

Understanding Engagement Patterns in Students with Autism during Physical Education: A Qualitative Inquiry

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HOW TO CITE:

Lalitha Ragul, Prathibha M V, Rashi Gupta, Shailaja S/ Shailaja Ravindra, Sindhuja Manisha Kamini. P, Javlon Bozorboyev, Rahul Tiwari, Neelam (Rani) Goyal (2026). Understanding Engagement Patterns in Students with Autism during Physical Education: A Qualitative Inquiry. International Journal of Special Education, 41(1s), 538-553.

ABSTRACT:

Physical education is an important context to promote inclusion, participation, and social engagement for students with autism, but to date, little research has addressed engagement. Existing studies have primarily focused on the effectiveness of interventions and barriers to participation, and little qualitative work has examined the nature and experience of engagement in physical education. To address this gap, this study investigated the engagement of students with autism using qualitative research. Guided by an interpretivist multiple-case study, data were collected through semi-structured interviews, observations, and field notes from 48 participants (including students with autism, physical education teachers, special educators, and teaching assistants). Reflexive thematic analysis highlighted four

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interconnected themes: engagement is facilitated by routines, sensory factors shape participation, social relationships support engagement, and engagement is activity-specific. Engagement is not a behavioral state but a dynamic, social, and contextual construct. This research provides an ecological conceptualization of multidimensional engagement that extends participation in autism and physical education. The findings suggest routine, sensory, and socially supportive pedagogies are needed to support inclusion. The study contributes to qualitative models of engagement and inclusive practice, policy, and research.

Keywords: Autism, physical education, student engagement, inclusion, sensory processing, peer-mediated support, thematic analysis.

1. Introduction

Inclusive education has grown to acknowledge the need for educational approaches that extend beyond access to participation for those with autism spectrum disorder (ASD). The World Health Organization estimates that many people globally are impacted by autism, highlighting the need for educational settings that accommodate learning and participation needs (WHO, 2024). In education, physical education (PE) offers a unique setting where social engagement, motor skills, emotional processing, and co-participation converge. However, engagement in PE for students with autism may be influenced by sensory sensitivities, social and communication differences, rigid instruction, and unpredictable student environments. It may affect the quality and consistency of engagement (Haegele & Maher, 2021). While inclusive PE has grown in theory and policy, there is a lack of understanding of the processes that underpin engagement of students with autism in these settings. Engagement has shifted from a behavioral to a multidimensional construct involving behavioral, emotional, cognitive, and social aspects (Fredricks et al., 2021). In physical education, engagement encompasses more than task involvement, involving a sense of inclusion, a drive to continue, attention to learning, and reciprocal interactions with others. For students with autism, these are often fluid, rather than fixed, features that change in response to environmental supports and challenges. Recent research indicates

engagement is determined not just by individual abilities, but also relational and environmental factors, especially in dynamic and interactive contexts like PE (McNamara et al., 2022). This multifaceted view is important because engagement is a measure of inclusion, rather than just presence in mainstream settings.

Although research about autism and inclusive physical education (PE) is increasing, there are still gaps. Current research has tended to focus on participation challenges, the effectiveness of interventions, or teacher perceptions, rather than the nature of engagement experiences and negotiation in routine PE contexts (Petersson-Bloom et al., 2022). In addition, much of the existing work has focused on observable participation patterns, providing little qualitative insight into the social, sensory, and pedagogic processes of engagement. This is especially important since engagement for students with autism may be dynamic, contextual, and socially constructed, rather than static or merely compliance- or task-focused. Thus, a qualitative approach is needed to explore these processes. The current study addresses the gap that inclusion in PE often focuses on placement and engagement opportunities but lacks insights into the conditions that enable engagement. Students with autism may be physically present in PE, but their level of engagement can be inconsistent based on their peer interactions, environmental affordances, pedagogical adaptations, and self-regulatory

experiences. This gap between inclusion policy and engagement practices calls for further research on the processes of engagement patterns and interpretations in authentic learning environments.

To address this gap, this study examines engagement of students with autism from an ecological and participation-informed lens using qualitative inquiry.

Figure 1. Conceptual Framework of Engagement in Physical Education

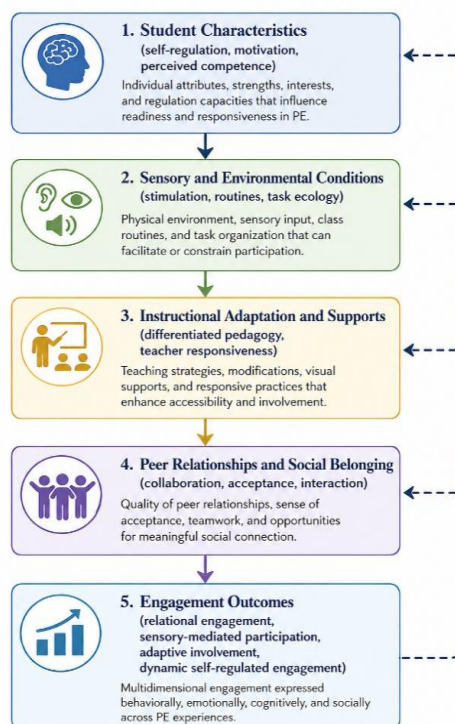


Figure 1. Conceptual framework illustrating engagement as a socially mediated and context-dependent process shaped through interactions among individual, environmental, instructional, and relational factors.

Figure 1 illustrates the conceptual framework for this study, which is consistent with the study's emphasis on engagement as dynamic, relational, and multidimensional. The framework, therefore, does not view engagement as a simple behavioral outcome, but rather as a product of the interaction between four related domains: student characteristics and needs, sensory and environmental conditions, instructional support, and peer relations. These four domains map onto the four thematic perspectives explored in this study: engagement in relation to others, sensory context as an influence on participation, instructional adaptation as an enabler of involvement, and engagement as a negotiation of competence, motivation, and self-regulation. In this way, the framework offers a lens to conceptualize

how engagement patterns emerge during inclusive PE lessons and guided data collection and analysis. So, the study has three goals: (a) to understand how students with ASD experience and negotiate engagement in physical education, (b) to identify how sensory, instructional, and relational factors influence engagement patterns, and (c) to develop qualitative knowledge to extend conceptual thinking and guide practice. In line with these goals, the study seeks to answer these questions:

1. How do students with autism experience and negotiate engagement during physical education?
2. How do sensory context, instructional supports, and peer relationships shape

engagement patterns in inclusive PE settings?

3. In what ways can understanding these engagement patterns inform theory and inclusive physical education practice?

By addressing these questions, the study seeks to advance qualitative scholarship on autism inclusion by conceptualizing engagement not as a fixed behavioral state, but as a multidimensional and contextually negotiated process.

2. Literature Review

Engagement is a major construct used to conceptualize meaningful learning in education, but it has shifted in meaning beyond mere behavior. Recent research has conceptualized engagement as a multidimensional and contextualized process that involves behavioral, emotional, cognitive, and social engagement that are dynamic and interrelated (Fredricks et al., 2021; Lawson & Lawson, 2021). This multidimensional perspective is consistent with the conceptualization of engagement in the current study, in which the engagement of students with autism in physical education (PE) is seen as relationally mediated, influenced by sensory factors, shaped by instruction, and negotiated through dynamic processes. Rather than viewing engagement as compliance and completion of tasks, new theories view engagement as an interactive process that occurs through the interaction between students, environment, and social context. In PE, indicators of behavioral engagement are often the presence of participation, persistence, and on-task behavior; yet such surface features may mask more nuanced aspects of involvement. Emotional engagement, such as enjoyment, belonging, and emotional safety, is particularly important in PE where interactions with others and public performance may influence engagement. Cognitive engagement, as exhibited through effortful attention and strategic engagement, is also shaped by teaching and competence perceptions. Social engagement, increasingly identified as important in inclusive settings, involves peer connectedness and shared involvement, and relational belonging (Fredricks et al., 2021). For students with autism,

these aspects may vary as demands change, highlighting the importance of conceptualizing engagement as dynamic and relational rather than individual.

This perspective is particularly important for autism studies, in which participation has often been examined from deficit or intervention perspectives. In recent years, positive participation experiences and affordances for inclusion have been studied. In the context of PE, affordances for students with autism may include sensory, motor, communication, and social opportunities or constraints (Srinivasan et al., 2021). While inclusive PE is often discussed as having a positive impact on physical, social, and emotional well-being, research has shown that participation experiences are not always equitable, and these are more greatly influenced by the environment rather than disability. This reinforces ecological models of engagement in interactions between individual, contextual, and relational factors rather than individual attributes. Recently, research into inclusive PE engagement patterns has indicated that engagement is dynamic, variable, and sometimes unpredictable. Liang et al. (2020) demonstrated that the engagement patterns of neurodiverse students are responsive to task conditions, autonomy support, and responsiveness to students. Similarly, Petrie et al. (2024) argue inclusive PE engagement is best understood as occurring through pedagogical, sensory, and social ecologies, rather than through discrete interventions. The current study is in line with these perspectives on process. Across studies, there are clear trends that students with autism engage more successfully with flexible teaching, social norm scaffolds, and responsive sensory environments. However, engagement is potentially constrained by unpredictability, sensory overload, and exclusionary peer cultures.

Sensory and social factors have gained salience in explaining engagement variability. Sensory contexts such as noise, density, change, and predictability may facilitate or hinder engagement depending on students' self-regulatory needs (Srinivasan et al., 2021). Now considered more fundamental to engagement, sensory factors once were viewed as

peripheral influences. Likewise, peer dynamics affect not only social engagement but also motivation and engagement. Waddington et al. (2025) note that acceptance by peers and collaborative contexts often contribute to inclusion.

So, social inclusion can be an outcome and a predictor of engagement. This supports the conceptual framework outlined in Figure 1, in which sensory and peer contexts are foundational to engagement.

Table 1. Summary of Recent Empirical Studies on Autism and Physical Education Engagement

Author/Year	Method	Sample	Focus	Key Findings
Fredricks et al. (2021)	Conceptual/Empirical Review	Multi-study synthesis	Multidimensional engagement	Engagement is behavioral, emotional, cognitive, and social, shaped contextually.
Liang et al. (2020)	Qualitative case study	Students with autism in inclusive PE	Participation dynamics	Engagement fluctuated with instructional structure and autonomy support
Srinivasan et al. (2021)	Mixed methods	Neurodiverse students and teachers	Sensory and motor influences	Sensory-responsive environments supported sustained participation
Lawson & Lawson (2021)	Theoretical review	Educational settings	Engagement theory	Engagement emerges relationally through ecological interactions
Petrie et al. (2024)	Qualitative inquiry	Inclusive PE stakeholders	Pedagogical supports	Adapted instruction and teacher responsiveness facilitated engagement
Waddington et al. (2025)	Multi-site qualitative study	Students, teachers, support staff	Peer and social dimensions	Social belonging and peer collaboration mediated meaningful inclusion

Some recent trends are shown in Table 1. First, engagement is increasingly conceptualized from a non-deficit, ecological, and participation perspective. Whatever the conceptualization, engagement is portrayed as a multidimensional and contextual, rather than behavioral, construct. Second, there is a consensus that the factors of instruction adaptation, sensory responsiveness, and peer interactions are inextricably linked. This is consistent with the conceptualization in the current study, which has conceptualized these as interacting in patterns of engagement. However, the research has its shortcomings. While empirical research recognizes the contextuality of engagement, it often examines the role of one factor (such as teaching adaptation) or another (such as sensory support) rather than their inter-relationship in everyday practice. Furthermore, although some studies have discussed the variability of engagement, there is less

research that has qualitatively investigated students' moment-to-moment negotiation of engagement. Previous research has also emphasized participation outcomes rather than the relational nature of engagement. This suggests a need to understand engagement as negotiation, as the current study does.

The theoretical framework undergirding this research effectively addresses these gaps by bringing together ecological and multidimensional engagement theory. Ecological theory recognizes that participation occurs through transactional interactions between individuals and contexts, and multidimensional theories of engagement offer a lens for understanding the multidimensional (behavioral, emotional, cognitive, social) expressions of this interaction (Fredricks et al., 2021; Lawson & Lawson, 2021). These views

together allow us to conceptualize engagement for students with autism neither as a constant property nor as socially mediated and contextualized. This view also resonates with the four thematic orientations proffered in the abstract and conceptual framework: relationally mediated engagement, sensory conditions as participation determinants, instructional adaptation as a catalyst for involvement, and engagement as dynamic self-regulation. Overall, the literature indicates that in order to understand engagement in autism-inclusive PE, it is important to shift the focus from participation (whether students are in class) to the construction of engagement through the interaction of personal characteristics, sensory ecologies, pedagogy, and social relations. Although previous literature establishes the relevance of these areas, it leaves unresolved how they intersect to construct complex engagement patterns from the perspectives of various stakeholders. In response, the current qualitative study builds on prior work to examine engagement as a dynamic, socially co-constructed phenomenon in authentic physical education contexts.

3. Methodology

Research Design

This study adopted an interpretivist qualitative thematic inquiry approach to explore the nature of engagement patterns of students with autism in physical education. In line with the study's conceptualization of engagement as ecological and multidimensional (as discussed in earlier sections), it was appropriate to use a qualitative approach as this considers meanings, interactions, and processes that may be lost in standardized measurement (John W. Creswell & Cheryl N. Poth, 2018). Specifically, a multiple-case qualitative approach was adopted to understand engagement in inclusive settings, with the potential to compare engagement patterns across cases. This was in line with the study's desire to conceptualize engagement as dynamic, social, and constructed rather than as an outcome-related behavior. The research was guided by a conceptual model (see Figure 1) that conceptualized engagement outcomes as an outcome of student characteristics, sensory environments, pedagogic

approaches, and peer contexts. The model was used to guide data collection, analysis, and interpretation to ensure congruence between the theoretical and methodological approaches.

Participants and Sampling

Purposive sampling (as is common in qualitative research) was used to sample cases with rich information, to identify those with experience of engagement processes in inclusive physical education (Creswell & Poth, 2018). The sample comprised 48 participants from four inclusive schools: 20 students identified with autism spectrum disorder, 12 physical education teachers, 8 special educators, and 8 teaching assistants. This was in line with the abstract of the study and sought to represent a range of perspectives on engagement processes, as well as triangulate perspectives between stakeholders. Students were identified for autism, engagement in general physical education (PE) lessons, and an ability to communicate engagement experiences verbally or with support. Adults were recruited for their involvement in supporting PE. Maximum variation sampling was used in purposive sampling to ensure variation in age, engagement, school environments, and inclusion supports. This varied the quality and content of the engagement experience data.

Data Collection

Data were collected via semi-structured interviews, extended non-participant observations, and researcher field notes. Semi-structured interviews were chosen to gain insight into participants' perspectives of their engagement experiences, with flexibility to explore relational, sensory, and instructional aspects of engagement as outlined by the conceptual framework. In all, 48 interviews were conducted, with an approximate duration of 40-60 minutes (adults) and 20-35 minutes (students), making necessary adjustments for communication support as needed. Data were observed in PE sessions over 12 weeks to capture naturally occurring engagement interactions, teaching practices, peer interactions, and contextual factors. This was important because engagement, as defined in this research, is interactional and embodied in

part; therefore, observations complemented document contextual details, analytic notes, and interview accounts and allowed for more contextual interpretive insights. Reflective field notes were kept to

Table 2. Interview Protocol Domains and Sample Questions

Domain	Sample Questions
Engagement	How do students experience involvement and participation during physical education activities? What makes students feel actively engaged or disconnected?
Barriers	What factors make participation difficult or limit engagement during PE? How do challenges emerge in instructional or social situations?
Supports	What teaching practices, peer interactions, or adaptations help support engagement? What conditions encourage sustained participation?
Sensory Experiences	How do noise, movement, routines, or environmental stimuli influence engagement during PE? How do students respond to these experiences?

Table 2 outlines the interview protocol domains developed from the conceptual framework and the relevant literature. Rather than being presented as discrete interview topics, the domains were designed as interrelated areas of inquiry corresponding to the study's central constructs of relational engagement, contextual barriers, enabling supports, and sensory mediation. The interview protocol was designed to facilitate consistency across interviews, whilst allowing for the kinds of probing and exploration that are responsive to the experiences of individual participants. The protocol also strengthens the correspondence between data collection methods and research questions.

Data Analysis

A reflexive thematic analysis approach was used to understand the data as proposed by Virginia Braun and Victoria Clarke (2022). We chose this approach as it offers an interpretive analysis of patterned meanings and allows for contextual and theoretically sensitized analysis. The six phases of analysis were familiarisation, initial coding, generation of candidate themes, review and revision of themes, definition of themes, and writing the analysis. Coding methods were guided by principles of iterative and interpretive coding (as described by Johnny Saldaña, 2021) that involved initial descriptive and process coding and evolving to interpretive pattern-based themes. Coding is centered not just on what factors impact

engagement, but also on how participants described engagement as co-negotiated relational, sensory, and instructional conditions. This resulted in four themes that were consistent with the study abstract: engagement as relationally mediated, sensory conditions as determinants of participation, instructional adaptation as enabling involvement, and engagement as dynamic negotiation of motivation, competence, and self-regulation. The analysis was inductive and theoretically guided. Themes were derived from participant stories and observations, but interpretations were guided by the ecological-participatory framework of the study. This allowed for meaningful analysis while ensuring consistency between the conceptual framework, literature review, and results.

Trustworthiness

We focused on ensuring trustworthiness through credibility, transferability, dependability, and confirmability (Yvonna Lincoln et al., 2021). Credibility was achieved through triangulation of interviews, observations, and field notes; member reflection with a handful of participants to check if interpretations resonated with participants. Prolonged engagement also enhanced contextual knowledge. Transferability was enhanced via thick descriptions of participants, milieu, and engagement contexts for readers to assess transferability to other inclusive PE contexts. Dependability was enhanced via an audit trail of methodological decisions,

coding, and memos. Confirmability was enhanced through reflexive journaling and peer debriefing to examine possible researcher biases and improve analytic procedures. These measures ensured rigor and that the findings of this study are a true reflection of engagement patterns of students with autism in physical education. The methodology was aligned to the qualitative nature of the study, and the aim was not to statistically generalize, but to provide important theoretical and practical understandings of engagement as a complex, social construct.

4. Findings

Four interrelated themes emerged from the thematic analysis that capture engagement in students with autism in physical education as dynamic, relational, and contextual. In line with the conceptual framework (Figure 1), engagement was not static “behavior” but a socio-environmentally constructed process that was negotiated through interactions between structure, sensory experience, peer relationships, and activity demands. Though presented separately, participants’ accounts depicted these aspects as interrelated influencers of engagement. The findings are presented in four themes, supported by participant quotations, interpretative analysis, and synthesis across themes.

Theme 1: Structured Routines Foster Engagement

Generally, routines supported engagement by reducing ambiguity, facilitating self-regulation, and providing time for engagement. Subthemes were predictability as regulation support, clarity as participation scaffold, and transitions as engagement stabilizers. Students tended to associate structured lessons with readiness to engage. A student commented, “When we warm-up, play, and cool-down, I know what to do.” Similarly, a physical education teacher said, “Students were more engaged in the lesson when there was repetition and visual cues.” During observations, routine appeared to reduce anxiety and promote engagement. Structural cues were also engagement scaffolds. Demonstrations and visuals, as well as consistent task formats, were often invitations to participate, particularly for students unsure of their abilities in

more open tasks. Students also frequently referred to transitions. Unsupported transitions tended to decrease engagement; supported transitions facilitated greater engagement. In interpreting these results, structure not only structures instruction, but it also enables engagement through its contribution to predictability, both cognitive and emotional. Predictability was a precondition for self-initiated engagement and flexible engagement, which provides evidence for the study’s claim that supports enabling engagement.

Theme 2: Sensory Context Shapes Engagement

Theme two is related to the significance of the sensory environment. Participants described engagement as being sensitive to the sensory environment, such as noise, crowding, movement, and change. We identified three subthemes: disengagement through sensory engagement, environmental accommodation to support engagement, and regulation of engagement through sensory responsiveness. Disengagement was commonly associated with overstimulation. One student commented, “When it’s too loud, I can’t listen, and I want to leave.” A support staff member also reported, “It appears to be disengagement, but it’s overstimulation.” Teachers noted sensory intensity was a factor in engagement, especially during fast-paced group tasks. In turn, the importance of sensory-sensitive environments was noted. Sensory breaks, routines, adjusting task demands, and providing self-regulatory opportunities facilitated engagement. One teacher said, “Small changes had a big impact on engagement.” These examples demonstrate the prominent role of sensory context in engagement. Engagement was occurring both in and through sensory environments. This supports the notion of engagement as sensory mediated and afforded.

Theme 3: Social Relationships Enable Participation

The third theme demonstrated engagement was relational. Peers and teachers’ interactions with students enabled engagement. Peer acceptance was found to be enabling and a sense of belonging, collaboration was found to be enabling and a

catalyst for engagement, and teacher responsiveness was found to be enabling and relational. Themes of engagement are linked to inclusion. One student said, “I want to stay in the activity if my friends choose me for their group. Another stated, “I participate more if someone tells me how to do it.” Teachers also noted the role of peer climate: “When there are good peers around, you can participate confidently.” Teachers reported cooperative tasks were often a formula for engagement if peers offered support and encouragement. Classroom observations also suggested cooperative tasks tended to elicit more engagement than competitive tasks. Responsivity from teachers also contributed when they enacted strategies to encourage inclusion with peers or lowered expectations. These findings interpretively indicate engagement was socially developed through social acceptance, inclusion, and support. Peer climate not only provided opportunities for engagement but also facilitated engagement. This affirms the abstract’s “relational” description of engagement.

Theme 4: Engagement Fluctuates Across Activities

The fourth theme related to engagement as a variable across different activities. Engagement was dynamic and varied within PE, due to task characteristics, perceived competence, and social norms. Subthemes were activity preference and competence fit, dynamic motivation, and contextual engagement. Students’ engagement fluctuated between activities. One student reported, “I enjoy skill stations, but not team games as they make me feel like giving up.” Likewise, one PE teacher commented, “You can see the same child being engaged in one task and not engaged in another.” Individual or skill-oriented activities tended to promote ongoing engagement, while competitive or unpredictable activities sometimes led to withdrawal. These experiences were not viewed as inconsistent but rather responsive to the context. Engagement and self-regulation seemed to be negotiated within activity ecologies. This theme contributes to seeing engagement as dynamic and contextual. Children were not purely engaged or disengaged; engagement varied in response to interactions between competence, structure, sensory stimulation, and relational needs. This is consistent with the study’s context as negotiation of engagement.

Table 3. Emergent Themes and Representative Quotes

Theme	Subtheme	Illustrative Quote
Structured routines foster engagement.	Predictability and instructional scaffolds	“When I know the routine, I know how to join.”
Structured routines foster engagement.	Supported transitions	“Moving between activities was easier when steps were clear.”
Sensory context shapes engagement.	Sensory overload and adaptation	“Too much noise makes me stop participating.”
Sensory context shapes engagement.	Regulation through environmental supports	“Quiet spaces helped students return to activities.”
Social relationships enable participation.	Peer belonging and collaboration	“If friends include me, I stay in the game.”
Social relationships enable participation.	Teacher relational support	“Supportive prompting helped students engage more.”
Engagement fluctuates across activities.	Activity-specific motivation	“Some activities make me want to keep trying.”

Engagement fluctuates across activities.	Situational variability	“Engagement changed depending on the activity.”
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Table 3 summarizes the emergent themes and representative participant quotations, illustrating how engagement was understood through recurring experiential patterns rather than isolated incidents. Across stakeholder groups, quotations reflected engagement as relational, contextual, and dynamic.

Figure 2. Thematic Map of Engagement Patterns

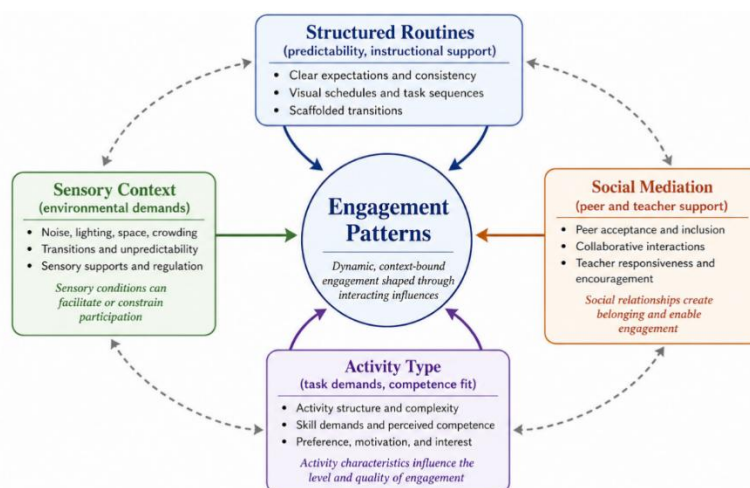


Figure 2 visually represents the interdependence among the four themes. Structured routines often moderated sensory challenges; social mediation buffered activity demands; and activity type interacted with all other domains in shaping engagement intensity. Rather than linear influences, the figure depicts engagement as emerging through interacting conditions.

Table 4. Contextual Factors Influencing Engagement Across Themes

Theme	Individual Factors	Environmental Factors	Relational Factors	Engagement Outcome
Structured routines foster engagement	Self-regulation, predictability needs	Consistent routines, task sequencing	Teacher scaffolding	Sustained participation
Sensory context shapes engagement.	Sensory responsiveness	Noise, space, transitions	Regulation support	Adaptive involvement
Social relationships enable participation.	Social confidence	Collaborative activity structures	Peer acceptance, teacher responsiveness	Relational engagement
Engagement fluctuates across activities.	Motivation, perceived competence	Activity demands	Peer interaction demands	Variable engagement intensity

Table 4 cuts across the themes to demonstrate how engagement patterns were produced in interactions between individual, environmental, and relational factors. These often worked in concert to support or inhibit engagement. For instance, timed activities supported self-regulation, but were often combined

with teacher supports; sensory supports affected engagement, but often in combination with peer and activity conditions. Likewise, variations in engagement across activities were often not due to activities per se but to the integration of perceptions of competence, social, and contextual affordances. The across-themes matrix supports an ecological-participatory interpretation of the findings, showing engagement outcomes were the product of interactions, rather than single factors. It also reinforces the conceptual fit between findings and the multidimensional model introduced previously, in that engagement is socially mediated, sensory responsive, and dynamic. Overall, the findings indicate engagement outcomes were most likely when structure, sensory responsiveness, relational, and activity fit coincided. When these fit, engagement was likely to be fragmented or fractured. Across tables and themes, students' descriptions of engagement reflected not an essential quality of students, but rather, an emergent, mediated process operating through multiple interactions. These findings support the conceptual and theoretical framework put forward here.

5. Discussion

We investigated engagement in physical education for students with autism as a multidimensional, social, and negotiated process. Across our four themes, the findings show engagement cannot be explained by behavioral participation or individual motivation alone, but is a complex interaction between structures and supports, sensory, peer, and activity demands. These findings, interpreted through Self-Determination Theory (SDT) and from a socioecological standpoint, offer a new understanding of engagement as motivationally supported and ecologically constructed. From an SDT perspective, this would indicate engagement is supported when the physical education

environment supports autonomy, competence, and relatedness. Routines and differentiation appeared to promote competence via predictability and success. This finding is consistent with Fredricks et al. (2021), who highlight the connections between engagement and perceived competence and learning environments. Alternatively, in this study, competence was not necessarily thought of as individually perceived, but rather supported by routines, clarity, and predictability.

We also observed evidence for autonomy, but perhaps not through unfettered choice of activities, but through manageable levels of participation, self-regulation, and engaging in activities that suit individual needs. This contributes to the historical application of SDT in implying that autonomy for students with autism may be achieved through predictable and responsive environments and through choice. Significantly, the importance of peer relations and teacher responsiveness points to relatedness. As other researchers (Connie Kasari et al., 2021) suggest, inclusion and social mediation were key to engagement, but, as our findings suggest, relatedness is not just a condition for engagement; it is a catalyst. An ecocultural approach also helps us to understand engagement as mediated by reciprocal influences of individual, interpersonal, instructional, and environmental factors. For example, sensory context not only contextualized but also enabled participation. Similarly, peer and activity demands were nested with instruction to mediate engagement intensity and variability. This perspective is consistent with ecological theories that participation is the product of nested interactions of context rather than being an individual property. Importantly, the findings suggest engagement variability between activities should not be seen as poor engagement or a deficit, but rather as a response to ecology.

Table 5. Integration of Findings with Theoretical Frameworks

Major Finding	Self-Determination Theory Interpretation	Socioecological Interpretation	Practical Implication
Structured routines foster engagement.	Supports competence and autonomy	Instructional environments shape participation	Use predictable, scaffolded routines
Sensory context shapes engagement.	Supports regulation and autonomy	Environmental conditions mediate engagement	Design sensory-responsive PE settings
Social relationships enable participation.	Fosters relatedness	Social systems support inclusion	Promote peer-mediated supports
Engagement fluctuates across activities.	Competence perceptions affect motivation	Activity ecology influences participation	Match activity design to student strengths

Table 5 illustrates how the study's findings align with SDT and socioecological perspectives; engagement is motivationally supported and ecologically mediated. Importantly, the table shows that the same empirical themes provide explanations from multiple viewpoints and pedagogical insights. This dual alignment is a theoretical contribution. These analyses are consistent with and extend previous studies. The multidimensional patterns of engagement observed in this study support Fredricks et al. (2021) in terms of the inter-relationship between behavioral, emotional, cognitive, and social engagement. But this study extends this by describing sensory mediation and variability across different activities as important but often under-recognized aspects of engagement.

Likewise, Haegele and Maher (2021) highlighted factors affecting participation in inclusive physical education, but the current findings extend this view by providing insight into positive ecological contexts and opportunities for engagement. Likewise, Petrie et al. (2024) noted ecological influences on inclusive engagement, and this is supported here. But the present findings include a more sophisticated perspective where structure, sensory, peer support, and activity design are interlinked engagement factors. Crucially, activity-specific variability is a dynamic response to features of the situation, rather than student inconstancy. This adds a dynamic element to this work.

Table 6. Comparison of Present Findings with Prior Literature

Present Study Finding	Fredricks et al. (2021)	Haegele & Maher (2021)	Petrie et al. (2024)	Contribution of the Current Study
Multidimensional engagement	Supports	Extends	Supports	Develops an autism-specific engagement model
Sensory mediation is central to engagement.	Limited emphasis	Partial support	Emerging support	Positions sensory context as a core engagement determinant
Social mediation as a participation mechanism	Supports	Partial support	Supports	Frames relationships as generators of engagement

Dynamic engagement fluctuation	Limited treatment	Minimal emphasis	Emerging recognition	Novel contribution emphasizing situational engagement variability
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Table 6 compares the current findings with previous studies and outlines the significance of the current study. Although the findings are consistent with prior literature on engagement and inclusion, they also contribute to the field in two key ways: first, by foregrounding the role of sensory context in

engagement rather than as a peripheral factor in inclusion; and second, by proposing that engagement is dynamic and activity-specific, rather than consistent across settings. These differences help inform the study's contribution to an autism-specific engagement framework.

Figure 3. Proposed Model of Autism Engagement in Physical Education

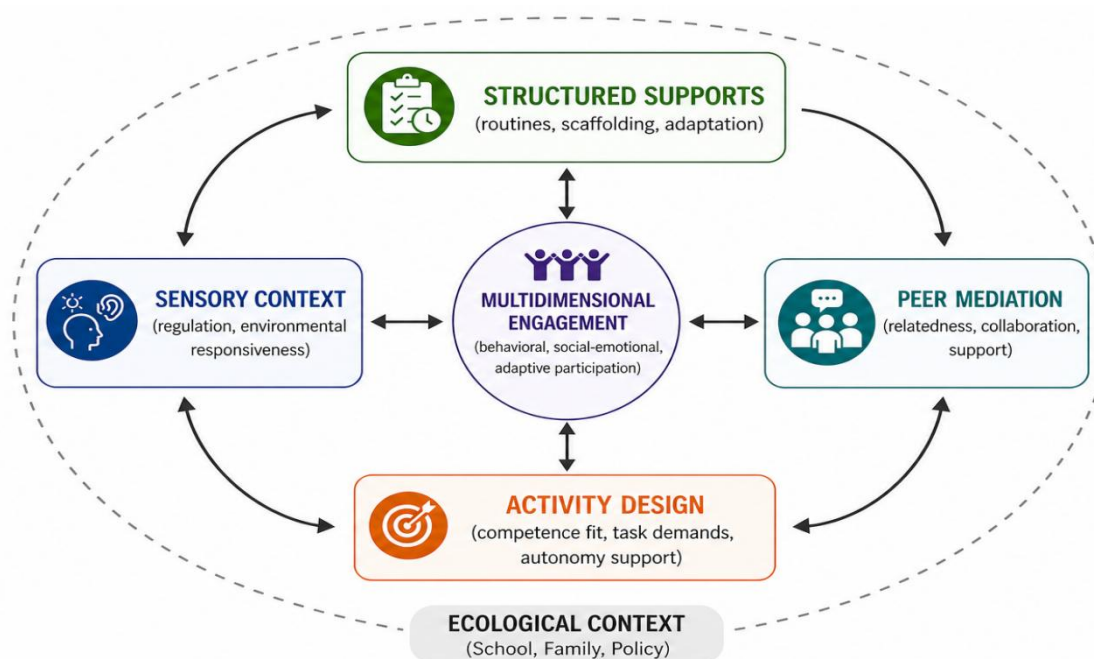


Figure 3. Proposed model of autism engagement in physical education illustrating engagement outcomes as emerging through the interaction of structured supports, sensory context, peer mediation, and activity design.

Figure 3 seeks to capture the argument in a model of engagement in physical education for children with autism. This model builds on the themes and connections shown in Figure 2 to make a theoretical case that engagement is the result of orchestrated supports, sensory responsiveness, peer interactions, and physical activity designs. These construct areas are not independent of one another, but are interdependent to produce engagement outcomes of sustained engagement, relational engagement, adaptive engagement, and self-regulated participation. The model contributes to this theory by shifting an individual to an interaction approach

to engagement. It shifts the problem of disengagement away from being a student deficit to conceptualizing engagement variability as affected by dynamical environmental factors. This is a new addition to engagement theory and inclusive physical education for children with autism. In this way, the study has three theoretical implications. First, it contributes to multidimensional engagement by drawing attention to the influence of sensory mediations on engagement. Second, it adds to socioecological thinking as it shows engagement is generated through system interactions, not supports. Third, it provides a dynamic participation

model by assuming participation is dynamic, socially and co-constructed, and activity-based. Overall, these advances build and move beyond static or deficit thinking of participation.

The findings also have implications for practice. For teachers, the findings suggest engagement may be improved by predictable classroom schedules, sensory-responsive classrooms, peer scaffolding, and activities congruent with competence and interest. Importantly, the findings suggest inclusion should not just consider adaptation of activity but design for engagement. Teacher training should focus on sensory-sensitive teaching, scaffolding, and engagement-focused lesson planning. Policy implications include that inclusion should be defined in terms of engagement opportunity, not just access. In summary, the discussion suggests engagement of students with autism should be seen not as their characteristic but as a product of engagement conditions. By bringing SDT and socioecological theory together and proposing a multi-dimensional framework for engagement, the findings of this qualitative study offer theoretical

and practical hints for the inclusion of students with autism in physical education.

6. Practical Implications

The study findings showing engagement of students with autism in physical education through engagement-focused classroom designs indicate a shift in inclusion from access to engagement. As engagement was found to be affected by support structure, sensory responsiveness, peer mediation, and activity design, the findings have classroom, school, and policy implications. For teachers, the findings suggest engagement-focused teaching focused on predictability, flexibility, and support. Predictability, visual supports, task structure, and sensory-responsive adaptations can support engagement while reducing uncertainty. Likewise, appropriate use of peer mediation, cooperative task structures, and activities that fit with the students' ability and motivational interests are key. Rather than adaptations being "added-on" to teaching, these findings suggest inclusive physical education should be structured for engagement.

Table 7. Practical Strategies Supporting Engagement

Challenge	Strategy	Expected Outcome
Uncertainty during activities and transitions	Use predictable routines, visual schedules, and structured transitions	Increased confidence and sustained participation
Sensory overload in PE environments	Provide sensory-responsive adaptations and regulation supports	Improved adaptive engagement and reduced withdrawal
Limited peer inclusion	Use peer-mediated supports and cooperative activity formats	Greater social participation and belonging
Activity-task mismatch	Align tasks with competence levels, choice, and autonomy support	Higher motivation and consistent engagement
Fragmented inclusion practices	Coordinate multidisciplinary planning across the school supports	More coherent and sustainable participation support

As shown in Table 7, strategies can be supported to respond to challenges at the proactive instructional and ecological level, rather than reactively. This is important as strategies are not independent: routine may support regulation, but can be supported by peer mediation and adaptable activity design. This echoes the ecological nature of the study that engagement is supported through holistic rather than isolated approaches. At the school level, the

study identifies the need for whole school approaches that embed engagement. Schools can do this by training staff in sensory-informed teaching strategies, co-planning between physical educators and other support staff, and offering flexible scheduling to accommodate teaching needs. Schools should also ensure that cultures of inclusion that focus on belonging and quality participation are promoted. The policy implications for these

recommendations include that inclusion policies in PE should shift from an emphasis on access and placement to engagement-based standards for inclusion. Teacher standards should also include skills in teaching students with autism, sensory sensitivities, and peer support for participation. Finally, system policies that support resourcing, collaborations with specialists, and engagement-based inclusion measures may help make inclusion a reality for participation and engagement. Overall, these implications suggest engagement is not a student right, but an instructional and ecological achievement that is supported through practice.

7. Conclusion and Future Research

This research advances the field of physical education for students living with autism by presenting a theoretical and qualitative understanding of engagement, which is dynamic, multi-dimensional, and co-constructed. This study

defined engagement as co-constructed through interactions between structured supports, sensory context, peer interactions, and activity designs, rather than as a deficit-focused and behaviouristic understanding of participation. Using this conceptualization, the study advances the theory of engagement in physical education and offers an empirically grounded ecological approach to engagement that supports neurodiversity. Four observations are given from the findings: engagement was enabled by predictable routines, which promoted regulation and predictability; participation quality was influenced by sensory context; engagement was mediated by social context through feelings of inclusion and collaboration; and engagement was situationally specific. This study proposes that engagement in physical education is not a question of inclusion or participation, but quality of ecological participation conditions.

Table 8. Alignment of Research Questions, Themes, and Contributions

Research Question	Theme	Contribution
How do students with autism experience and negotiate engagement during physical education?	Structured routines foster engagement.	Extends understanding of engagement as supported through predictability and instructional structure
How do contextual and relational conditions shape engagement patterns?	Sensory context shapes engagement	Positions sensory ecology as central to engagement theory
How do social processes influence engagement in inclusive PE?	Social relationships enable participation	Advances relationally mediated understanding of participation
How does engagement vary across physical education contexts?	Engagement fluctuates across activities	Contributes a dynamic, activity-contingent model of engagement

As outlined in Table 8, the research questions corresponded with a particular theme and yielded a conceptual contribution. This enhances the design and coherence of the research while showing how themes emerged to inform theoretical development. Together, these findings add to an advanced ecological model of multidimensional engagement in the context of autism-inclusive physical education. There are some limitations of the study. The qualitative multiple-case study design produced rich information, but not necessarily representative

information, and the study findings represent experiences in specific inclusive school settings. While stakeholder perspectives were rich in information and multi-stakeholder, their lived experiences may not reflect the diversity of lived experiences of autism across ages, cultures, or teaching approaches. Further, engagement was examined qualitatively, rather than over time, and so little is known about how patterns might change. These findings highlight the need for future work. Longitudinal and mixed-methods research could

explore how engagement patterns emerge over time, across development and lesson contexts. Researchers might also apply and refine the ecological engagement model in different school systems and populations with disabilities. Additional studies on student voice, peer-mediated interventions, and sensory-based pedagogies may

help better understand inclusive physical education pathways from access to engagement. Finally, the study provides a starting point to conceptualize engagement in physical education for students with autism as an ecological, dynamic process and a critical indicator of inclusion.

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