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VALIDATING CAREGIVER-CHILD INTERACTIONS SCALE (CCIS) AMONG GHANAIAN EARLY CHILDHOOD PRACTITIONERS: A PILOT STUDY

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ABSTRACT: To ensure quality in the rendering of early childhood development and care services, guidelines are in place to ensure physical and structural quality expectations are followed in Ghanaian early childhood institutions. However, it is not known what processes or interactions caregivers engage in to enhance the development of the children in their care. The Caregiver-Child Interaction Scale (CCIS) assesses child development on the three developmental domains (i.e., physical, cognitive, and socio-emotional) and captures child development and wellbeing quality based on the interactions (processes) adopted by caregivers (teachers). This paper explores the factor structure of the CCIS when used to assess the process quality in some selected early childhood care and development facilities in Ghana. Seventy-six percent (76%) of the 103 caregivers observed obtained minimal scores and their interactions resulted in basic (minimal) support to the development and wellbeing of the children in their care. The CCIS demonstrated a positive but weak correlation (.26) with perceived interactions scale intended to assess similar dimensions of child development and wellbeing. Further, the CCIS reported 3 factor loadings that mimicked the three developmental domains.
Keywords: Child development, interactions, validation, childcare quality, caregiver child interaction scale, Ghana.

INTRODUCTION

Ghana has moved from a cultural perspective of childcare -where family members cared for children in the home - to a new global agenda of formal education leading to the establishment of educational institutions for children below the official school going age (i.e. below four years). This has resulted in the proliferation of day-care centres, crèches and nursery schools. While it is important to offer alternative childcare services to parents and their young ones, there is the need to ascertain children receive quality care. Early Childhood Development Programmes in Ghana comprise Day Care which is based at centres/ stand-alone or schools (i.e. attached to mainstream/formal school). There are in-home programmes (where caregivers go to the homes of children) and nanny homes (where parents take children to homes of nannies). Afterschool home care programmes also exist (where children who close earlier from their centres/schools are sent until their parents pick them up after work). Nurseries in Ghana are available to children aged 2-4 and crèches cater to children under 2 years of age. These programmes are run by the Department of Social Welfare, the Ghana Education Service, private proprietors, and nongovernmental organisations (NGOs).

As part of the country's development goals, the Government of Ghana through the then Ministry of Women and Children's Affairs (MOWAC, 2004) put together the early childhood care and education (ECCD) policy in 2004 to serve as a framework to cater for the survival needs of all children ages 0-8. The policy was clear on the need for capacity building for ECCD practitioners and the quality of classroom instruction was expected as it stated the importance of improving not only access to, but the quality of ECCD services to children (pp16). Further, it proposes the need for appropriate guidelines to be set to regulate the establishment and performance of these programmes" (pp16). Additionally, the national minimum guidelines for setting up Kindergartens by the Ghana Education Service (GES,2016) is clear on the minimum structural and environmental quality to be expected in Ghanaian kindergartens but illusive on the process quality, specifically caregiver-child interactions.

Having access to quality early childhood development and care have positive outcomes (Wolf, Raza, Kim, Aber, Behrman, & Seidman, 2018) and is key to sustaining national development (United Nations, 2023). Phillips (1987) asserted that quality childcare comprises three facets. Firstly, the environment, which is measured by the materials present, room arrangement in the physical environment, the structural (Adult/ Child ratio, caregivers education and experience) and the process (interactions between caregivers and children). Whilst the first two are clearly stated in Ghanaian ECCD strategies, the third equally important facet is illusory. So what then is process? Slot, Leseman, Verhagen and Mulder (2015) explained process quality as referring to a child's

"day-to-day experiences in Early Childhood Education and Care settings and encompasses the social, emotional, physical, and instructional aspects of children's activities and interactions with teachers, peers, and materials, that are seen as the proximal determinants of child development" (pp 64) and wellbeing.

The Caregiver Child Interaction Scale (CCIS) has been used in two studies. Nyarko & Mate-Kole (2024) sought to identify predictors of teacher-child interactions amongst early childhood teachers. Lim &Lim (2013) used the qualitative section to assess caregivers' interactions in supporting language and learning of infants in Singapore. This paper reports further analysis and results on the extent the CCIS was able to measure child development and wellbeing through caregiver-child interactions (process quality) among Ghanaian early childhood teachers.

METHODOLOGY

This study utilised a cross-sectional design which was useful for collecting information within 31 early childhood institutions in a two week time frame. Ethical clearance was sought and granted by the Institutional Review Board from the University of Ghana (# 070/12-13). Also, following principles set in the Helsinki ethical guidelines for conducting studies with human populations, informed consent were sought from directors and teachers of participating schools prior to commencing the study. Anonymity was assured all participants and their data were identified by alphanumeric codes which were password protected as well. There were no photographic representations of the process.

Participants

Thirty-one schools providing childcare services for children between the ages of 2-5 years were purposively sampled. In addition, schools selected were: - urban schools (from both public and private early childhood institutions in the Accra Metropolis), either centre based or school based. Centre based formed 21% or school based 79%. One hundred and three (103) caregivers were conveniently selected to participate in the study. Participants comprised 102 females, and 1 male. The reported Mean age was 36 years with an age range of 20-50 years. About 69 % of teachers were young adults. Fifty percent (50%) of the same sample had Secondary (12 years of education) education as their highest level of education.

Measures

The **Child Caregiver Interaction Scale Revised (CCIS-R)** (Carl, 2010). The CCIS-R consists of 14 items organized into three (emotional, cognitive/physical, and social) domains. The items under the **Emotional domain** include –Tone of Voice/Sensitivity, Acceptance/Respect for Children, Enjoys and Appreciates Children, Expectations for Children. Under **Cognitive/Physical domain** items include - Health and Safety, Routines/Time Spent, Physical Attention, Discipline, Language Development, Learning Opportunities, Involvement with children's activities. Finally, under the **Connections with a Wider World (social) domain**, items include - Arrival, Promotion of Prosocial Behaviour/ Social Emotional Learning (SEL), Relationship with Families.

Scoring

Carl (2010) presents each item as a 7-point scale with detailed criteria at four anchor points: 1 (inadequate), 3(minimal), 5(good) and 7(excellent). Numerous indicators comprise each CCIS-R item. Each of these indicators operationally defines specific actions/behaviours that comprise a score. Either the behaviour is present, or it is not. This method removes much of the subjectivity in scoring. On the CCIS score sheet, if the behaviour occurred during the observation, "Y" (meaning yes) is circled on the corresponding indicator. If the behaviour does not occur, "N" (meaning no) is circled.

An average score for each of the identified domains is attained by summing the item ratings for each specified domain and dividing by the number of items in that domain. The total overall CCIS score is calculated by summing all scores and dividing by the number of total items. (Carl, 2010 p9). A range of 1to 2 is minimal, 3 to 4 is minimal and 5 to7 is excellent

Psychometric properties of CCIS-R

The manual reported an internal consistency of .94 (Carl, 2007). The then CCIS correlated with the overall Environmental Rating Scale (ERS) (.740, $p<.001$). Correlations with the interaction's subscale of ERS (.745, $p<.001$), the space and furnishing subscale suggest concurrent validity of the CCIS. It has proved to have construct validity. Carl (2007) reported a significant relationship between CCIS score and a caregiver's level of education ($r=.022$, $p<.05$) as well as CCIS score and facility's STAR level ($r=.001$, $p<.05$). The STAR level is a rating for the quality level of a care provider in the United States of America.

The CCIS has been used in Ghana for the first time. It was a preferred tool because of its ability to assess interactions between a caregiver and his or her class comprehensively. Its provision of space to allow the observer to document field notes compliments the whole observation process (Lim & Lim, 2013; Carl, 2010).

The time spent observing was long (4hours) and required the observers to sit unobtrusively in the class as much as possible for that length of time. This was justifiable because as Carl (2010) explained; it would allow the participants being observed to finish 'acting' to please the observer and eventually become themselves. Also because of the comprehensive nature of the scale sometimes not all the indicators/items on the scale were observed at a time during observation. In such cases, Carl (2010) encourages the observers/ assessors to interview the teacher. This usually required another appointment so as not to disrupt the class routine for the day.

It also required training on the developmentally appropriate practice principles before its use, and requires time, logistics and a careful selection of personnel as research assistants.

The Beliefs Intentions Scale (Ward & Wilcox-Herzog, 2004) is a four-item self-report scale that measures the following aspects of teacher-child interactions: (1) sensitivity of interactions with children, (2) involvement (both verbal and nonverbal) of interactions with children, and (3) play style adopted when interacting with children.

These aspects of teacher-child interaction are all related to children's developmental outcomes, and all have been used observationally to assess teachers' actual interactions with children. It is scored on a 5-point scale ranging from 1 to 5. Beliefs and intentions scale report an internal consistency reliability of .85 as measured by Cronbach's alpha (Wilcox-Herzog & Ward, 2004).

Procedure

The CCIS-R and beliefs intention scales was pre-tested on 10 pre-school teachers and their students with similar characteristics to the study sample. This helped in clarifying the scoring of the CCIS-R. Some indicators under the health and safety (HESA) item for example, were re-worded to help observers understand what to look out for. For example, one indicator 3.2- 'Formal procedures for administration of medication are in place and implemented'. This was difficult to measure as such in situations where it was not witnessed or absent at the time of observation, teachers were interviewed. It was observed that the practice differed from school to school. As a result, after the feedback from the pilot study, observers were trained to interview for this item where teachers were asked about their actions when a child in their class became ill. Their responses were documented on the space on the scoresheet earmarked for field notes. The pre-test also revealed that some teachers' scores were inadequate and expanding at the same time for an item. As a result, researchers regrouped the CCIS-R scores from inadequate, basic, engaging and expanding to low care, minimal care and high care. Low care (when they scored up to 2 points, Minimal care (when they scored between 3 and 4 points). When participants scored 5 points and above it was considered excellent care. There were no modifications made to the beliefs and intentions scale.

Observations were conducted by the researchers and 2 trained research assistants. Researchers gave a break of one week after which data on teachers' beliefs and intentions (self-administered) were collected and scored as soon as they were returned. This was done to reduce the incidence of social desirability in respondents' responses. The one week delay however resulted in 67% response rate with 69 out of 103 teachers returning their questionnaire.

All caregivers observed were present the whole time of the observation. Where a teacher was absent during half of the observation duration, it was classified as null and void and that observation was not added to the data for final analysis.

Analysis

The total scores of CCIS-R were entered into the Statistical Package for the social Sciences (SPSS) version 18. Data were analysed using both descriptive and inferential statistics. Correlation analysis was used to test for a relationship between teachers' perceived interactions and observed interactions. Factor analysis was conducted to determine the extent to which items will be correlated into smaller simpler structures (Brown, 2009). Results are presented and explained below.

RESULTS

Table 1 gives an overview of caregiver-child interactions of the 103 teachers observed. These were summarised by the three domains of the CCIS – emotional, cognitive/physical and connections with the wider world. Teachers' total scores recorded revealed that they were giving minimal support to enhance children's development and wellbeing.

Table 1 Caregivers' Interaction Scores by Domain Scores

Interaction	Classification	n	n (%)
EMOT	Low care	23	22
	Minimal care	62	60*
	Excellent care	18	18
COPH	Low care	43	42
	Minimal care	54	52*
	Excellent care	6	6
COWW	Low care	59	57*
	Minimal care	40	39
	Excellent care	4	4
TOTA	Low care	24	23
	Minimal care	79	77*
	Excellent care	-	-

EMOT= Emotional domain; COPH= Cognitive/Physical; COWW= Connection with a wider world;
TOTA= Total caregiver domain score. * Represents classification that teachers scored the highest.

Seventy-nine (77%) of the teachers' scores reflected they were giving minimal support in terms of their interactions to support the development of these children in their care. For the Emotional domain, 62 (60%) of the sample scored minimal care. The Cognitive/Physical domain recorded 54 (52%) of teachers giving minimal care.

On the 14 items that make up the child caregiver interaction scale, five items recorded minimal care. These were Acceptance and respect for children (52), Health and safety (67), Routines and time spent (51) and Learning development (60). On these items, teachers' interactions with children to enhance their development and wellbeing was minimal.

Again, five other items recorded low care on the CCIS. The items included discipline (66), arrival (67), Involvement with children's activities (40), Promotion of social emotional Learning (48) and Relationship with families (53). In essence, caregivers' behaviours were inadequate and did not support the development and wellbeing of children in these areas. These could be explained based on the cultural fairness, differences in school culture and some administrative priorities.

The items that recorded high on excellent care included Tone of Voice with a score of 46, Expectations for children scored 42, Physical attention (45). Even though these items received less than 50 percent of the entire scores these were the highest recorded.

The scores were split between low care (40) and excellent care (40) an item like Enjoys and appreciates children. Teachers were seen here to be giving just low to minimal care based on their interaction scores. This corroborates findings in table 1a.

Correlations between CCIS and Beliefs and Intention Scale

Table 2 Correlation among Caregiver - Child Interaction Scores (CCIS) and Perceived Interactions (Beliefs and Intentions)

	Variables	1	2	3	4
1	CCIS				
2	Beliefs	.142			
3	Intentions	.320**	.078		
4	Perceived Int	.264*	.842**	.919**	

CCIS, Perceived Int-perceived interactions, (Nyarko & Mate-Kole, 2024)

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

From Table 2 Intention scores (r=.32, p<.01), Perceived Interaction scores (r= .26, p<.05), were significantly related to total caregiver child interaction (Observed Interactions) scores. The significant correlation between Perceived Interaction scores and total caregiver child interaction (observed interactions) scores (r= .26, p<.05) confirms a relationship between teachers' perceived interactions and observed interactions.

Psychometric Properties of CCIS when used in the Ghanaian Population

Reliability (test re-test and internal consistency) and validity (exploratory factor analysis) of the CCIS-R after its use in Ghana are presented to addresses the research question 'Is the CCIS an appropriate measure of teacher child interactions in a developing country context like Ghana?'

Reliability

The computed internal consistency (Cronbach alpha) was .77 (Nyarko & Addo, 2013). Test-retest reliability was conducted on the CCIS scale to determine its ability to produce consistent results when the same entities were tested at two different points in time. Ten respondents were used in the test-retest reliability analysis. Ten respondents who had already been observed were selected for re-observation using the CCIS. The second observation was done 6 months after the first observation. Table 3 shows the test-retest reliability of the CCIS.

Table 3 Child-caregiver Interaction Scale Test Retest Reliability

CCIS Domains		N	Pearson Correlation Coefficients	Sig. (2- tailed) p-value	Comment
Emotional	Emotional 2	10	.471	.170	Moderate
Cognitive/ physical	Cognitive/ physical 2	10	.563	.090	Moderate
Connections with a wider world	Connections with a wider world 2	10	-.119	.743	Very weak and negative
Total child caregiver interaction	Total child caregiver interaction 2	10	.360	.306	Weak

Comments based on Evans (1996)

As shown in table 3 the test-retest reliability in the Ghanaian population was not strong according to the classifications given by Evans (1996, p. 146). This is inconclusive as the sample size (10) used for the analysis was small (Imasuen, 2022). A larger sample may prove otherwise. Further, at the time of the second observation, a new academic year had begun, and some teachers had been moved to a new class. Teachers were now getting to know their pupils; as such it will not be fair to conclude on the weak associations of the test- retest variables.

Validity

There was a significant correlation between intentions and beliefs and CCIS scores (r= .26, p<.05). This suggests a concurrent validity. Whilst the beliefs intentions scale is self-report, CCIS records and reports on observed behaviour by a third party.

Factor Analysis for CCIS

Factor analysis was used to identify the underlying structure (Pallant, 2005). Varimax Rotation of three factor solution was computed to determine factor loadings for the CCIS when used in Ghana and results are presented in table 4 below.

Table 4 shows the results of a principal component analysis performed for factor extraction of the CCIS scale on the Ghanaian sample. Varimax Rotation was computed to determine factor loadings (for subscale identification) for the Ghanaian sample. The results show three factor loadings. In line with theoretical and literature support for three domains (Carl, 2007) through which children's development can be supported.

Table 4a CCIS items loading on factor 1(Emotional)

Item Number	Item Content	Item Loading
1	Tone of Voice	.54
2	Respect for Children	**.78**
3	Enjoys and Appreciates Children	**.75**
4	Expectations for Children	**.70**
5	Health and safety	.55
6	Routine/ Time Spent	.53
11	Involvement with Children's Activities	.56

The first factor had all four items under the emotional domain (tone of voice, respect for children, enjoys and appreciates children and expectations of children) loading on it with values ranging from .5 to .78.

Table 4b CCIS items loading on factor II (Physical/ Cognitive)

Item Number	Item Content	Item Loading
6	Routine/ Time spent	.57
7	Physical attention	.65
8	Discipline	**.70**
10	Learning Opportunity	.56
11	Involvement with Children	.59
13	Promotion of Social Emotional Learning	.57
14	Relationship with Families	**.81**

Under the second factor loading, there were five items with values ranging from .5 to .81. Routine time spent, physical attention, Discipline, learning opportunities and involvement were all under Physical /cognitive domain.

Table 4c CCIS items loading on factor 1(Connections with a wider world)

Item Number	Item Content	Item Loading
12	Arrival	**.83**
13	Promoting Social Emotional Learning	.53

For the third factor, the items Arrival and promotion of social emotional learning were the items that loaded with values of .83 and .53 respectively.

Carl (2007) underscored that Developmentally Appropriate Practice, supporting childcare theories and other research studies identified that quality childcare could best be assessed through three constructs or domains: 1) emotional development, 2) cognitive/ physical development, and 3) social support for families/cultural competence. The CCIS when used in the Ghanaian sample displayed three factor loadings which can be likened to the three constructs or domains of child development.

There have been no direct financial benefits from the work. However, some teachers in early childhood schools have been taught using the findings in this manuscript.

DISCUSSIONS

The findings from the Ghanaian adaptation of the Child-Caregiver Interaction Scale (CCIS) have several important policy implications for early childhood education. The study demonstrated acceptable internal consistency (Cronbach's alpha = .77), supporting the scale's use in a developing country context (Nyarko & Addo, 2013). However, the test-retest reliability was weak-likely due to a small sample size (N = 10) and contextual changes such as teacher reassignments and the beginning of a new academic year (Imasuen, 2022). This suggests that CCIS should not yet be used for high-stakes evaluation purposes such as teacher appraisal, but rather for formative assessments and professional development. Additionally, there is a need to invest in larger-scale and longitudinal validation studies to establish stronger reliability and generalizability. A policy recommendation here would be to fund large-sample psychometric studies to strengthen the evidence base for the CCIS's reliability in Ghana. Also, the three distinct domains revealed through factor analysis- emotional, cognitive/physical, and social/cultural- align with existing child development theories and global standards (Carl, 2007), underscoring the CCIS's relevance for evaluating quality in early learning environments. This provides a basis for incorporating CCIS into national monitoring and evaluation frameworks for early childhood education.

Moreover, the significant correlations between teachers' intentions ($r = .32$, $p < .01$), perceived interactions ($r = .26$, $p < .05$), and observed behavior support the argument for integrating reflective and perception-based training into teacher education programs (Cirocki, Indrarathne, & Calderón, 2024). This indicates that teacher training policies should include self-assessment and perception-awareness modules to help align teacher beliefs with effective classroom behaviors. These relationships indicate that what teachers believe and perceive can meaningfully influence their real-time interactions with children, which has direct implications for child outcomes. Consequently, national teacher training curricula should emphasize emotional and cognitive engagement techniques, while embedding social-emotional learning (SEL) as a foundational element of classroom practice. Since SEL-related items in the CCIS loaded across both cognitive and wider-world domains, its integrative role in child development should be reflected in curriculum reforms (Carl, 2007). As such, SEL should be formally adopted in early childhood policies and supported through continuous teacher professional development. Incorporating these findings into Ghana's Early Childhood Care and Development (ECCD) policy can support improved teacher-child relationships, better classroom environments, and holistic child development outcomes.

In conclusion, the CCIS is a useful tool for training caregivers on the kinds of interactions expected of them and the effects it will have on the children in their care. The domains and corresponding items which capture child development and wellbeing are clear and easy to understand. The indicators are straightforward, and the manual offers further clarification on some indicators. When used in Ghana it loaded three factors similar to the developmental (physical, cognitive and emotional) domains it measures. As such it can easily be adopted and incorporated into the curriculum for early childhood professional development to strengthen national standards on quality care giving in Ghana. Further CCIS research with larger sample sizes across different contexts and countries may be useful in validating its protocol internationally.

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