Sensory play as an educational strategy to enhance attention span in early childhood education

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RESUMEN

La atención sostenida continúa desarrollándose durante la primera infancia y es sensible al diseño de las actividades y de los entornos de aprendizaje. Este estudio examinó los cambios en la atención observada durante una intervención de tres meses basada en juego sensorial e integrada en clases de inglés en una institución privada de Pedernales, Ecuador. Se utilizó un diseño preexperimental de un solo grupo con seis niños de 5 a 6 años. La intervención incorporó plastilina, pintura, harina y materiales con distintas texturas en actividades lingüísticas guiadas por la docente. Los tiempos individuales de atención se recuperaron del gráfico pretest-postest incluido en el manuscrito, mientras que el registro de aula y las notas de entrevistas docentes permitieron interpretar la participación, la motivación y la autorregulación. La atención media aumentó de 2,50 minutos (DE = 0,55) a 6,50 minutos (DE = 1,05); los seis participantes mejoraron, con una ganancia media de 4,00 minutos. Una prueba exacta de rangos con signo de Wilcoxon mostró una diferencia pretest-postest (T = 0, p = .031). Los registros cualitativos describieron menos interrupciones, mayor participación y transiciones más ordenadas. Sin embargo, el tamaño muestral, la ausencia de grupo de comparación, la medida no estandarizada y los posibles efectos de novedad y observación impiden atribuir causalidad. El juego sensorial estructurado debe considerarse una práctica complementaria prometedora que requiere adaptación a las necesidades individuales y al contexto del aula.Palabras clave: juego sensorial; atención sostenida; educación infantil; aprendizaje del inglés; aprendizaje multisensorial; Ecuador

ABSTRACT

Sustained attention is still developing in early childhood and is sensitive to the design of learning activities and environments. This study examined changes in observed attention during a three-month sensory-play intervention embedded in English lessons at a private school in

Pedernales, Ecuador. A one-group pre-experimental design was used with six children aged 5-6 years. The intervention incorporated plasticine, paint, flour, and materials with contrasting textures into teacher-guided language activities. Participant-level attention durations were obtained from the manuscript's embedded pre/post chart, and classroom logbook entries and teacher interview notes were used to interpret patterns of participation, motivation, and self-regulation. Mean observed attention increased from 2.50 minutes (SD = 0.55) before the intervention to 6.50 minutes (SD = 1.05) afterward; all six children improved, with a mean gain of 4.00 minutes. An exact Wilcoxon signed-rank test indicated a pre/post difference (T = 0, p = .031). Qualitative records described fewer interruptions, more active material exploration, greater willingness to participate, and more orderly transitions. These findings are consistent with research linking play, choice, embodied activity, and multisensory materials to engagement. Nevertheless, the small sample, absence of a comparison group, non-standardized attention measure, and possible novelty and observer effects prevent causal attribution. Structured sensory play should therefore be treated as a promising supplementary practice whose intensity, materials, and degree of choice require careful adaptation to individual children and classroom conditions.Keywords:sensory play; sustained attention; early childhood education; English language learning; multisensory learning; Ecuador.

INTRODUCTIONSustained attention enables children to remain oriented toward a task, inhibit competing responses, follow instructions, and coordinate behavior over time. These capacities overlap with the broader development of executive functions, particularly inhibitory control and working memory (Diamond, 2013). Because attentional control develops substantially across childhood, short periods of off-task behavior in the early years are not necessarily evidence of a deficit; they also reflect the interaction between developmental readiness, task demands, motivation, and environmental stimulation (Karakaş, 2024; Machado-Bagué et al., 2021). Educational research should therefore examine not only how long children attend, but also the conditions under which attention becomes easier to sustain.Play is one such condition. It provides children with goals, actions, materials, and social meanings that can organize attention without reducing learning to passive compliance. In a mixed-method study of free play, Cheng et al. (2025) showed how teachers'environmental and pedagogical decisions supported children's attention during playful activity. DiCarlo and Ota (2026) likewise found that three-year-olds sustained attention longer when they could initiate or select activities than when materials were simply presented by an adult. Evidence from Ecuador also links playful classroom activity with attention development in young children, although this literature

remains methodologically heterogeneous (Alay Rodríguez et al., 2025). Together, these studies suggest that agency and meaningful engagement may be as important as the novelty of materials.Sensory play adds embodied and multimodal features to playful learning. Children touch, move, see, hear, and sometimes smell materials while pursuing a task. Fan et al. (2024) reported that multisensory educational toys can strengthenattraction, interest,and learning efficiency, while also emphasizing individual preferences and the need for carefully designed feedback. Di Fuccio et al. (2025) found stronger retention when digital-tangible learning materials engaged multiple sensory channels, with particularly notable effects at delayed recall. In early childhood contexts, Montessori-inspired resources and play-work methods similarly foreground manipulation and exploration as supports for sensory development (Llerena López et al., 2023; Londoño Vega et al.,2024). These findings provide a plausible pedagogical rationale for using clay, paint, flour, and textured objects in language lessons: the materials can make instructions and vocabulary actionable rather than merely verbal.More stimulation, however, is not automatically better. Stern-Ellran et al. (2016) found that highly colorful proximal surfaces disrupted structured play among preschoolers, illustrating that sensory enrichment can compete with the task for limited attentional resources. A systematic review of inclusive early learning environments similarly concluded that lighting, color, acoustics, materials, and spatial organization should be graded and controllable because the same environmental features can produce different responses across children (Abdou et al., 2026). This caution is especially important in inclusive classrooms. Universal Design for Learning supports flexible routes to participation and individualized scaffolding, not a single sensory prescription for every learner (Tīģere et al., 2025).The present study concerns sensory play within English lessons. Conceptual work on inclusive English teaching proposes movement, music, visual supports, and differentiated activities as ways to sustain participation among learners withattentional difficulties, although such proposals should not be mistaken for intervention evidence (Bilgiç & Kutlu Demir, 2025). More broadly, game-based learning research indicates that engagement can support learning when challenge and skill are appropriately matched, while immersion alone does not guarantee educational benefit (Hamari et al., 2016). The educational question is therefore not whether an activity is playful or multisensory in itself, but how the activity is structured around a clear learning purpose.Despite growing international research, small-scale evidence from Latin American early-primary English classrooms remains limited. The original classroom records examined here provide an opportunity to describe how observed attention changed during a three-month sensory-play intervention without

replacing the modest evidence with stronger claims than the design can support. The study asks: How did observed sustained attention and classroom participation change following a structured sensory-play intervention among six early-primary English learners?Conceptual BackgroundSensory play as embodied and active learningSensory play can be understood as purposeful activity in which children explore and transform materials through coordinated perception and action. This view is compatible with Piaget and Inhelder's (1972) emphasis on knowledge construction through action and with Vygotsky's (1978) account of learning through mediated social activity. The teacher's role is not to supply stimulation indiscriminately, but to organize materials, language, prompts, and peer interaction so that children can act within a manageable challenge.

Sensory play as an educational strategy to enhance attention span in early childhood educationThe distinction between sensory exposure and pedagogically structured experience is central. Fan et al. (2024) emphasize goals and feedback in multisensory toy design. Aksoy (2026), drawing on pre-service teachers' experiences with natural and sustainable art materials, similarly identifies creativity, collaboration, and hands-on learning alongside practical challenges involving material organization, time, age appropriateness, and classroom management. These findings imply that the educational value of paint, clay, flour, or textured objects depends on how those materials are introduced, bounded, and connected to lesson content.Evidence from sensory activities also varies by domain. Weiser et al.'s (2026) scoping review of food-related sensory activities found substantial diversity in intervention design, delivery, and outcome measurement, with many proposed benefits only partly evaluated. This is a useful corrective for the present study: observations of longer attention and participation do not establish broad improvements in cognition, emotional regulation, language acquisition, or child development. Each outcome requires an appropriate measure.Attention, regulation, and individual variationAttention during classroom activity is inseparable from regulation of movement, emotion, and competing stimuli. In a quasi-experimental study with children with mild intellectual disability, Jacob et al. (2021) found that pictorial illustration andmusic-based activities improved measured attention relative to a control condition. Lin et al. (2012) reported changes in activity regulation following sensory-processing strategies in inclusive preschool classrooms, while acknowledging that developmental change could not be excluded. Although these populations and interventions differ from the present sample, they show why attention should be interpreted as situated behavior rather than as a fixed trait.Individual responsiveness is equally

important. Children can seek, tolerate, or avoid different intensities of sensory input. The inclusive-design synthesis by Abdou et al. (2026) argues for legible, graded, and controllable environments, and Stern-Ellran et al. (2016) demonstrate a concrete risk of visual overstimulation. Thus, a well-designed sensory activity should have a clear focal object, limited competing materials, predictable transitions, and opportunities for children to step back or choose among equivalent options.Physical, digital, and hybrid multimodalityThe intervention examined here was predominantly physical and non-screen-based, but current classrooms increasingly combine tangible and digital modalities. Reviews of digital device use and screen time show that developmental consequences depend on duration, content, context, and adult mediation rather than on a simple digital-versus-nondigital distinction (Clemente-Suárez et al., 2024; Kar et al., 2025). A recent scoping review of early science education recommends balancing digital tools with tactile, outdoor, sensory, and social activity (Salehi Gahrizsangi et al., 2026).Interactive technologies can also generate forms of engagement and measurement relevant to future research. Urbina-Alarcón et al. (2025) found high acceptability for a music-based pediatric serious-game system, although its motor outcomes and healthy sample are not directly comparable with classroom attention. Sánchez-DelaCruz et al. (2025) demonstrated that accelerometer data from interactive toys can classify patterns such as picking up, shaking, hitting, dropping, and throwing. Such methods could eventually supplement human observation with objective behavioral traces, provided that privacy, validity, and developmental appropriateness are addressed.METHODSDesign and settingThe study used a one-group pre-experimental pretest-posttest design with qualitative classroom records. It was conducted during the 2023-2024 school period in a private educational institution in Pedernales, Manabí, Ecuador. The intervention lasted three months and was embedded in English lessons. Because no comparison group was used, changes can be described temporally but cannot be attributed exclusively to sensory play.ParticipantsThe source manuscript identified a population of 27 students and a purposively selected sample of six children aged 5-6 years. Classroom descriptions inconsistently labeled the group as first or second grade; the chart note and main results identified first grade, which is the designation used here. The original manuscript also reported sex percentages that could not be reconciled with a sample of six; those percentages were therefore excluded rather than estimated.Sensory-play interventionActivities incorporated plasticine or clay, paint, flour, and materials with varied textures. The materials were used in teacher-guided English tasks that included introducing content, clarifying ideas, giving directions and feedback, and

Ibero-American Journal of Education & Society Research, S(1), e26S03| 4Sensory play as an educational strategy to enhance attention span in early childhood educationpracticing vocabulary or basic structures. The pedagogical intention was to create short cycles of explanation, manipulation,description, and completion. The source manuscript contained inconsistent statements about weekly and monthly instructional hours; because these values could not both be correct, duration is reported only as a three-month intervention.Data sourcesObserved attention duration.A pre-intervention and post-intervention classroom observation recorded the number of minutes each child remained engaged in a structured task. The embedded chart contained complete participant-level values for all six children. These chart values were treated as the primary quantitative record because surrounding prose reported conflicting ranges.Classroom logbook.The logbook organized observations under four categories: sustained attention, participation, motivation, and self-regulation. Entries described interruptions, task completion, interaction with materials, willingness to participate, following directions, turn-taking, transitions, and responses to frustration.Teacher interview notes.The source manuscript reported teacher interviews as a form of corroboration, but did not state the number of teachers, interview duration, question protocol, or transcription procedure. The interview material is therefore used only as contextual support and not as an independently analyzed qualitative dataset.All ethical protocols were followed to ensure the well-being and safety of the participants in this study.Data analysisPre/post attention scores were summarized using means, sample standard deviations, ranges, and individual gains. Because the sample was very small and scores were paired, an exact two-sided Wilcoxon signed-rank test was calculated. Logbook evidence was summarized within the four categories already defined in the source records. No new themes, participant quotations, reliability coefficients, or causal mechanisms were invented during revision.

RESULTS AND DISCUSSION

Change in observed sustained attentionAll six children had higher post-intervention scores. Pre-intervention attention ranged from 2 to 3 minutes ($M = 2.50$, $SD = 0.55$); post-intervention attention ranged from 5 to 8 minutes ($M = 6.50$, $SD = 1.05$). The mean gain was 4.00 minutes ($SD = 0.89$), with individual gains ranging from 3 to 5 minutes. The exact Wilcoxon signed-rank test yielded $T = 0$, $p = 0.031$. The statistical result indicates a consistent pre/post difference in this sample, but the design does not isolate the intervention from maturation, repeated observation, teacher effects, or novelty.

Figure 1. *Individual pre-intervention and post-intervention attention durations*

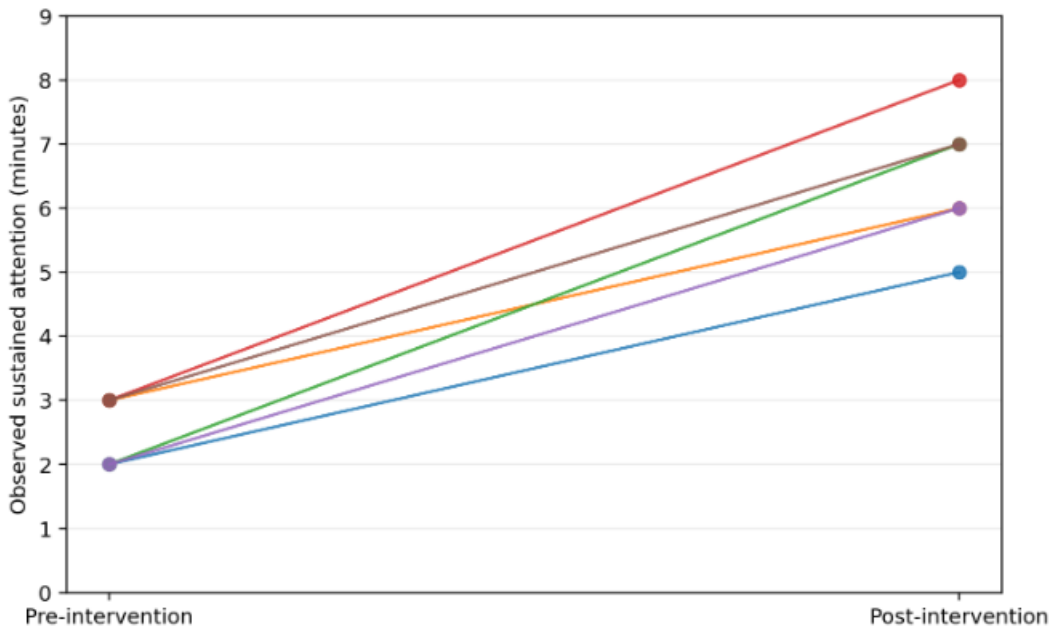

Table 1. *Participant-level observed attention before and after the intervention*

Participant	Pre (min)	Post (min)	Gain (min)
1	2	5	3
2	3	6	3
3	2	7	5
4	3	8	5
5	2	6	4
6	3	7	4
Mean	2.50	6.50	4.00

Classroom observation patterns

The logbook indicated changes in four related areas. First, sensory activities were associated with fewer interruptions and more complete task engagement than the traditional activities described in the initial records. Second, children interacted more readily with paint, flour, clay, and textured materials and showed greater willingness to join the proposed tasks. Third, entries characterized curiosity and enthusiasm as higher during exploratory activities. Fourth, later records described improved turn-taking, followingdirections, and transitions between activities.

Table 2. *Qualitative classroom patterns and bounded interpretations*

Category	Observed pattern in source records	Interpretive boundary
Sustained attention	Fewer interruptions, longer task engagement, more completed activities.	Supports a change in observed on-task duration; does not establish a generalized attention gain.
Participation	More manipulation of materials and more willingness to enter activities.	May reflect agency, novelty, task accessibility, or teacher prompting.
Motivation	Greater curiosity and enthusiasm were recorded during sensory activities.	No validated motivation scale was used; this is an observational characterization.
Self-regulation	More orderly turn-taking, following directions, and transitions.	Suggestive classroom behavior; not a standardized measure of executive function.

Teacher interview notes reportedly agreed that manipulation and sensory stimulation supported longer participation. Because the interview protocol and respondent count were not documented, this agreement is treated as contextual corroboration rather than formal triangulation capable of confirming an intervention effect.

Discussion

Interpreting the attention changeThe central empirical findings arenarrow but clear: every child remained on task longer in the post-intervention observation, and the group mean increased by four minutes. This pattern is compatible with studies showing that playful conditions, meaningful choice, and multimodal materials can extend engagement (Cheng et al., 2025; DiCarlo & Ota, 2026; Fan et al., 2024). It also aligns with research in which tactile and multisensory interfaces supported retention, although retention and attention are distinct outcomes (Di Fuccio et al., 2025). The present study adds a small Ecuadorian classroom case in which sensory play was integrated with English instruction rather than delivered as a separate laboratory task.The findings should not be described as proof that sensory play caused a generalized improvement in attention. Six children were observed before and after a three-month period with no comparison group. Maturation, growing familiarity with the teacher and tasks, repeated observation, changes in classroom routine, and novelty could all contribute. Hamari et al. (2016) further remind educators that engagement is related to learning but is not identical to it. Here, the study measured time on task, not English achievement, vocabulary retention, executive function, or transfer to other activities.The exact Wilcoxon result is useful as a description of consistency, not as a substitute for design strength. A p value cannot control for confounds absent from the research design. The appropriate conclusion is that structured sensory play coincided with longer observed attention among these six learners and merits more rigorous testing.

Why might structure sensory play support engagement?

Several mechanisms are plausible. Manipulation gives children a visible and tactile focus, turns verbal instructions into actions, and creates immediate feedback when a task is completed. From constructivist and sociocultural perspectives, materials become mediational resources through which children act, talk, imitate, and receive guidance (Piaget & Inhelder, 1972; Vygotsky, 1978). In an English lesson, describing texture, color, movement, quantity, or sequence can connect language with a shared object and reduce the abstraction of teacher

talk.Choice and autonomy may also matter. DiCarlo and Ota (2026) found longer attention under child-initiated and adult-choice conditions than under adult presentation. The current records do not specify how much choice each child received, but the exploratory nature of clay, paint, flour, and textured materials likely permitted more varied action than passive reading exercises. This interpretation is consistent with the regional evidence on play and attention (Alay Rodríguez et al., 2025) and with classroom approaches that use manipulatives and play-work methods to support sensory exploration (Llerena López et al., 2023; Londoño Vega et al., 2024).The observations of participation and transitions may also reflect how structured sensory tasks channel movement. Lin et al. (2012) found that sensory-processing strategies could influence classroom activity levels among children with sensory-integration difficulties, while Jacob et al. (2021) reported attention benefits from pictorial and music-based interventions in a different special-education population. These studies do not validate the present intervention directly, but they support the broader proposition that attention can be facilitated by matching activity structure to children's perceptual and regulatory needs.

Sensory calibration, inclusion, and overstimulation

A major contribution of the newer literature is its rejection of the assumption that maximal stimulation is desirable. Stern-Ellran et al. (2016) observed more disruptive behaviors when preschoolers completed structured play on a highly colorful surface. Abdou et al. (2026) similarly argue that inclusive environments require graded, controllable sensory conditions because children with different neurodevelopmental profiles may respond differently to light, sound, color, texture, and spatial complexity. The same paint or texturethat attracts one child may distract or discomfort another.The present results should therefore guide design toward focused sensory activity rather than sensory saturation. Materials should be introduced in limited sets, unnecessary visual clutter should be removed, and the sensory feature should serve the learning goal. Children should have equivalent low-intensity options and predictable ways to pause. This approach is compatible with Universal Design for Learning, which emphasizes flexible participation and teacher competence in adapting support (Tīģere et al., 2025).Teacher preparation is essential. Aksoy (2026) found that hands-on activities with natural and sustainable materials were valued for creativity and collaboration, while pre-service teachers also identified time, organization, age appropriateness, and classroom management as challenges. The practical success of sensory play depends on routines for distributing materials, explaining boundaries, cleaning up, and linking exploration to language.

Implications for English learning and multimodal classrooms

The intervention occurred in English lessons, but the evidence does not permit a claim that English proficiency improved. Bilgiç and Kutlu Demir (2025) offer a conceptual model in which movement, music, and multiple modes can support inclusive English participation, particularly for learners with ADHD. The current observations are consistent with that pedagogical direction, but future studies must assess language outcomes independently through age-appropriate vocabulary, comprehension, or oral-use measures.Hands-on sensory play can also function as a counterbalance within increasingly digital childhood environments. Reviews indicate that digital media can support some cognitive and educational outcomes but that excessive or poorly mediated use is associated with attention, sleep, physical, emotional, and social risks; effects vary by content, duration, and context (Clemente-Suárez et al., 2024; Kar et al., 2025). The implication is not to reject technology. Salehi Gahrizsangi et al. (2026) recommend multimodal designs that combine digital tools with tactile, social, outdoor, and movement-based learning. Di Fuccio et al. (2025) demonstrate one productive hybrid through tangible interfaces. Emerging technologies may improve research quality as well as pedagogy. The music-based serious game studied by Urbina-Alarcón et al. (2025) combined children's usability reports with objective movement data, illustrating the value of multimodal evaluation. Sánchez-DelaCruz et al. (2025) showed that accelerometer-equipped interactive toys can classify patterns of physical interaction. Future classroom studies could combine unobtrusive behavioral sensing with validated human coding, but only after addressing consent, data protection, interpretability, and the risk that measurement itself alters play.

5.5 Practical implications

Teachers should integrate structured sensory-play tasks into English lessons, offer limited choices, scaffold language use, regulate sensory intensity, document attention consistently, and adapt materials to individual developmental needs across contexts.In practice, activities should be brief, goal-linked, and observable. A teacher might introduce two or three target words, invite children to select between two materials, model the action and language, and close with a short verbal or pictorial recap. Observation records should use the same definition of on-task behavior before and after implementation.

Limitations and Future Research

Studying hassomelimitations. The sample contained only six children from one private school, limiting transferability to public, rural, socioeconomically diverse, or inclusive settings. Purposive selection may have favored children who were especially responsive to the activities. The one-group design cannot separate intervention effects from maturation, classroom history, teacher influence, repeated observation, or novelty.Measurement was also limited. Attention was recorded in minutes through a classroom observation rather than a validated attention instrument, and the manuscript did not provide operational rules, observer training, inter-rater reliability, or blinding. Narrative ranges conflicted with the participant-level chart, requiring the chart to be treated as the authoritative record. Teacher interviews were insufficiently documented for formal qualitative analysis. Motivation and self-regulation were observational categories, not psychometrically measured constructs.Future research should use larger samples, transparent recruitment, comparison or randomized conditions where feasible, repeated baseline observations, delayed follow-up, and standardized or clearly operationalized attention measures. Studies should distinguish attention, learning, motivation, emotional regulation, and language outcomes rather than treating them as interchangeable. Weiser et al. (2026) show why intervention heterogeneity,and loosely measured benefits make synthesis difficult. Research should also test sensory intensity, child choice, teacher scaffolding, and individual sensory profiles as moderators.Objective measures may complement observation, but they should not replace pedagogical interpretation. Video coding, wearable movement sensors, or instrumented toys could help quantify engagement and activity patterns (Sánchez-DelaCruz et al., 2025; Urbina-Alarcón et al., 2025). Such methods require child-centered ethics, minimal intrusion, secure data management, and validation against meaningful classroom behavior.

CONCLUSIONS

Across a three-month period, six early primary English learners showed longer observed attention during structured activities after sensory play had been integrated into their lessons. The participant-level records increased from a mean of 2.50 to 6.50 minutes, and classroom notes described greater participation and more orderly behavior. These results offer exploratory support for sensory play as a supplementary pedagogical practice. They do not establish causality or broad cognitive, emotional, or language gains. The strongest implication is design-oriented: teachers should connect a limited number of sensory materials to explicit learning goals, provide manageable choice and scaffolding, monitor individual responses,

and avoid overstimulation. More rigorous studies are needed to determine when, for whom, and under what classroom conditions sensory play supports sustained attention and learning.

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