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Bambi activity tools more effective than brick blocks in early childhood development: a comparative study

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ABSTRACT

Early childhood development is key to shaping a child's intelligence, and stimulation aligned with developmental stages is essential. Learning through play is an effective approach, as applied in Bambi Activity Tools, which stimulate various aspects of development in children aged 5–6 years. The aim of study was to compare the effectiveness of Bambi Activity Tools and Brick Blocks in stimulating the development of children aged 5–6 years. This study used quasi-experimental research with a controlled group pretest-post-test design. The population included all children in Harapan Gorongan Kindergarten and Bim Bim Cha Kindergarten. The sampling technique used was purposive sampling, with a total of 42 children. Data analysis used the Wilcoxon signed rank test and the Mann-Whitney test. The independent variable was the type of play material, Bambi Activity Tools and Brick Blocks. The dependent variable was the developmental score of children aged 5–6 years. There was a significant increase in child development in both groups, with the mean developmental score of children stimulated using Bambi Activity Tools being higher than those using Brick Blocks, with a difference of 0.95 (P-value < 0.000). Bambi Activity Tools are more effective in improving child development compared to Brick Blocks.

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INTRODUCTION

Early childhood development is the key to shaping a child's intelligence. Developmental delays can occur in one or more areas, such as gross motor skills, fine motor skills, speech and language, and social and independence skills.(1) Appropriate stimulation ensures children develop optimally across various dimensions, including movement, communication, and social interaction. Children with developmental delays may struggle to keep up with peers, impacting their self-esteem and future opportunities, as well as causing difficulties in school and relationships. This approach aligns with the Sustainable Development Goals (SDGs) objectives, which underscore the necessity of fostering inclusive and effective learning environments for all children. The SDGs strive to guarantee equal access to quality education, enhance the availability of early childhood education, and reduce disparities in educational opportunities at all levels. Furthermore, the SDGs emphasize the importance of creating safe, violence-free, and inclusive educational facilities that celebrate diversity.(2)

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The World Health Organization (WHO) reports that 5–25% of preschool-aged children worldwide experience minor brain dysfunction, including fine motor developmental disorders.(3) Based on data from the United Nations Children's Fund (UNICEF), there are 1,375,000 children under five who experience fine motor and gross motor disorders per 5 million developmental delays. In Indonesia, based on data from the Ministry of Health of the Republic of Indonesia in 2018, it was reported that 11.7% of children experienced developmental delays, 35.4% had delayed literacy skills, 2.2% had physical delays, and 4.8% experienced learning delays.(4) Meanwhile, data from the Yogyakarta Health Office in 2018 showed that 13.43% of preschool-aged children experienced fine motor delays.(5) These figures highlight the importance of addressing child development issues from an early age to ensure optimal growth.

Bambi Activity Tools are innovative educational tools that combine play and learning, tailored to children's developmental stages. Bambi Activity Tools are designed to stimulate child development through various activities, such as recognizing colors, basic shapes, fruits, animals, numbers, letters, and simple arithmetic. The tools also help children stay calm, identify body parts, engage in physical activities, and develop creativity through imagination. The learning materials in Bambi Activity Tools have been adapted to the guidelines of Stimulation, Detection, and Early Intervention of Growth and Development (SDIDTK) and have been reviewed by experts in early childhood development. These tools are designed to support improvements in various aspects of child development, such as cognitive, gross motor, fine motor, speech and language, social, and independence skills. The media used in Bambi Activity Tools include a child stimulation book and various supporting toys, such as posters, Montessori jars, and modeling clay, designed to support play activities and optimize child development. Previous studies have shown that the components in Bambi Activity Tools effectively improve child development. The Happy Thinking book has been shown to enhance children's language skills,(6) while poster media is effective in stimulating cognitive development.(7) Additionally, Montessori jars (busy jars) have been proven to develop fine motor skills in children aged 5–6 years.(8) The use of modeling clay has also been found to improve fine motor skills,(9) while strengthening hand muscles and introducing colors and vocabulary.(10) Brick Blocks, as a comparative medium in this study, has been shown to effectively enhance fine motor skills in preschool children.(11) Although numerous studies have explored the role of educational media in enhancing child development, most have examined these tools in isolation or focused on single modalities. To date, no specific research has directly compared the effectiveness of Bambi Activity Tools as multimodal stimulation package with Brick Blocks, a more traditional manipulative toy, in promoting fine motor development in early childhood. Existing literature lacks comparative analyses that assess these two approaches within the same study context, making it difficult to determine which method yields more significant developmental benefits. This gap limits the ability of educators and caregivers to make evidence-based choices regarding the most effective tools for early stimulation. Therefore, this study aims to fill this void by directly evaluating and contrasting the developmental outcomes resulting from the use of Bambi Activity Tools and Brick Blocks, thereby providing clearer guidance for practitioners in early childhood education and care.

This research study aims to compare the effectiveness of Bambi Activity Tools and Brick Blocks in enhancing motor, cognitive, and social skills among children aged 5 to 6 years. The findings of this study are expected to provide valuable insights for educators, parents, and schoolteachers in selecting the most effective educational media to support the optimal development of young children. In addition, the results may serve as a reference for future research related to play-based learning and early childhood development tools.

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METHOD

This study employed a quasi-experimental pretest–posttest-controlled group design conducted from May to June 2023. The research aimed to compare the effectiveness of Bambi Activity Tools and Brick Blocks in improving early childhood development. The study population included all students aged 5–6 years from Harapan Gorongan Kindergarten and Bim Bim Cha Kindergarten, located in Depok District, Sleman Regency, Special Region of Yogyakarta, Indonesia. A purposive sampling technique was used to recruit participants who met specific criteria. The sample size, determined by using the Lemeshow formula, consisted of 42 children, with 21 participants per group. The inclusion criteria were children aged 5–6 years; children in healthy condition, based on anthropometric assessment; cooperative behavior during activities; and written informed consent obtained from parents or legal guardians. The exclusion criteria included children with poor nutritional status, identified using Body Mass Index-for-Age (BMI/A) according to WHO growth charts, adjusted for gender, and children with known developmental or neurological disorders. Baseline characteristics, including age, sex, BMI category, and initial developmental scores, were recorded and tested for baseline comparability using appropriate statistical methods to ensure equivalence between groups prior to intervention. Each intervention was conducted over 4 weeks, with a frequency of 3 sessions per week and a session duration of 30 minutes, totaling 12 sessions. The intervention group used Bambi Activity Tools, which included child stimulation books; illustrated educational posters; Montessori jars (also known as busy jars) containing tactile objects (buttons, pom-poms, ropes); and modeling clay for creative play. Each tool was implemented based on a structured stimulation guide developed by early childhood educators and tailored to the targeted developmental domains. Activities were guided by classroom teachers, who were trained by the research team before the intervention phase. The control group engaged with Brick Blocks, consisting of multicolored and variably shaped interlocking blocks. Children were encouraged to play creatively under teacher supervision without structured instruction. Child development was measured using the *Kuesioner Pra Skrining Perkembangan* (KPSP) or Developmental Pre-Screening Questionnaire, an instrument endorsed by the Indonesian Ministry of Health. The KPSP assesses four developmental domains: gross motor (e.g., jumping, climbing stairs); fine motor (e.g., stacking, threading); language (e.g., naming objects, following verbal instructions); and social-personal (e.g., dressing, interaction with peers). The KPSP contains age-specific tasks, and responses are scored on a binary scale (yes/no). The total score is used to classify children into “Appropriate Development,” “Questionable Development,” or “Delayed Development.” Improvement was defined as a positive shift in total developmental score, with higher scores indicating more advanced developmental milestones. The validity and reliability of the KPSP have been established in prior studies, with reported inter-rater reliability above 0.80, and content validity verified by expert panels. The instrument has been widely used in Indonesian pediatric screening programs. The study received ethical approval from the Research Ethics Committee of Poltekkes Kemenkes Yogyakarta (Ref: No.DP.04.03/e-KEPK.1/329/2023). Written informed consent was obtained from parents or legal guardians prior to participation. Normality testing was performed using the Shapiro–Wilk test. Within-group differences in pretest and posttest scores were analyzed using the Wilcoxon signed-rank test. To assess the difference in post-intervention outcomes between the Bambi Activity Tools group and the Brick Blocks group, the Mann–Whitney U test was applied. A p-value < 0.05 was considered statistically significant. Data analysis was conducted using SPSS version 26.

RESULTS

A total of 42 children aged 5–6 years participated in this study, with 21 assigned to the Bambi Activity Tools group and 21 to the Brick Blocks group. As presented in Table 1, most participants in both groups were boys (76.2% and 71.4%, respectively). Most mothers were

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unemployed (61.9% in the Bambi group and 57.1% in the Brick Blocks group), and the majority had secondary or tertiary education (52.4% and 61.9%, respectively). The results of the Chi-square test indicated no statistically significant differences between the two groups regarding gender, mother's occupation, or mother's education level (P > 0.05). These findings confirm that both groups were homogeneous and comparable at baseline, suggesting that the observed effects are unlikely to be influenced by demographic differences.

Table 1. Baseline Characteristics of Participants (N = 42)

Characteristics	Category	Bambi Activity Tools (n = 21)	Brick Blocks (n = 21)	P-value[1]
Gender	Male	16 (76.2%)	15 (71.4%)	0.726
	Female	5 (23.8%)	6 (28.6%)	
Mother's occupation	Employed	8 (38.1%)	9 (42.9%)	0.753
	Unemployed	13 (61.9%)	12 (57.1%)	
Mother's education level	Primary education	10 (47.6%)	8 (38.1%)	0.533
	Secondary and tertiary education	11 (52.4%)	13 (61.9%)	

Note. Values are presented as *n (%)*.
[1]Chi-square test; P > 0.05 indicates no significant difference between groups.

Before the intervention, most children in both groups were categorized as having "questionable" developmental status according to the Developmental Pre-Screening Questionnaire (KPSP). As shown in Table 2, 66.7% of children in both the Bambi Activity Tools and Brick Blocks groups fell into this category. A smaller proportion of children demonstrated appropriate development (19.0% in the Bambi group and 23.8% in the Brick Blocks group), while 14.3% and 9.5%, respectively, were categorized as having developmental deviations. These results indicate that both groups had similar initial developmental profiles, confirming that they were comparable prior to the intervention. Following the four-week stimulation period, substantial improvements were observed in both groups. As displayed in Table 2, 90.5% of children in the Bambi Activity Tools group achieved an "appropriate" developmental category, while 9.5% remained in the "questionable" category. In comparison, in the Brick Blocks group, 66.7% of children reached the "appropriate" category, and 33.3% remained "questionable." These results suggest that Bambi Activity Tools produced a greater positive shift in developmental status compared to traditional Brick Blocks play.

Table 2. Child Development Status Before and After Stimulation (N = 42)

Developmental Status	Bambi Activity Tools (n = 21)	Brick Blocks (n = 21)
Before stimulation		
Appropriate	4 (19.0%)	5 (23.8%)
Questionable	14 (66.7%)	14 (66.7%)
Deviation	3 (14.3%)	2 (9.5%)
After stimulation		
Appropriate	19 (90.5%)	14 (66.7%)
Questionable	2 (9.5%)	7 (33.3%)

Prior to inferential analysis, the normality of data distribution was examined using the Shapiro–Wilk test. As shown in Table 3, both pretest and posttest scores in the two groups were not normally distributed (P < 0.05). Therefore, non-parametric tests were applied for subsequent analyses, including the Wilcoxon signed-rank test for within-group comparisons and the Mann–Whitney U test for between-group comparisons.

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Table 3. Normality Test of Child Development Scores (Shapiro–Wilk Test)

Group	N	P-value (Pretest)	P-value (Posttest)	Interpretation
Bambi Activity Tools	21	0.002	0.000	Not normal
Brick Blocks	21	0.016	0.004	Not normal

The results of the Wilcoxon signed-rank test (Table 4) revealed a significant increase in developmental scores within both groups after stimulation. In the Bambi Activity Tools group, the mean score increased from 7.76 (pretest) to 9.62 (posttest), with a mean difference of 1.86 ($Z = –4.079$; $P < 0.001$). In the Brick Blocks group, the mean score increased from 7.76 to 8.67, with a mean difference of 0.91 ($Z = –3.755$; $P < 0.001$). These findings indicate that both forms of stimulation were effective in improving children's developmental performance, although the magnitude of improvement differed between the groups. To determine which intervention was more effective, the Mann–Whitney U test was used to compare the magnitude of score improvement between the two groups (Table 4). The analysis showed that the mean increase in developmental scores was significantly higher in the Bambi Activity Tools group (Mean = 1.86, SD = 0.85) compared to the Brick Blocks group (Mean = 0.91, SD = 0.63), with a mean difference of 0.95 ($Z = –3.574$; $P < 0.001$). This result confirms that Bambi Activity Tools were more effective than Brick Blocks in stimulating overall developmental progress among children aged 5–6 years.

Table 4. Within- and Between-Group Differences in Child Development Scores

Variable	Group	N	Mean (Pretest)	Mean (Posttest)	Mean Difference (Δ)	Z	P-value	SD (Δ)
Within-group comparison (Wilcoxon test)	Bambi Activity Tools	21	7.76	9.62	1.86	–4.079	<0.001	0.85
	Brick Blocks	21	7.76	8.67	0.91	–3.755	<0.001	0.63
Between-group comparison (Mann–Whitney U test)	—	—	—	—	0.95	–3.574	<0.001	—

In summary, the findings demonstrate that both Bambi Activity Tools and Brick Blocks effectively enhanced children's development as measured by the KPSP instrument. However, Bambi Activity Tools produced significantly greater developmental gains, suggesting that this structured and engaging play medium provides more comprehensive stimulation across fine motors, cognitive, and social domains compared to conventional block play.

DISCUSSION

The characteristics of the research subjects in the Bambi Activity Tools group and the Brick Blocks group, based on gender, mother's occupation, and mother's latest education, showed the results of the analysis with a P-value> α. This indicates that there is no significant difference in each characteristic between the two groups, so both are comparable for the trial. The lack of significant differences in demographic characteristics confirms group equivalence at baseline, thereby strengthening the internal validity of the comparative analysis on developmental outcomes.

The first characteristic of the research subjects is gender. It is known that most of the research subjects are boys, which are 16 people (76,2%) in the Bambi Activity Tools group and as many as 15 people (71,4%) in the Brick Blocks group. The predominance of boys in both intervention groups may influence the effectiveness of the stimulation tools used,

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particularly regarding motor development. This aligns with previous studies which have shown that boys tend to be more physically active and are more inclined toward play activities that involve bodily movement and motor coordination, both of which play a crucial role in stimulating the development of gross and fine motor skills. Furthermore, parenting styles also contribute to this tendency, as boys are generally encouraged to be more independent than girls, thereby providing them with more opportunities to explore their environment through physical activities.(12) However, this consistency must be interpreted cautiously. While physical activity preferences based on gender may explain part of the motor development outcomes, it is also essential to consider sociocultural expectations and parenting styles. In Indonesia, as in many societies, boys are often encouraged to explore their environment more freely, potentially reinforcing physical developmental advantages. This socio-cultural reinforcement has been observed in previous research in Yogyakarta and Central Java, where gendered play expectations were found to influence stimulation exposure.

The second characteristic of the research subjects is the mother's occupation. It was found that most of the mothers in the research subjects were not working: 13 mothers (61.9%) in the Bambi Activity Tools group and 12 mothers (57.1%) in the Brick Blocks group. Mothers who are not working have more time to care for and engage with their children, providing adequate attention to stimulating their development.(13) However, the quality of interaction between the mother and the child depends on how meaningful their time together is. Working mothers, despite having limited time, can still optimally monitor their children's development if they can utilize and maximize their time by continuing to play and engage with their children.(14) Bambi Activity Tools allow mothers to engage in beneficial activities even with limited time available. This aligns with previous research, which has shown that working mothers can still play an important role in their children's lives despite the need to fulfill their work responsibilities.(15) Nevertheless, as highlighted in other studies the quality of interaction, rather than the mere availability of time, is a stronger predictor of developmental outcomes. Interestingly, the structured nature of the Bambi Activity Tools appeared to facilitate high-quality interaction even in households where the mother was working, suggesting the potential of such tools to bridge time limitations by promoting purposeful engagement. This aligns with prior findings that working mothers who use guided or structured play materials can still foster positive developmental trajectories.

The third characteristic of the research subjects is the mother's education level. It was found that most mothers in the research subjects had attained secondary (high school/vocational school) and tertiary education (Diploma/bachelor's degree): 11 mothers (52.4%) in the Bambi Activity Tools group and 13 mothers (61.9%) in the Brick Blocks group. Parental knowledge plays an important role in providing stimulation to children.(10) The higher the parents' level of education, the more information they acquire about how to stimulate their child's development. Higher education also provides greater access to information sources that support child health and development, thus improving welfare and quality of life.(16) The mother's education level significantly influences her ability to effectively choose and use developmental stimulation tools effectively. Previous studies have shown that mothers with higher education levels tend to provide their children with more optimal psychosocial and gross motor stimulation.(17) Therefore, maternal education level is an important factor in supporting the optimal use of Bambi Activity Tools to promote child development. Our study reinforces this, as mothers' education levels appeared to support optimal use of the tools, especially in understanding instructions and customizing play activities to the child's developmental needs.

The demographic characteristics of research subjects, such as gender, mother's occupation, and mother's education level, are important for understanding how the use of educational tools like Bambi Activity Tools and Brick Blocks impacts children's motor, cognitive, and social development. Although no significant differences were found between

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the groups, understanding these factors helps interpret the effectiveness of stimulation tools based on the child's background and environment, which is crucial for making informed decisions regarding early childhood development interventions. Overall, the demographic composition of the study participants predominantly boys, mostly children of non-working and secondary-educated mothers is relatively reflective of the early childhood population in semi-urban areas of Yogyakarta and surrounding regencies, but may not fully represent the national profile, particularly in more rural or under-resourced settings where maternal education and employment patterns may differ substantially. According to the Indonesian Early Childhood Education Profile (PAUD 2022), disparities still exist between urban and rural areas in terms of access to early childhood stimulation and parental educational background, potentially limiting the generalizability of these findings.

Nonetheless, this study contributes to the literature by directly comparing two widely used educational tools an area not previously explored in depth in the Indonesian context. The findings are consistent with broader literature emphasizing the importance of structured, multi-sensory, and caregiver-facilitated stimulation in improving developmental outcomes in early childhood.

Differences In Average Development Improvement Before and After Stimulation

Based on data analysis, there was a difference in the average child development scores before and after stimulation in both the Bambi Activity Tools and Brick Blocks groups. The difference in the average development score in the Bambi Activity Tools group was 1.86, while in the Brick Blocks group it was 0.91. The average improvement in child development in the Bambi Activity Tools group was 0.95 higher. The Mann-Whitney test results showed a (P-value < 0.000), indicating a significant difference in the average improvement in child development between the two groups. The score differences are significant as this developmental stage is a crucial period for cognitive growth, during which appropriate stimulation is vital for establishing a strong cognitive foundation.(18,19) These findings provide strong evidence that Bambi Activity Tools, with their structured and multisensory design, offer a more effective method of stimulating early childhood development than traditional block play highlighting their potential for broader implementation in preschool education settings.

Bambi Activity Tools are educational toys consisting of child stimulation books, educational posters, Montessori jars (busy jars), and modeling clay, which provide multisensory stimuli to enhance cognitive, affective, and psychomotor aspects. These tools align with Vygotsky's theory of Zone of Proximal Development (ZPD), which emphasizes the importance of developing children's skills with the help of appropriate tools and supporting interactions from skilled parents or teachers.(20) The findings of this study indicate that the use of books as a medium in the Bambi Activity Tools significantly contributes to the improvement of early childhood development. These results are consistent with the research conducted by Ratnasari, which demonstrates that illustrated media such as storybooks can significantly enhance children's visual intelligence.(21) However, when compared to Ningtias's study on the use of Happy Thinking Books, some differences emerge, as Happy Thinking Books place greater emphasis on language and emotional development.(6) These differences in findings may be attributed to the broad range of developmental domains that book-based simulation tools are capable of addressing, depending on the focus and content of the specific media utilized.

The use of supporting media Bambi Activity Tools, such as educational posters, Montessori jars (busy jars), and modeling clay, plays a significant role in enhancing various aspects of child development. Educational posters featuring symbols or simple words combined with visual designs, colors, and strong messages to attract children's attention.(22) Research by Wiji and Fitri indicates that poster media can notably improve children's cognitive knowledge.(23) However, a study by Fidiyah et al. found that poster

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media does not lead to a greater increase in children's knowledge when compared to comic media.(23) Montessori jars (busy jars) which contain materials such as buttons, pom-poms, and geometric ropes in various shapes and colors, are specifically designed to help children learn and practice age-appropriate skills. Research by Mardhiah and Sartika shows that these busy jars can significantly enhance fine motor development in children aged 5 to 6.(24) Modeling clay is a dough that can be shaped in various ways and has also been shown to benefit child development. According to Badriah's research, using modeling clay can significantly improve children's ability to recognize number symbols.(25)

In the intervention group using Bambi Activity Tools, a significant improvement was observed in the domain of fine motor skills. This finding is supported by previous studies. Hermawati's research demonstrated that the use of Montessori jars (busy jars) can enhance hand and finger coordination through activities such as stacking and threading.(8) Similarly, Yarsiah and Kasiyati's research found that modeling clay can improve finger strength and hand-eye coordination, even in children with motor impairments such as cerebral palsy.(26) These improvements contribute to the optimization of fine motor skills, enabling children to better develop writing abilities, recognize numbers, and complete tasks independently. In the control group using Brick Blocks, an educational toy in the form of bricks with various colors and shapes that can be assembled into various structures, demonstrated an improvement in children's fine motor skills after play.(27) Zulaikhan's research also revealed that playing with Brick Blocks can enhance the ability to generate ideas and promote collaboration, although its approach is less structured in stimulating creativity and social interaction.(28) In contrast, Bambi Activity Tools offer more directed activities with clear objectives, supporting active and structured learning. Nonetheless, both groups showed a significant improvement in developmental scores according to their developmental stages. Therefore, it can be concluded that the success of enhancing child development is closely related to the multimodal, structured, and exploratory nature of the media. This aligns with the findings of Hafidhoh et al., showing that multimodal-based interactive media provides significant improvements and plays an important role in increasing self-confidence in early childhood.(29) These results underscore the need for early childhood education programs to adopt structured, multimodal learning tools like Bambi Activity Tools as part of national PAUD curricula. Training modules should also be developed to equip teachers and caregivers with the skills to utilize these tools effectively.

This study has several limitations, such as the use of a quantitative approach that does not fully capture the qualitative aspects of child development. Additionally, variations in the implementation of stimulation by educators or parents may influence the results. Therefore, it is recommended that future research employ a mixed-methods approach and examine the impact of training for teachers and parents in the use of these simulation tools, considering that the success of the method largely depends on the quality of interaction and involvement from caregivers.

CONCLUSION

This study demonstrated that both Bambi Activity Tools and Brick Blocks improved early childhood development outcomes; however, Bambi Activity Tools yielded a significantly greater improvement, with an average score increase of 0.95 ($p < 0.000$). Notably, fine motor and cognitive skills showed the most marked gains, likely due to the structured, multisensory, and goal-oriented nature of Bambi tools.

These findings highlight the importance of using comprehensive, developmentally appropriate educational tools in early childhood settings. Teachers and caregivers are encouraged to incorporate Bambi Activity Tools into daily learning activities to optimize child development. Further research is recommended to examine long-term developmental impacts, assess socio-emotional domains, and explore the effectiveness of training modules for parents and educators in the proper use of these tools.

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AUTHOR CREDIT STATEMENT

AMP: responsible for research planning, data collection, statistical analysis, and manuscript writing. **MRH**: revision and editing of the manuscript according to journal writing guidelines, **MM**: contributed to the revision of the data and analysis.

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DECLARATION OF COMPETING INTEREST

The author declares that there are no conflicts of interest.

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