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# Development and preliminary testing of a culturally-friendly pain assessment tool for children (Crying Faces Pain Scale)

## Opracowanie i wstępne badania nad przyjaznym kulturowo narzędziem do oszacowania bólu u dzieci – Skala Bólu wg Wizerunków Płaczących Twarzy (Crying Faces Pain Scale)

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### Key words

pain, crying, children, Nigeria

### Abstract

**Background and aims:** Having a universal tool for assessing pain in children is hamstrung by cultural sensitivity. This study aimed to develop and validate a culturally-friendly pain assessment tool (i.e. Crying Faces Pain Scale (CFPS)) among Nigerian Children.

**Material and methods:** This study employed criterion-standard design. The study was in three phases, namely: (1) development of CFPS, (2) cross-validity and (3) validation of the CFPS. 70 children (39 (55.7%) males and 31 (44.3%) females) within the age range of 4-13 years who had post-surgical pain, orthopaedic pain, stomach pain or headache were involved in the validation phase. Psychometric properties and preferences for the CFPS compared with the Wong-Baker FACES Pain Rating Scale (FACES) were examined. Descriptive and inferential statistics were used to analyze the data. Alpha level was set at  $p < 0.05$ .

**Results:** The median score of the CFPS was 4.60 compared to FACES median score of 4.49. There was weak correlation between FACES and CFPS ( $r = 0.325$ ;  $p = 0.006$ ). Preference score as a culturally friendly tool for CFPS and FACES was  $6.07 \pm 1.23$  and  $3.67 \pm 1.09$  respectively, based on a modified 0-10 numerical pain scale.

**Conclusions:** The crying faces pain scale has fair psychometric properties for assessing pain in children. However, CFPS was preferred to FACES as a culturally friendly tool for assessing pain among Nigerian children.

**Implications:** The CFPS is more culturally friendly and so might be better suited as a pain scale in Africa. However, due to its fair psychometric properties, further studies may be needed to improve upon this scale.

### Słowa kluczowe

ból, płacz, dzieci, Nigeria

### Abstrakt

**Podstawy i cele:** Posiadanie uniwersalnego narzędzia do oceny bólu u dzieci jest utrudnione przez wrażliwość kulturową. Badanie to miało na celu opracowanie i walidację przyjaznego kulturowo narzędzia do oceny bólu u dzieci tj. Skali Bólu wg Wizerunków Płaczących Twarzy (Crying Faces Pain Scale, CFPS) wśród nigeryjskich dzieci.

The individual division of this paper was as follows: a – research work project; B – data collection; C – statistical analysis; D – data interpretation; E – manuscript compilation; F – publication search

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**Metody:** W badaniu tym zastosowano standard wzorcowy. Badanie odbyło się w 3 fazach, mianowicie: 1) opracowanie CFPS, 2) walidacja krzyżowa oraz 3) walidacja CFPS. W fazie walidacji wzięło udział 70 dzieci, (39 (55.7%) chłopców i 31 (44.3%) dziewcząt) w przedziale wiekowym 4-13 lat, cierpiących na ból pooperacyjny, ból ortopedyczny, ból brzucha czy ból głowy. Zbadano właściwości psychometryczne i preferencje dla CFPS, w porównaniu z Graficzną Skalą Oceny Bólu Wonga-Bakera (FACES, Wong-Baker Faces Pain Rating Scale). Do analizy danych wykorzystano statystyki opisowe i inferencyjne. Poziom Alpha ustawiono na  $p < 0.05$ .

**Wyniki:** Średni wynik dla CFPS wyniósł 4,60, w porównaniu do średniego wyniku FACES wynoszącego 4,49. Wystąpiła słaba korelacja pomiędzy FACES a CFPS ( $r = 0,325$ ;  $p = 0,006$ ). Preferowany wynik dla kulturowo przyjaznego narzędzia dla CFPS i FACES wyniósł odpowiednio  $6,07 \pm 1,23$  i  $3,67 \pm 1,09$ , na podstawie zmodyfikowanej liczbowej skali bólu 0-10.

**Wnioski:** Skala CFPS ma wystarczające właściwości psychometryczne do szacowania bólu u dzieci. Jednak preferowano bardziej CFPS niż FACES, jako bardziej przyjazne kulturowo narzędzie do oceny bólu wśród dzieci w Nigerii.

**Implikacje:** CFPS jest bardziej przyjazny kulturowo i dlatego mógłby być bardziej odpowiedni, jako skala bólu w Afryce. Jednak, ze względu na swoje właściwości psychometryczne, potrzebne będą dalsze badania w celu poprawy tej skali.

## INTRODUCTION

Pain is a complex personal experience influenced by multiple interactive, psychosocial processes<sup>1,2</sup> and its management constitutes a significant challenge to clinicians and researchers<sup>1,3</sup>. There is common consensus that assessment should be both the first step and the foundation of pain management<sup>3</sup>. However, quantifying the subjective phenomenon of pain and determining the nexus between the experience and expression of pain remains a clinical enigma<sup>4</sup>. Ethno-cultural differences account for some of the most significant factors that can influence the experience and expression of pain<sup>5,6,7</sup>.

In paediatric care, the challenge of assessing children's pain is even greater since children are yet to acquire the language or cognitive skills to adequately describe their pain<sup>8</sup>. Consequently, literature is replete with tools that have been developed to help children quantify and express pain. These tools mostly employ a progression of images of faces using photographs, such as the Oucher Scale<sup>9</sup> or cartoon drawings as obtained in the Wong-Baker Faces Pain Rating Scale<sup>10</sup> and Faces Pain Scale – Revised (FPS-R)<sup>11</sup>. Nonetheless, these tools are limited in their cross-cultural application as culture is a factor in pain behavior and experience<sup>12</sup>. In addition, factors such as disparity in the level of cognition and cultural differences in perception of emotions imply that child pain tools developed among western populations may have lower psychometric utility when applied to the African child<sup>13</sup>. Although the Oucher scale has been

developed to overcome cultural limitations, it has been reported to be difficult to use especially by children 3-7 years old. Furthermore, it is more expensive to implement because it requires the use of colored photographs<sup>7,14</sup>.

Children constitute a large proportion of the African population and are unduly exposed to pain<sup>15,16</sup>. Unfortunately, there seems to be a dearth of cultural-friendly pain assessment tools for African children. The influence of cultural factors upon pain assessment in children remains unclear, as does the construct of culture<sup>17</sup> itself. Some studies, especially among people of African descent, showed that pain experience and perception have strong ethno-cultural links<sup>7,18</sup>. Conversely, some other authors submit that there is little evidence that pain perception is modified by cultural or ethnic factors, but pain expression by children and interpretation by caregivers may be affected by the culture of the patient or the caregiver<sup>17</sup>. These researchers<sup>6,17</sup>, investigated the cultural sensitivity of pain tools in children from different racial groups living in the same geographical region of North America or Europe, and attending the same schools, thus complicating their studies' methods and also making their conceptualizations of culture ambiguous. It is therefore possible that studies on the cultural sensitivity of pain tools in children from different racial groups living in different geographical region and under different socio-cultural context may give a different result. Finley et al.<sup>17</sup>, submit that many of the issues described in low- or middle-income countries as 'cultur-

al' can more directly be traced to context, education, limited resources and economic struggles. Therefore, pain tools developed and validated among other populations may have limited applicability among Africans. However, culturally-friendly pain scales specific for African children are sparse. The objective of this study was to develop and validate a culturally-friendly pain assessment tool for Nigerian children.

## MATERIALS AND METHOD

### Procedure

Ethical approval for the study was obtained from the Ethical Committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria. Parental consent was obtained for the respondents in this study. The purpose of the study, the study instruments and their mode of use were explained to the children and their parents/caregivers.

### Respondents

Respondents in this study were 70 children within the age range of 4-13 years and had post-surgical pain, orthopaedic pain, stomach pain or headache. The respondents were recruited from three (a specialist, missionary and tertiary) hospitals from two states in Southwestern Nigeria. Excluded from this study were children who were under four years and children who were yet to fully recover from the effects of anesthesia post-operation, as they were considered to have impaired cognition.

## Instruments

### Wong-Baker FACES Pain Rating Scale

The Wong-Baker FACES Pain Rating Scale (FACES) is a valid and reliable self-reporting pain assessment tool<sup>10,19</sup>. FACES is reported to be an appropriate tool for children mainly due to its ease of usage in observing and reporting pain<sup>19</sup>. It utilizes cartoon-like (line) drawings of six faces that portray children's pain levels. Each child was asked to self-report their current pain by pointing to the face that reflects their pain. These faces range from a smiling face (extreme left) to one of severe pain with tears visible (extreme right). Numerical values are assigned to each of the six faces in multiples of two, starting from zero and ending at ten. Also, word descriptors are added underneath each of the faces from "No hurt" (extreme left) to "Hurts worst" (extreme right)<sup>8</sup>.

### Crying Faces Pain Scale

This study was aimed to develop and validate a "Crying Faces Pain Scale (CFPS)" among a sample of children with pain. FACES was used as the criterion tool for the validation of the CFPS. The development of CFPS was premised on anecdotes and reports that African culture inhibits pain expression<sup>20</sup>. Anecdotally, pain experienced among African children is poorly expressed. African

children experiencing pain are sometimes lured with distractions and in some cases to the extreme of being required to put up a smile despite their pain<sup>21</sup>. Crying is one of the behavioral measures of pain expression in children<sup>22</sup>. Thus, pain-related crying may be a useful metric for pain felt among African children.

### Development of Crying Faces Pain Scale

In the first stage, ten children who had post-surgical operations were asked to select and rank six emoticon-based pain/crying faces in the order of their understanding of the scales, as well as, the feasibility of using the scales to assess their pain. All the emoticon-based crying faces tools, except FACES were poorly rated as feasible for assessing their pain. Thus, FACES was selected as the criterion tool for the development of the CFPS. Consequent to the poor rating of emoticon-based tools for pain assessment among the sample, real photographic faces of children expressing crying to pain, as well as smiling, were adopted in this study.

During the scale development, several photographs of crying and smiling faces were taken. Respondents were asked to mimic crying and smiling scenarios in varying degrees. A team with expertise in pain care, comprising of four physiotherapists (two of whom were pediatric physiotherapist), a pediatrician, two orthopedic surgeons and a child health

dentist reviewed and were made to select the photographs to be used for CFPS. The team considered the extent of tears drops and eye closure, frowning of the brow, mouth opening and closure, as well as dropping or elevation of the eyebrows in attributing pain magnitude to crying or smiling photographs. The "crying" and "smiling" faces were ordered to depict increasing magnitude (Figure 1 and 2). Also, the faces were arranged in an inverse pattern such that the least crying face photograph on the front strip of the CFPS (extreme left) tallies with the best smiling on the back strip of the scale (extreme right) and vice versa.

Whilst a person may have no pain and yet not be smiling, peculiarly in children pain is associated with crying and the absence of a smile. Validating 'crying faces' as a measure of pain intensity among Nigerian children was intended to be in addition to the stereotypes of facial expressions or facial actions such as the furrowed brow, narrowed eyes, raised cheeks, deepened nasolabial fold, and horizontally stretched mouth that are common to pain faces scales<sup>23</sup>. During the development of the CFPS, analysis revealed an inverse correlation of  $r=-0.206$  ( $p=0.047$ ) between the crying and smiling score of the scale. Owing to the weak correlation, we felt that smiling may not be a suitable inverse measure of pain even among Nigerian children, and as such may not have adequate practical and clinical application. Thus,

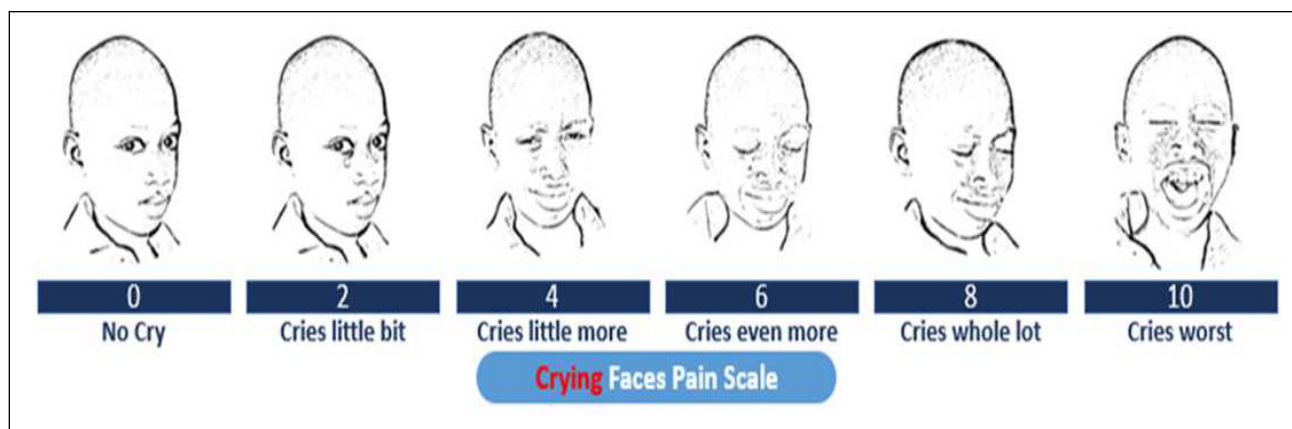
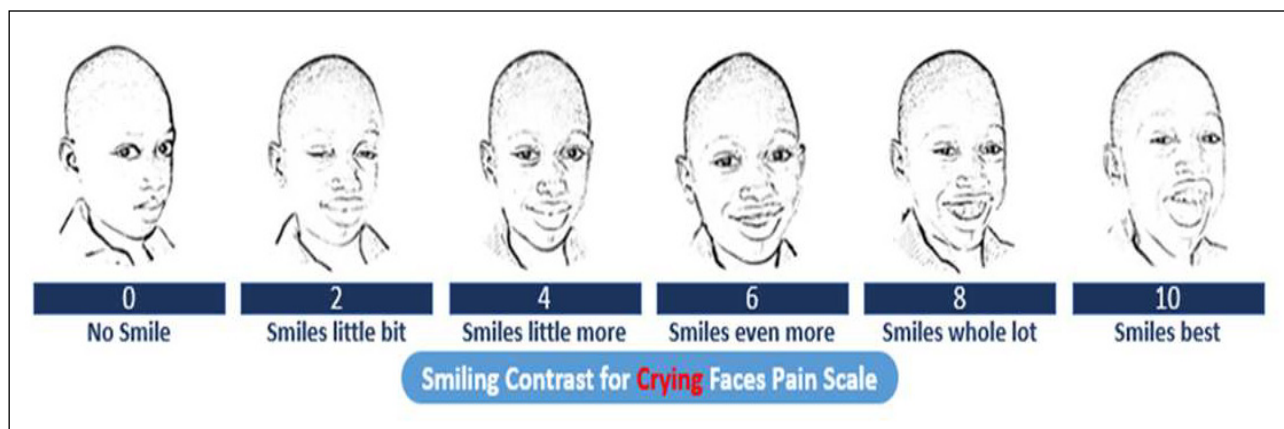
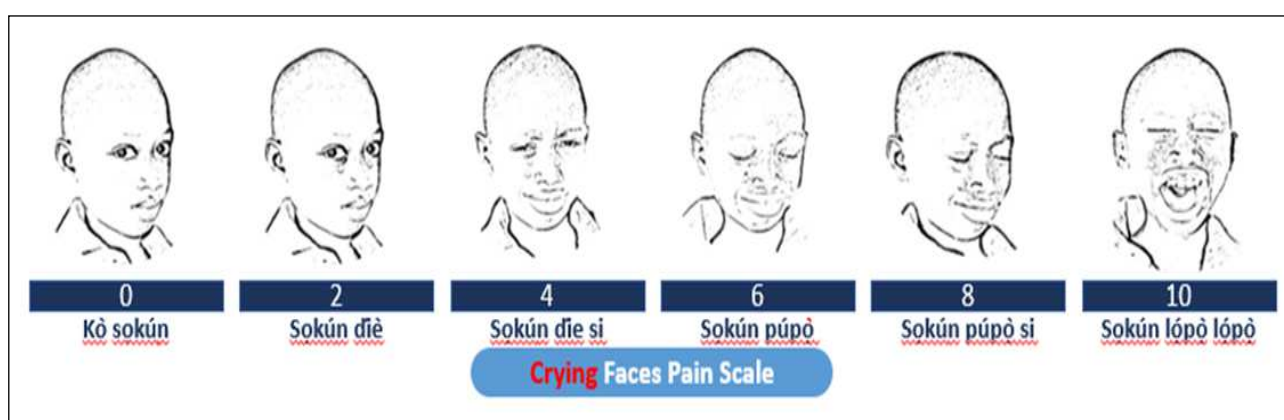


Figure 1  
Crying Faces Pain Scale



**Figure 2**  
The Smiling Contrast for Crying Faces Pain Scale



**Figure 3**  
Crying Faces Pain Scale (Yoruba version)

the weight accorded to smiling was stepped down and the focus in developing the scale was now on crying as a measure of pain intensity.

In order to ascertain the face validity of the new scale, five children with a positive history of pain who were not part of the initial process of scale development were asked to indicate the level of crying that reflected his / her pain. This stage allowed for the validation of the relevance and optimal recognition of the crying images chosen for the scale by the children. Subsequently, a new scale was produced on hardcover paper strips with the crying faces.

### Second stage – Cross-validation of the Crying Faces Pain Scale

The second stage of the study was the cross-validation of the CFPS. This stage involved the translation of

the CFPS into the Yoruba language among twenty respondents. Yoruba is the local language in the setting where this study was carried out. The translation of the CFPS was made by a Yoruba linguist at the Department of Linguistics and African languages of the Obafemi Awolowo University, Ile-Ife, Nigeria. A physiotherapist with experience in the translation of scales, who was not associated with the initial translation phase, then back-translated the Yoruba version of the CFPS into English. The back-translated CFPS was then checked against the original scale by another physiotherapist. Spearman rho correlation for the Yoruba version of the CFPS was  $r=0.926$  ( $p=0.001$ ) for the criterion validity. The inconsistencies in the translation process were addressed in order to produce the same meaning as the original CFPS. The translation of the CFPS into the

Yoruba language was carried out to remove the language barrier that can limit the use of a new scale in a study setting (Figure 3).

### Third stage – Validation of the Crying Faces Pain Scale

In the third stage, a convenience sample of 70 children with pain including post-surgical pain, orthopaedic pain, stomach and headache were recruited. The CFPS was validated by correlating it with the FACES. The respondents were asked to indicate the level of 'crying' shown on CFPS that best represented their current pain. At the same time, they were asked to rate their pain intensity on the FACES. The administration of both the CFPS and FACES was done in random order. Using a modified 0-10 numerical pain rating scale, the respondents were asked to rate their

preference between CFPS and FACES as a culturally friendly tool for example “which of these drawings can you relate with / like”.

### Data analysis

Data was analyzed using descriptive and inferential statistics. Spearman's rho correlation coefficient was used to correlate between the CFPS and FACES, as well as the cross-validation of the Yoruba version of the CFPS. Scatter plots were used to depict the relationship between CFPS and FACES. Data analysis was performed using the Statistical Program for Social Sciences for Windows version 16 (SPSS Inc., Chicago, Illinois, United States). Alpha level was set at 0.05.

### RESULTS

The mean age of the respondent was  $7.81 \pm 3.64$  years. There was no significant difference in the age between male and female ( $7.21 \pm 3.18$  vs.  $8.58 \pm 4.07$ ;  $p=0.117$ ). The general and clinical characteristics of the respondents are presented in Table 1. 41.4% of the respondents had headache while 12.9% had post-surgical pain. The median pain response for CFPS and FACES score was 4.60 and

4.47 respectively. Preference score as a culturally friendly tool for CFPS and FACES was  $6.07 \pm 1.23$  and  $3.67 \pm 1.09$  respectively on a modified 0 - 10 numerical pain scale.

Using FACES, the respondents' pain intensity ranges from 2 to 10 with a mean score of  $4.54 \pm 2.66$ . There was no significant difference in pain intensity between male and female respondents ( $4.77 \pm 2.81$  vs.  $4.26 \pm 2.46$ ;  $p=0.428$ ). The mean CFPS score was  $4.60 \pm 2.62$ . Similarly, there was no significant difference in CFPS scores between male and female respondents ( $4.72 \pm 2.70$  vs.  $4.45 \pm 2.56$ ;  $p=0.676$ ).

Spearman's correlation showed a weak correlation between FACES and CFPS ( $r=0.325$ ;  $p=0.006$ ) while the Spearman rho correlation analysis between CFPS and demographic variables of age and sex were  $r=0.41$ ;  $p=0.733$  and  $r=-0.044$ ;  $p=0.715$  respectively. Figure 4 shows the correlation between FACES and CFPS using scatter plots.

### DISCUSSION

Pain is a subjective symptom that is difficult to measure objectively in children and consequently is often undertreated<sup>24</sup>. This study was undertaken to provide a cultural-

ly sensitive pain assessment tool for use among Nigerian children. Ethno-cultural differences are reported as among the most significant factors that can influence the experience and expression of pain<sup>5,6</sup>. Most pain scales developed use self-reported numerical scoring in an attempt to rate an individual's pain objectively but in younger children, this presents a challenge because most are unable to adequately self-describe their pain<sup>17</sup>. Hence, tools which use a series of facial pictures or images in varying degrees of pain have been developed<sup>9-11,25-27</sup>.

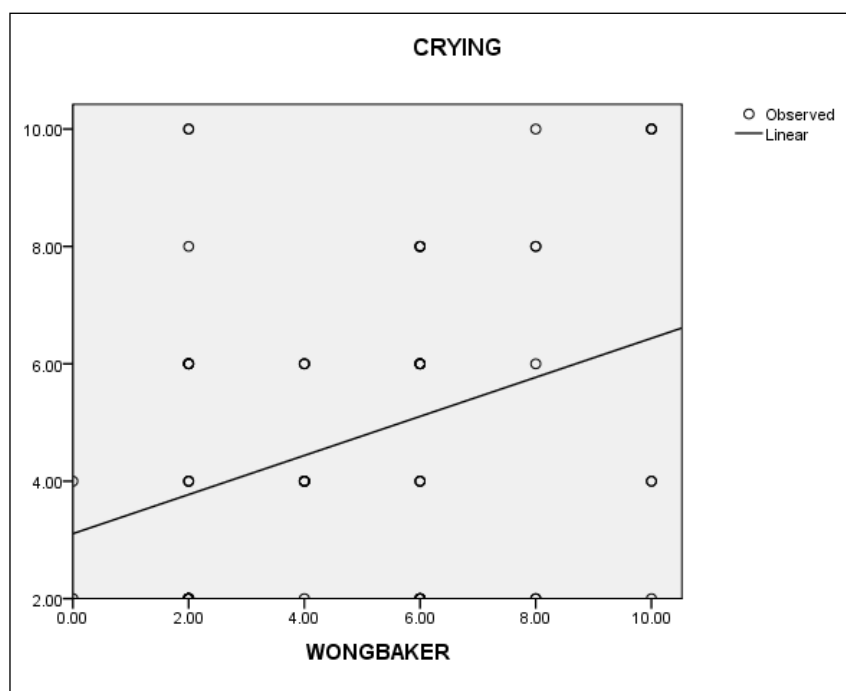
Emoticon-based pain tool such as the FACES has been employed in previous studies among children<sup>10,19,23</sup>. Psychometric properties of the FACES have been proven to be adequate<sup>23,28</sup>. However, the universality of an emoticon-based scale among children is debatable, as it is hamstrung by ethno-cultural influences<sup>8,29,30</sup>. Vandergriff<sup>31</sup> submits that emoticons are highly context-sensitive and multifunctional. As such, emoticons or smiley-faces based pain scales developed in developing countries like in the Sub-Saharan Africa may have limited applicability in regions that are far remote in terms of culture and development.

In light of these concerns some researchers have suggested adding hair,

**Table 1**

#### General and Clinical Characteristics of the Respondents

| Variable                 | n (%)     | Mean (SD)   |
|--------------------------|-----------|-------------|
| Age (years)              |           | 7.81 (3.64) |
| < 5                      | 22 (31.4) |             |
| 5 - 10                   | 32 (45.7) |             |
| 11 - 14                  | 16 (22.9) |             |
| Weight (kg)              |           | 36.4 (7.16) |
| Height (m)               |           | 1.36 (0.09) |
| BMI (kg/m <sup>2</sup> ) |           | 19.6 (2.42) |
| Gender                   |           |             |
| Male                     | 39 (55.7) |             |
| Female                   | 31 (44.3) |             |
| Clinical Condition       |           |             |
| Post-surgical pain       | 9 (12.9)  |             |
| Orthopaedic pain         | 13 (18.6) |             |
| Headache                 | 29 (41.4) |             |
| Stomach pain             | 19 (27.1) |             |



**Figure 4**  
Correlation between Wong Baker scale and the Crying Faces Pain Scale

clothing, and color to facial emoticons in order to make the facial emoticons “locally” typical of their environment<sup>17,32</sup>. However, there is no empirical proof that these modifications lead to scales with strong psychometric properties<sup>17,33</sup>. Anecdotally, children, especially those of low socio-economic backgrounds, in many African settings do not understand adequately emoticons or smiley faces, thus making pain scales using emoticons or smiley faces difficult to understand. The finding of this study showed that the CFPS was preferred to FACES as a culturally friendly tool for assessing pain among Nigerian children. The FACES seems to be less understood by the respondents compared with CFPS.

From this study, the CFPS is seen to possess moderate psychometric properties for assessing pain in children. The children rated their pain intensity higher on CFPS than on FACES. In addition, the smiling faces scale within CFPS was less understood by the children. However, it was considered as a valuable check, as the worst cry due to pain is supposed to be complemented by least smile. The pattern of correlation between crying and smiling scores of the CFPS was

inversely significant but weak. There was no significant correlation between the pain measures and demographic variables among the children in this study. It is therefore believed that the CFPS is not influenced by demographic characteristics in children within the age range of 4 to 13 years. However, it was observed in this study that the older children tended to rate their pain lower on the Crying-faces scale.

This study has several limitations. Firstly, the lack of a homogenous sample of children with similar painful conditions was a potential limitation. Secondly, although the FACES is well established in pediatric pain studies, it may not be the most appropriate comparator for the CFPS. The CFPS is designed to assess the intensity of pain experienced in children by asking them to express their experience by selecting the “best-fit” crying face and smiling face from the scales. It is noteworthy to state that crying is a characteristic that is more specific for acute pain than long-term pain as the behavioral manifestations of pain attenuates when pain becomes long-term, as long-term pain is not typically expressed by continual crying. However, the CFPS can be used

as a clinician-administered pain tool for children in acute pain. This highlights the need for validation of CFPS in the assessment of acute pain. Following this preliminary study, it is intended that the design of the CFPS be upgraded from the paper form to a more durable three dimension polymer.

The Crying Faces Pain Scale has fair psychometric properties for assessing pain in children. CFPS was preferred to FACES as a culturally friendly tool for assessing pain among Nigerian children.

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