of different building envelopes and components on building design [13]. Nageib et al. used EnergyPlus and virtual environment software IES, respectively, to build the same model to compare their effectiveness and suitability as a BIM-based energy simulation tool [14]. For the further development of the research, the researchers especially focus on the energy consumption caused by different building orientations and window areas and finally summarize how to use BIM-based building energy analysis effectively.

The research time of BIM technology in my country is still short, and it is mostly used in the architectural design stage. In order to achieve building energy conservation, many researchers are actively exploring the application of BIM technology in building energy conservation-related fields. At present, many architectural design and research departments have applied Ecotect's calculation results to practice and research [15].

Billah et al. proposed a method for applying BIM technology to building energy conservation and constructed a building energy conservation work framework based on BIM technology [16]. Bazazzadeh et al., on the basis of analyzing the software requirements of building energy-saving design, carried out the detailed functional design of the building energy-saving design software system, and the system development was carried out [17]. According to Luo and Oyedele, based on the current situation and existing problems of building energy-saving design, this paper introduces the development ideas and key technologies of building energy-saving software based on BIM technology [18]. Chen et al. used the energy consumption results of Ecotect to judge the pros and cons of the inclination angle of the

external windows of the building and finally analyzed the optimal energy-saving angle of the windows to guide the installation of windows in practical buildings [19].

On the basis of the current research, this research is aimed at comprehensively applying BIM technology, using the Ecotect Analysis software to establish an energy consumption simulation information model in the design stage, and conducting energy consumption simulation analysis for a residential building in a certain place. In order to determine how BIM technology has been used in construction compared to the current power generation process in our country, the differences in power consumption analysis of participants, software, process analysis, and electronic data analysis were compared. There are advantages and disadvantages of energy-saving analysis of construction plans compared to conventional electrical inspection procedures.

3. Research Methods

3.1. Application of BIM Technology in PKPM Construction Engineering Software System. BIM or Building Information Technology is made up of three-dimensional digital technology, and the design data engineering that includes information related to the design is digital information on behalf of appropriate documents.

BIM is a product that the whole team works on, and as shown in Figure 1, it can be used by different participants at different angles at each stage to improve performance, quality, and data sharing of all participants. Therefore, the purpose of BIM is to complete the integration of data from various parts of the construction industry, to improve the speed of reuse of data construction, thus reducing construction costs and improving productivity.

All standardized data files for PKPM civil engineering software systems are developed by combining modeling templates, one model for each job, and one model with multiple counts. The design data is all three-dimensional, object-oriented, and parametric, and it is very easy to modify, query, make changes to objects, and modify the view in real time. From simple 3D data modeling, PKPM integrates design ideas, product design, building design, quantity engineering, cost reporting, garden management building, and other links to the construction and implementation of the BIM concept. It is now possible to combine data files, data structures, and design and then apply building materials to the entire life cycle.

Special applications are as follows.

- (1) Three-dimensional housing planning and design software in PKPM can be used for preliminary survey of areas in planning, design, urban planning, design, urban assessment, and planning. 3D modeling technology to ensure the performance of 3D modeling, reconstruction, process and site design, modeling, document design, green space design, counting of materials design, solar analysis, and design of real-life observational models, using experts. The software introduces various technologies such as 3D modeling technology, ground technology, design technology modeling data, index dynamic control technology,

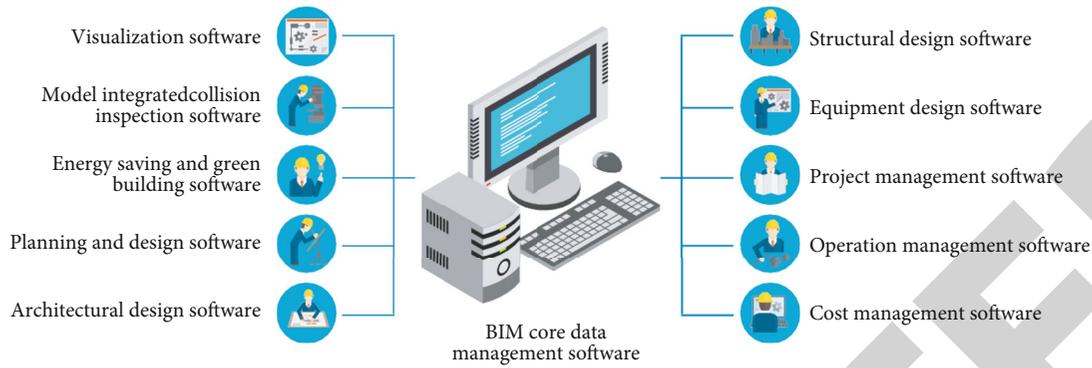


FIGURE 1: Architecture of Building Information Modeling (BIM).

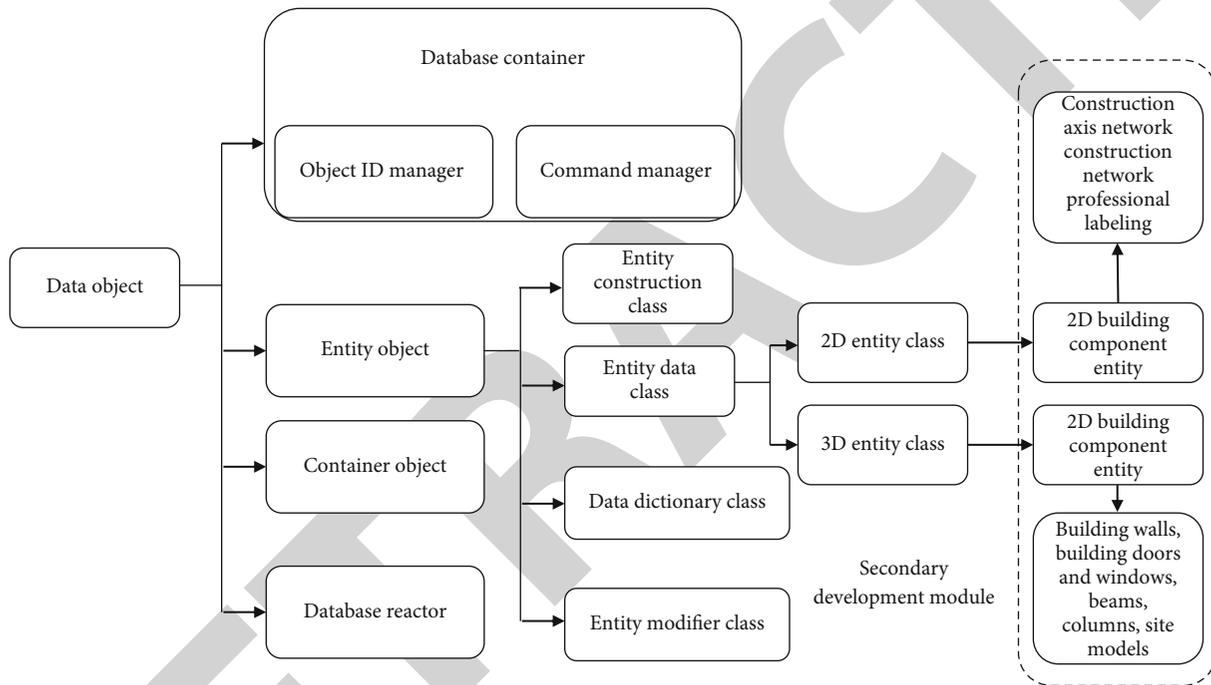


FIGURE 2: Architecture of PKPM 3D graphics platform.

counting, reverse, dynamic shadow simulation technology output, and current image capture and provides design data with good control and sensitivity. 3D photos affect the screen

- (2) PKPM Architectural design software APM is a software architecture based on BIM technology, which starts from the design concept to create simple documentation of the building design, and all the functions are based on simple information. The base file just creates a variety of drawings of the house
- (3) The building information model of the PKPM architectural design link can be reused in the cost (estimated budget) analysis link. The building information model entered in the design process contains the basic information of the building, which is also the concern of the cost engineer. Therefore, the reuse of the building information model can greatly save the workload of the cost

engineer. Of course, this information is not complete and needs to be further supplemented. Based on the architectural structure design model, the PKPM budget software supplements the information required for the budget, such as supplementing the decoration practices of each room and exterior wall, selecting the quota library, and entering the scaffolding information. The program automatically extracts the corresponding quota or list code, completes the calculation of the engineering quantity and reinforcement quantity of each floor and each component, carries out the quantity analysis, and generates various forms and data required by the cost engineer

- (4) CFG, an independent copyright graphic platform that PKPM has long relied on, is mature and stable, various professional software of PKPM have been developed on it, and it has a large user base. Scholars have conducted comprehensive and in-

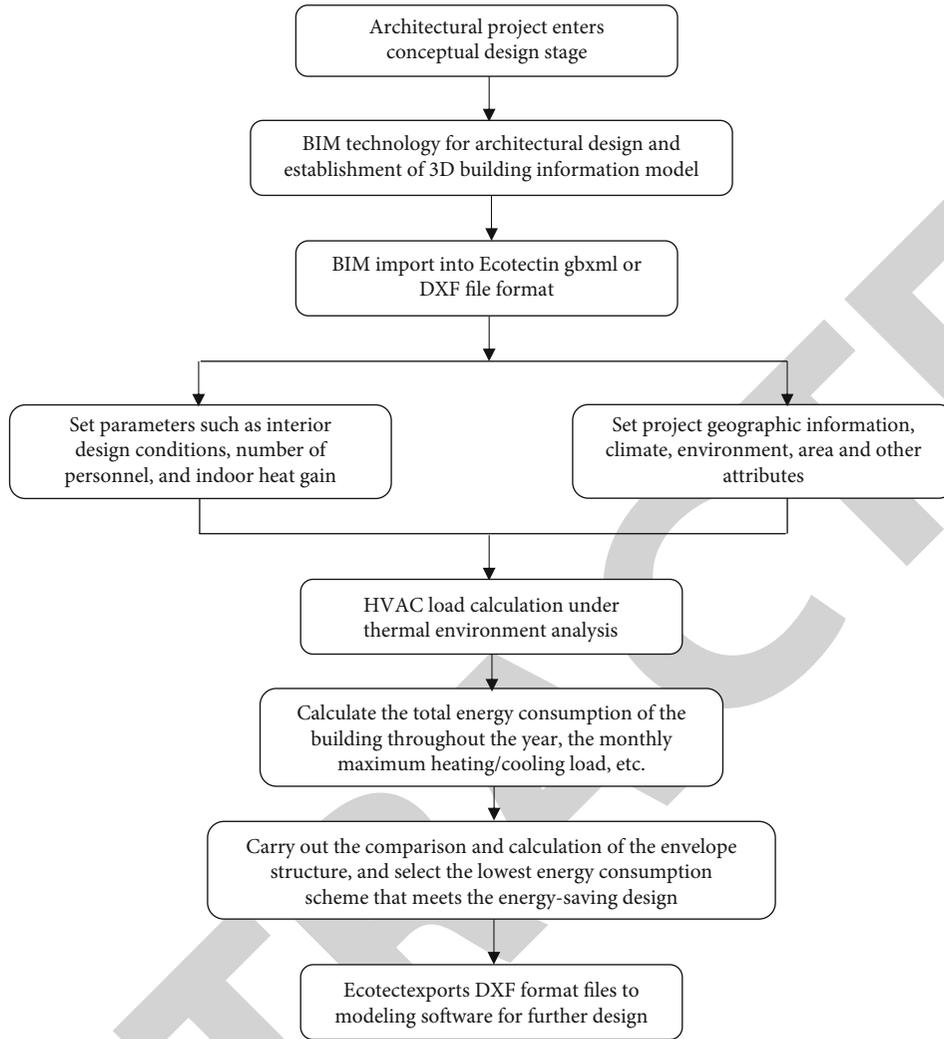


FIGURE 3: BIM technology energy consumption simulation analysis process.

depth research on PKPM in the field of 3D graphics platform and have established a mature system architecture as shown in Figure 2, in object-oriented technology, 3D geometric modeling core system, graphics display technology, parallel computing technology, graphics interaction technology, 3D entity, professional entity modeling technology and related data management, software interactive interface, 3D scene realistic rendering technology, path animation, and key frame animation technology, and other aspects have deep technical accumulation

3.2. Simulation Analysis of Energy Consumption of BIM Technology. BIM technology examines and calculates the electrical applications of the construction, which is a small part of the use of BIM technology throughout the life of the home, and the equipment used to analyze review by the Ecotect Analysis software. Unlike conventional electronic simulation analysis, BIM technology is involved in the entire project life cycle by design phase design, while BIM technology utilizes design software such as Revit Archi-

TABLE 1: Heat transfer coefficient of the building envelope.

	Exterior wall, W/m^2K	Roof, W/m^2K	Exterior window, W/m^2K
Design structure (I)	0.793	0.58	2.665
Standard limit (II)	0.8	0.6	2.5
Hypothetical construction (III)	0.793	0.58	2.5

ecture and Revit during the design phase. Its visual design allows owners to use design ideas by interacting with designers to create 3D data models and to design concepts simultaneously, such as designing and creating project directly into the virtual model, which can be more efficient as the owner needs. Thanks to BIM software integration, gbXML or DXF files can be exported from the Revit Architecture model software at the end of the schematic design phase and imported directly into Ecotect software for various physical models or create a model with the same data files directly from the Ecotect software as a 3D data model and then identify it as stable. The procedure for using

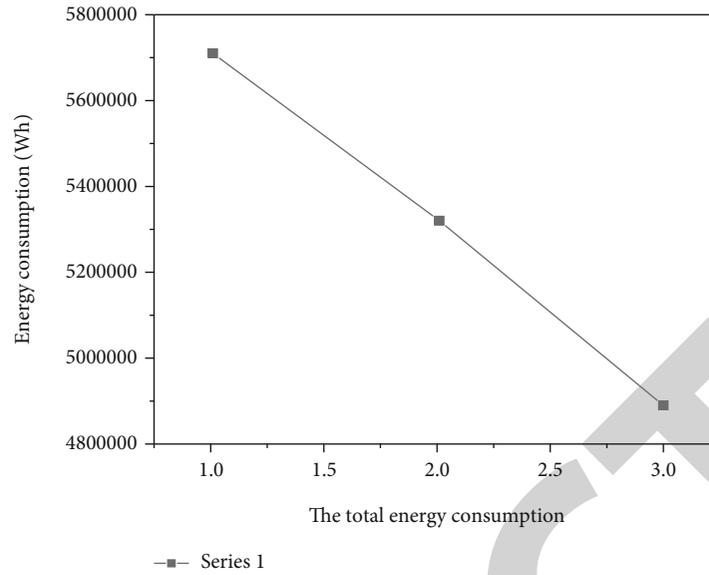


FIGURE 4: Annual total energy consumption.

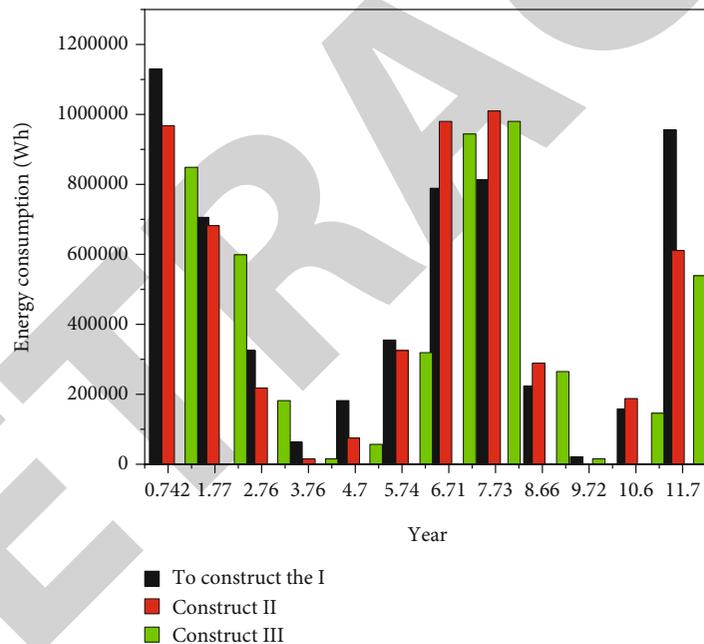


FIGURE 5: Comparison of monthly energy consumption under three structural conditions.

electronic analysis using the Ecotect software to model the electricity is shown in Figure 3.

4. Analysis of Results

4.1. *An Example of Energy Consumption Analysis of Residential Buildings Based on BIM Technology.* The project covers an area of more than 1,800 mu, with a total construction area of 327,158 square meters, a total development volume of more than 1.5 million square meters, a plot ratio of only 1.93, and a green space ratio of 31.23%; after completion, it will have a population of nearly 50,000 people and is currently the largest pure residential project in the area.

The author selects the D9 villa in this residential group as an example to conduct energy simulation analysis; the fire protection height of D9# building is 33 m, with the underground garage floor, the negative floor, and eleven floors above ground, which belongs to the second-class high-rise residential [20]. The outer walls of all enclosures designed in this project are made of 200 mm-thick B5.0 autoclaved aerated concrete blocks. The roof is made of reinforced concrete with a thickness of 20 cm for thermal insulation, 20 mml : 2 cement mortar : 13 mm air layer.

The heat transfer coefficient of engineering design is compared with the limitations specified in “energy save design standard for homes” and is provided in Table 1.

The instructions show that the roof and exterior walls are lower than the maximum height of the structure compared to the thermal conductivity required by the design, which meets the requirements of energy conservation standards. Because the exterior window does not follow the rules of the energy-design model, energy consumption simulation analysis is done to determine the building energy consumption according to the model. In order to create more energy-efficient building materials, Hypothetical Building II is designed to reduce the thermal conductivity of exterior walls, roofs, and exterior windows to a minimum large model [21]. The monthly energy consumption analysis is calculated in turn from cases I to II, and the simulation results are analyzed using Excel charts, as shown in Figures 4 and 5 [22].

As can be seen from Figure 5, the design structure I is not much different from the energy-saving standard limit. However, if the heat transfer coefficient of the external window is reduced to the standard value, the total energy consumption for the whole year is much smaller than that of the design structure [23]. The energy consumption of design structure I in winter is greater than that of standard structure II, and the energy consumption of design structure I is less than that of II in summer. Construct III is assumed to be below the standard limit throughout the year, meeting the energy-efficient design requirements. It is recommended that the engineering design scheme change the type of exterior windows and make the energy consumption of buildings meet the requirements of energy-saving standards [24].

5. Conclusion

Rapid urban growth, increased demand for energy, and energy conservation are future improvements. As BIM technology is developed and promoted in China, BIM has been increasingly used throughout the life of the construction industry, and the role of BIM technology in home design is the importance increases. Designers have used Ecotect to assist with home design because of its versatility, simplicity, design, and seamless integration with SketchUp, CAD, Revit, and more other software. The author compares the usual power simulation techniques with power metrics using BIM technology output models and analyzes the differences. It helps users to understand the differences between the Ecotect software and other electronic simulation analysis software, as well as the differences between participants and processes in the monitoring process. The main conclusions of the author's research are as follows: When the BIM software can be used directly to identify applications using BIM technology to help create building plans, it is very easy to plan, design, and modify the schematics of the software. Its three-dimensional design can be used directly to show the construction of the site, and CAD-format architectural drawings can be directly drawn from the model. Because BIM technology is used to simulate and analyze power consumption in construction, the home data created in BIM software can be used for Ecotect software power simulation, shading system analysis, etc. The performance of the physical environment is used not only in the design phase but also

for various accompanying activities during the construction, operation, and maintenance phase. For example, for construction simulation, collision detection, project planning, etc., the model can also guide construction on site and compare the corresponding degree of project entities and BIM data in real time. The simulation results of Ecotect have a limited scope of use in auxiliary architectural design, and its basic calculation method is not suitable for large changes in the outdoor environment; there are also some errors in the calculation of solar radiation and heat storage, but it is feasible to use Ecotect to judge the pros and cons of building shading system.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares no conflicts of interest.

Acknowledgments

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