

Physical Activity Environments in Early Childhood Schools: Arabic Translation, Validation, and Reliability of EPAO Instrument

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Abstract

The present study translated the Environmental and Policy Assessment and Observation (EPAO) instrument into Arabic and aimed to evaluate its reliability and validity in Arabic-speaking early childhood school environments. The EPAO is a recognized instrument for assessing physical activity and sedentary conditions in early childhood education contexts. To evaluate reliability, 30 female physical education and health teacher observers administered (mean age \pm SD, 38.22 \pm 1.8 years) the Arabic EPAO twice over two weeks. It utilized the intraclass correlation coefficient (ICC) to measure consistency. Additionally, ten physical activity experts assessed the tool for content validity, employing the content validity index (CVI) to gauge consensus. This study conducted a targeted analysis by focusing on the following EPAO domains: staff-child interactions in physical activity, sedentary time, sedentary environment, teacher-led lessons and activities, equipment, physical environment, and space in early childhood school environments. The findings revealed high ICC (≥ 0.75), indicating substantial dependability in most areas, with the equipment domain exhibiting the highest reliability (ICC = 0.87). The CVI ratings revealed robust content validity, with scores of 80% or above in most domains. The Arabic EPAO is now a dependable tool for assessing physical activity environments in early childhood education settings and has the potential for broader use in Arabic-speaking communities.

Keywords: *sedentary environment, physical education, sedentary time, space in early childhood school environments, Arabic-speaking communities.*

Introduction

Sedentary behavior and physical inactivity significantly heighten the likelihood of developing numerous chronic illnesses and reduce life expectancy (Esteves & Stanford, 2024). In recent years, there has been a significant increase in obesity among children (Lister et al., 2023). Managing obesity is a challenging task, and children who are overweight are at a higher risk of becoming obese in adulthood. These patterns have prompted the World Health Organization (WHO) member states to aim for zero growth in pediatric obesity by 2025 (WHO, 2024). The Saudi Ministry of Health reports that 68.2% of adults are overweight (69.2% of women and 67.5% of men), and 33.7% are obese (39.5% of women and 29.5% of men). Obesity was 6% in preschool children and 9.3% in school-age children (Althumiri, BinDhim, & Alqahtani, 2020).

Farooq et al. (2020) believe engaging in moderate-intensity physical activity is crucial for avoiding and managing childhood obesity. However, the impact of such activity diminishes as children get older. Thus, it is imperative to encourage moderate-intensity physical activity during childhood (Pfledderer, Kwon, Strehli, Byun, & Burns, 2022). However, a 2019 survey by the Saudi General Authority for Statistics shows that 78% of Saudis do not engage in sufficient physical activity. Furthermore, in a study investigating correlations among lifestyle determinants, health consequences, physical activity, and overweight/obesity in Saudi children, excessive television viewing and insufficient physical activity were recognized as significant risk factors for obesity (Lubans, Morgan, Cliff, Barnett, & Okely, 2010).

Children go through a fast physical and mental growth period during which they form habits and adjust to their surroundings. Therefore, the Saudi Ministry of Health established the Agility Program and its accompanying guidelines to provide Saudi children and teenagers with

guidelines for leading active lives. The guidelines include suggestions about how much time children should spend in motion, how often they should rest, and what foods they should eat (Määttä et al., 2019).

Childhood can be categorized into three distinct stages: early childhood, which spans ages 3 to 5; middle childhood, which covers ages 6 to 8; and late childhood, which encompasses ages 9 to 11. The early childhood school environment influences long-term dietary and physical activity patterns, essential for preventing childhood obesity (Ebbeling, Pawlak, & Ludwig, 2002). This environment is also optimal for implementing methods to enhance physical activity levels (Wolfenden et al., 2020). Comprehensive interventions addressing policies and practices related to physical activity have been strongly emphasized, with experts advocating for developing early childhood school-based programs to improve physical activity behaviors (Ward et al., 2008). A critical aspect of assessing the effectiveness of such interventions is the accurate evaluation of physical activity environments in early childhood education settings. However, limited methods are currently available for effectively assessing these environments (Maalouf, Evers, Griffin, & Lyn, 2013). One such tool is the Environmental and Policy Assessment and Observation (EPAO) instrument (Vanderloo et al., 2014).

Based on best practice recommendations, the EPAO was initially developed as a self-assessment tool for evaluating physical activity environments in early childhood interventions. These strategies were formulated after thoroughly reviewing United States guidelines and scientific evidence about creating healthy physical activity environments in early childhood education settings. Due to its broad scope and connection to evidence-based practice, the EPAO has been extensively used by researchers (Maalouf et al., 2013; Vanderloo et al., 2014; Ward, Mazzucca, McWilliams, & Hales, 2015), facilitating comprehensive, all-day environmental observations to assess school-based regulations and provisions related to physical activity and nutrition. The consensus was reached on nearly 65% of the items during the document review, and substantial agreement among observer pairs was reached on approximately 80% during observations (Benjamin et al., 2007), further validating its application. Early childhood and health specialists also evaluated the techniques (Ward et al., 2008; Ward et al., 2015).

Given its extensive use and effectiveness, it is critical to translate the EPAO into Arabic to facilitate accurate, reliable assessments of physical activity environments in early childhood education settings in Arabic-speaking regions. Translating this tool would enable schools and researchers in these areas to optimize physical activity environments and align them with best practice recommendations and national guidelines.

However, accurately translating tools that assess physical activity, especially in early childhood education contexts, poses significant challenges for many researchers (Toma, Guetterman, Yaqub, Talaat, & Fetters, 2017). These challenges arise from the complexity of maintaining the tools' cultural relevance, linguistic precision, and scientific validity. Factors such as children's unique developmental stages, varying educational settings, and the need to account for culturally specific behaviors and terminology further complicate the translation process. To address these challenges, researchers often rely on pre-existing instruments with established reliability and validity, as adapting an existing tool is generally more resource-efficient than developing a new one from scratch.

Assessments of the appropriateness of instruments developed in foreign languages focus on ensuring the accuracy and fidelity of translations. Although various approaches to conducting cross-cultural translations have been proposed, concerns still need to be addressed regarding the

effectiveness and precision of these translations and the suitability of the research methodologies employed in different cultural contexts (Maneesriwongul & Dixon, 2004). Errors can occur due to cultural differences in the phenomenon being measured, variations in dialects within the target language that lead to miscommunication and shifts in word meanings that distort the original intent. Methodological challenges also arise from the lack of standardized translation protocols and inadequate instrument validation and testing. These factors highlight the critical need for rigorous translation processes to preserve the reliability and validity of tools in cross-cultural research settings (Maneesriwongul & Dixon, 2004).

Researchers utilize various methods for translating instruments, including forward and back translations. One or more skilled linguists translate the instrument into the target language in forward translation. In back translation, different language experts translate the target version into the original language to detect inconsistencies or errors. Common approaches include unidirectional translation, where a single translator is involved, and bidirectional translation, where a second translator performs the back translation, and the original and back-translated versions are compared (Toma et al., 2017). The WHO (2016) frequently employs this method to translate health-related instruments. Another approach involves two translators conducting separate forward translations, followed by a reconciliation process without the need for back translation. Therefore, this study recognizes the importance of a rigorous translation process and aims to translate the EPAO instrument from English to Arabic using a forward-backward translation methodology. The primary objective of this research is to evaluate the translation tool's reliability and validity in Arabic-speaking contexts. Following this, we conducted test-retest reliability assessments and obtained expert feedback through content validity evaluations to ensure that the translated version is accurate and culturally relevant. The findings from this study will contribute to a comprehensive strategy for developing effective interventions to enhance physical activity environments in early childhood education settings within Arabic-speaking regions by utilizing the Arabic version of the EPAO instrument.

Methods

The EPAO assesses early childhood school environments' nutritional and physical activity settings through direct observation by trained and certified data collectors. Created in 2006, it is a 102-item assessment tool for evaluating environmental factors related to nutrition and physical activity (Ward et al., 2008). The EPAO is used to observe staff support for nutrition and physical activity, opportunities for active and sedentary behaviors during mealtimes, the availability of food and drink, staff-child interactions during mealtimes, the physical activity environment (including fixed and portable equipment and outdoor spaces), and the nutrition environment (including how children are fed) (Ward et al., 2008). Additionally, observers record both common behaviors and infrequent actions, such as engagement in physical activity training. The checklist format primarily presents items, enabling observers to skip sections if they don't observe certain activities.

The present study focused on translating seven EPAO domains from English to Arabic. These domains include staff-child interactions during physical activity, sedentary time, sedentary environment, teacher-led lessons and activities, equipment, physical environment, and space in early childhood school environments.

Study Design

A cross-sectional study was performed to fulfill the research objectives. The translation process was conducted from January 2024 to March 2024, while the test-retest reliability and validity evaluations were conducted in April 2024 and Jun 2024.

Cross-Cultural Adaptation. The English version of the EPAO was translated into Arabic using a forward-backward translation strategy, using the standards for the cross-cultural adaptation of self-report measures (Maneesriwongul & Dixon, 2004).

The translation process consisted of five stages. In stage I, two bilingual (Arabic and English) translators worked separately on the Arabic translations. The second translator had a sports science background, while the first lacked such experience. In stage II, the synthesis stage, the two Arabic translations were compared and assessed for inconsistencies. An Arabic language professional was present to verify the translation, ensure its clarity, and correct any inaccuracies. In stage III, a physical activity specialist reviewed both Arabic translations to ensure that the language and the concepts related to physical activity were accurately conveyed. The specialist offered insights to rectify context-specific discrepancies and made adjustments to ensure the translation conformed to the desired meaning within the physical activity domain. The final product of this stage was the first version of the Arabic EPAO.

In Stage IV, the back translation stage, two bilingual translators without knowledge of sports science translated the combined Arabic version into English. The generated back translation was juxtaposed with the original English version to verify the former's precision. In Stage V, an expert committee comprised of sports science professionals, particularly those with expertise in physical activity specialist methods, reviewed all translations to ensure that the content of the target and original language versions, including their sentences and phrases, were identical and consistent. The university's ethics committee approved the research protocol (No. 4401064470).

Test-Retest Reliability and Content Validity. To evaluate its test-retest reliability, 30 female physical education and health teacher observers administered (mean age \pm SD, 38.22 ± 1.8 years) the final Arabic version of the EPAO to the same cohort of observers twice during a two-week period. The intraclass correlation coefficient (ICC) was calculated to assess the stability of the scores over time. An ICC above 0.75 indicated good test-retest reliability.

A panel of 10 physical activity professionals and Arabic language experts reviewed the seven studied domains in the Arabic version of the EPAO scale items to assess their relevance, clarity, and comprehensiveness in measuring physical activity environments. The content validity index (CVI) was utilized to quantify expert agreement. Each element was rated on a four-point scale (1 = not relevant/unclear, 2 = somewhat relevant/somewhat clear, 3 = quite relevant/quite clear, and 4 = highly relevant/very clear). The CVI score for each item was determined based on the ratio of experts who assigned it a rating of 3 or 4. For example, if four out of five experts rated an item as relevant, the CVI score would be 80%, indicating good content validity.

Statistical Analyses

SPSS statistical software was used for all statistical analyses (Version 25.0; SPSS Inc., Chicago, IL, USA). An ICC with a 95% confidence interval was used to evaluate the test-retest reliability of the Arabic version of the EPAO. Based on the ICC results, the reliability levels were classified as weak (<0.5), moderate (0.5 to 0.7), strong (0.7 to 0.9), or very strong (0.9 to 1.0).

Results

Table 1 displays the test-retest reliability outcomes for the seven studied domains in the Arabic version of the EPAO. Reliability was evaluated using the ICC, which measured the tool's consistency over time. An elevated ICC value signified enhanced reliability.

Table 1: Test-Retest Reliability (ICC) Results for the Arabic Version of the EPAO
(n = 30 teacher observers)

Domain	ICC Value*	95% Confidence Interval	Reliability Classification
Staff-child interactions in physical activity	0.80	(0.70 – 0.90)	Strong
Sedentary time	0.85	(0.75 – 0.95)	Very Strong
Sedentary environment	0.78	(0.68 – 0.88)	Strong
Teacher-led lessons and activities	0.82	(0.72 – 0.92)	Strong
Equipment	0.87	(0.77 – 0.93)	Very Strong
Physical environment	0.81	(0.71 – 0.91)	Strong
Space in early childhood school environments	0.76	(0.66 – 0.86)	Strong

* An ICC value ≥ 0.75 indicated good reliability.

Staff-child interactions in physical activity had an ICC value of 0.80 and a 95% confidence interval of 0.70–0.90, indicating that the EPAO reliably, consistently, and precisely measures this domain. Similarly, the ICC value of 0.85 and the 95% confidence interval of 0.75–0.95 for sedentary time reflected the tool's consistency and excellent reliability in measuring this domain. Sedentary environment had an ICC value of 0.78 and a 95% confidence interval of 0.68–0.88, indicating a good level of consistency (ICC value ≥ 0.75 indicated good reliability). Similarly, the ICC value of 0.82 and the 95% confidence interval of 0.72–0.92 for teacher-led lessons and activities indicated strong reliability, confirming the robustness of this reliability estimate.

Equipment had an ICC value of 0.87 and a 95% confidence interval of 0.77–0.93, denoting extreme reliability and reinforcing the consistency of the EPAO in assessing this domain. The ICC value of 0.81 and the 95% confidence interval of 0.71–0.91 for the physical environment indicated strong reliability and confirmed the precision and consistency of the tool in measuring this domain. Although the ICC value of 0.76 for space was the lowest among the domain results, the 95% confidence interval of 0.66–0.86 suggested a solid level of reliability, indicating that the tool had a good level of consistency in measuring this domain.

Table 2 displays the CVI scores for the seven studied domains in the Arabic version of the EPAO. The CVI evaluated the percentage of experts who classified each item as relevant or highly relevant, quantifying the tool's content validity.

Table 2: Differences in CVI Scores for the Arabic Version of the EPAO (n = 10 Experts)

Domain	Experts Providing Ratings of 3 or 4	Total Number of Experts (n)	CVI Score (%)*
Staff-child interactions in physical activity	8	10	80%
Sedentary time	9	10	90%
Sedentary environment	9	10	90%
Teacher-led lessons and activities	10	10	100%
Equipment	9	10	90%
Physical environment	8	10	80%
Space in early childhood school environments	9	10	90%

* A CVI score $\geq 80\%$ indicated good content validity.

A CVI of 80% was considered good because it meant that 8 of the ten experts deemed the staff-child interactions in the physical activity domain very relevant or essential. Similarly, 90% of the experts viewed the sedentary time domain as crucial, rating it 3 or 4.

In addition, the sedentary environment domain had a high degree of agreement, with 90% of experts stating that it was either relevant or very relevant. The teacher-led lessons and activities domain had a CVI of 100% because all ten experts agreed that it was very relevant.

The equipment domain achieved a CVI of 90% because 9 out of 10 experts considered it relevant, reinforcing its strong content validity. While slightly lower, the physical environment domain reached the threshold of good content validity with a CVI of 80%, reflecting acceptable agreement among experts. The space in the early childhood school environments domain had a CVI of 90%, indicating that most experts agreed on its importance to the tool's overall validity. Overall, the results in Table 2 show that most domains in the Arabic version of the EPAO met or surpassed the CVI threshold of 80%, signaling strong content validity across the evaluated domains.

Discussion

Comparing the test-retest reliability results of the Arabic version of the EPAO to those of other environmental assessment tools can enhance the understanding of the present study's findings. The ICC results in the present study indicate the strong to very strong reliability of the studied EPAO domains. These results are consistent with research (Maitland et al., 2020), that has confirmed the effectiveness of EPAO environmental assessment tools for evaluating physical activity and sedentary behaviors in early childhood education environments.

Benjamin et al. (2007) examined the reliability of the original EPAO instrument for assessing childcare institutions and found ICC values comparable to those in the present study. The staff-child interactions in the physical activity domain had high reliability (ICC = 0.80), corroborating the findings of this study. The quality of interactions between professionals and children was generally considered a reliable criterion when evaluated over time. Increased ICC values in this region were occasionally attributed to the systematic nature of staff-child interactions, which regularly follow established patterns over different periods.

This study's high reliability of the sedentary time domain (ICC = 0.85) is similar to what other studies have found, like Gubbels et al. (2012), which found that the EPAO instrument used to measure sedentary behavior in childcare settings was also reliable. Sedentary activities like screen time and passive play generally exhibit consistency over multiple observations, resulting in high ICC values. This discovery is significant because of the escalating apprehension regarding the rising prevalence of sedentary behavior among children in early childhood settings (Gubbels et al., 2012).

In the present study, the sedentary environment domain's reliability was strong, with an ICC of 0.78; this value was significantly lower than the other domains. Nonetheless, the ICC values in the present study showed that the EPAO is valid for evaluating this area. This finding aligns with similar studies, which showed that environmental and physical factors, such as the arrangement of seats and quiet areas, may change more because of changes in a classroom's structure or the weather (Tucker, Vanderloo, Burke, Irwin, & Johnson, 2015).

Meanwhile, it is crucial to acknowledge that the educational landscape in Saudi Arabia may markedly differ from the landscapes in nations where analogous studies have been conducted. Schools in Saudi Arabia may possess distinctive architectural designs, cultural practices, and resource availability that influence the utilization of areas for sedentary activities. Elements such as open-air classrooms and conventional seating configurations might vary children's interactions with their surroundings during the school day. Moreover, local climate conditions might affect the utilization of outdoor spaces for sedentary activities, leading to further variations in the physical environment. Given such contextual differences, assessment tools, such as the EPAO, must be adjusted to account for regional differences and ensure that tests are reliable in various educational settings.

In the present study, teacher-led lessons and activities had strong reliability ($ICC = 0.82$), which was attributed to the structured nature of scheduled classes and activities in early childhood settings. This finding is consistent with those of studies on environmental assessments measuring organized physical activity in educational environments. For example, Sollerhed (2023) found that effective teacher-led programs can enhance motor abilities in early childhood settings, underscoring the significance of structured activities in promoting physical development. Teacher-led physical activity and movement significantly improve children's already advanced motor skills. This supports the usefulness of testing tools that check for structured activities in early childhood education settings.

The availability and use of physical activity equipment were consistently observable in the present study since the equipment domain achieved the highest ICC value of 0.87. This finding aligns with studies such as Brown et al. (2006), which showed that physical exercise equipment is an essential and consistent part of childcare facilities' environmental evaluations. High ICC values result from equipment availability being static for brief periods.

The findings from the current study regarding the physical environment ($ICC = 0.81$) and space ($ICC = 0.76$) domains indicate strong reliability, with the latter having the lowest reliability among the assessed domains. This comparatively lower reliability may be attributed to variations in space utilization, which can fluctuate based on factors such as class size, specific activities, and teacher preferences. These findings align with those of previous studies, notably Cosco et al. (2010), which emphasized the inherent variability in physical space use in early childhood settings. Changes in space utilization can occur in dynamic classroom settings, but structured tools, such as the EPAO, can still provide accurate assessments (Cosco, Moore, & Islam, 2010). Thus, although certain regions may display diversity, thorough evaluation systems can effectively grasp the crucial features of early childhood settings, making it easier to assess the factors influencing children's physical activity.

Overall, the high ICC values in the present study for most domains affirm the robust trustworthiness of the Arabic version of the EPAO. These results are similar to other studies examining the physical activity environment in early childhood settings. This shows that the EPAO can accurately measure the key environmental factors that affect kids' active and inactive behaviors. Furthermore, the findings in this study support the utilization of the Arabic EPAO in analogous circumstances, particularly in Arabic-speaking areas, to evaluate early childhood environments that regularly foster healthy behaviors.

The CVI results in the present study demonstrate the strong content validity of the Arabic version of the EPAO. Most domains met or surpassed the acceptable CVI level of 80%, indicating that each evaluated area is essential and valuable in assessing early childhood environments. Several studies have shown that the most critical research on content validity indices stresses that a CVI score of 80% or higher means that experts agree on the relevance and appropriateness of an item (Lynn, 1986; Zamanzadeh et al., 2014). Similarly, Polit and Beck (2006) highlighted that a CVI threshold of 80% is widely accepted to indicate good content validity, particularly in tools assessing physical activity-related environments or practices. The Arabic version of the EPAO in the present study aligns with these findings; all domains met this benchmark, suggesting that the tool effectively captures relevant aspects of early childhood environments.

In the present study, the experts widely agreed on the importance of the EPAO domains, with the teacher-led lessons and activities domain receiving a perfect CVI score of 100%. Additionally, the experts recognized the significance of organized activities in encouraging

physical activity in young children. Dowda et al. (2004) noted the critical role of structured, teacher-led activities in fostering physical activity in young children. A unique finding of the current study is that the experts agreed that the items in the tool were the same as the original version and suitable for translation into Arabic, ensuring that the material accurately reflected the intended message and remained culturally relevant. This consistency in translation contributed to the high level of agreement among the experts.

In the present study, multiple domains in the EPAO, such as sedentary time, sedentary environment, and equipment, attained CVI scores of 90%. Based on these findings, it is clear that the experts agreed that these domains must be considered when evaluating settings for young children. Gubbels et al. (2010) determined that similar domains were critical for assessing active and sedentary habits in childcare settings. The literature supports the high CVI scores for EPAO domains, such as sedentary time and equipment, and their essential roles in evaluating a child's physical activity environment. Ward et al. (2008) verified the original English EPAO and found significant CVI scores for items about the environment and equipment, further supporting the relevance of these factors in ECE contexts.

The physical environment domain in the current study achieved a CVI score of 80%. Although this score was marginally lower than other domains, it nonetheless indicated satisfactory content validity. According to Tucker et al. (2015), similar findings show that although physical environmental variables may vary depending on the context, they are crucial elements of environmental evaluations in early childhood.

Consistency in translation may have played a significant role in the high degree of agreement between the experts across the domains, particularly in the teacher-led lessons and activities domain. Sireci et al. (2016) emphasized the importance of maintaining equivalence in meaning when translating assessment tools. The experts in the present study agreed that the Arabic translation of the EPAO preserved the integrity of the original material, possibly enhancing the CVI scores. Furthermore, these results suggest that the Arabic version is culturally relevant and aligns with the original EPAO's intent.

Overall, the Arabic version of the EPAO had strong CVI scores in several domains, proving that it is valid for evaluating early childhood environments in Arabic-speaking areas. According to the findings of previous studies and expert agreement on the importance of domains such as sedentary time, equipment, and teacher-led lessons and activities, the studied EPAO domains are significant for getting children active and developing healthy behaviors. The observation that most domains achieved scores exceeding 80% aligns with the content validity norms observed in earlier validation studies. Thus, the Arabic EPAO is an effective instrument for early childhood school environments.

Conclusions

This study proved that the Arabic version of the EPAO is a reliable tool for evaluating early childhood environments in Arabic-speaking areas. It was found to be strong on both test-retest reliability and content validity. Elevated ICC values for domains such as staff-child interactions in physical activity and sedentary time showed the tool's reliability, while robust CVI scores validated expert consensus on its pertinence. The tool's effective cultural adaptation guarantees that it precisely reflects the essential elements of physical activity and sedentary behaviors. Thus, the Arabic EPAO is valid and effective for evaluating circumstances that foster healthy behaviors in early childhood school environments.

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