



## Assessment of Wellbeing and Children Understanding of Hygiene Protocols Using hand-washing pictorial measure

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### Abstract

Regular hand washing is a normative lifestyle that is intricately related to the overall well-being of individuals, with special importance among African children. This practice is capable of driving well-being. Handwashing is a hygiene protocol that is expected to be inculcated and carried out regularly by everybody. The importance of regular hand washing is enormous because it prevents diarrhea, viral infectious diseases, and other related ailments. This may account for the adoption of regular handwashing as a global approach for the containment of the COVID-19 pandemic. Given the importance of hand-washing on well-being, the authors adopted an exploratory survey design to assess children's understanding of hand-washing among 300 kindergarten pupils between the ages of 5 and 7 years, with a  $M = 6$  and  $SD = 2.1$ . Their genders consisted of boys (145, 45%) and girls (155, 55%). The Hand-washing Pictorial Measure was utilized for assessment, and five questions were asked, namely: (1) What is the child in the picture doing? (2) Why does the child in the picture doing it? (3) How does the child in the picture feel? (4) Have you ever felt that way? (5) What do you think will happen next? The qualitative results showed that 295 participants recognized and described activities in the picture while 3 were ambivalent, and 2 did not recognize it. The quantitative results showed that the scale provided adequate psychometric properties required for assessment. The instrument yielded acceptable psychometric parameters.

**Keywords:** wellbeing, hand-washing, pictorial measure, development, health

### Introduction

One of the important factors in ensuring the healthy development and functioning of children is inculcating protective lifestyles in them. An example of such lifestyles is regular hand-washing, which is deemed critical for the prevention of illnesses such as diarrhea, COVID-19, and other bacterial infections, among other health-threatening diseases (UNICEF, 2013; World Health Organization, 2021). The World Health Organization (2021) stated that regular

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hand washing is a powerful protective mechanism against illnesses not only in children but also in adults. This may be the basis for its adoption and utilization of regular hand-washing during the COVID-19 pandemic to contain the spread of the virus by the World Health Organization. Its efficacy in the containment of viral diseases was acknowledged by other researchers in the public health sector (Cutis & Cairncross, 2003; Garg et al., 2013; Shrestha & Angolka, 2014; Shrestha & Angolka, 2015).

Given the enormity of health risks, the funds and resources expended when children develop sickness serve as a wake-up call for its prevention. The United Nations Children Education Fund (UNICEF, 2023) reported that 1.4 million people die annually and about 400, 000 children die globally due to diseases related to poor hand hygiene. The number is humongous and fearful, thus requiring an urgent need to curtail the menace. The urgency is anchored on the fact that when a child becomes sick or dies from sickness, the parent(s), caregiver, sibling(s), peers, and larger society bear the brunt of the situation. The pain associated with such development is indescribable (Gijzen et al., 2016). For example, when a child dies, the mother often suffers from parietal pain, mother-to-child attachment loss, and expends resources on the dead child. The pain may last for an extended period of time, though it often depends on resilience, social support, and psychological resources (Gijzen et al., 2016).

The importance of inculcating the behavioral pattern of regular hand-washing in children at the early childhood stage should not be overemphasized. The early childhood stage consists of children whose chronological ages range from 3 to 5, and middle childhood from 5 to 7 years (Santrock, 2006). It is plausible to assert that behaviors developed in childhood and reinforced are capable of being carried along the human developmental trajectory (Rovee-Collier, 2002). Previous research findings have confirmed that behaviors developed even in the womb will continually reoccur as the individual reinforces the behaviors (Rovee-Collier & Barr, 2004). This is in tandem with the theoretical postulation of operant conditioning theory (Skinner, 1938). The theory states that behaviors that are effectively reinforced will be internalized and manifest thereafter. Therefore, a child learns to wash their hands after using a toilet, after an interpersonal handshake, after playing, and before and after eating food.

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Similarly, from the cognitive maturity point of view, children in the early and middle childhood stages have developed the capacity to understand hand-washing (Greene et al., 2012; Shrestha & Angolka, 2014, 2015). According to the theory of mind (Premack & Woodruff, 1978) children in the early childhood period who are stable and functioning well have well-developed brain cells that will enhance the internalization of their behavior. It becomes reasonable to state that If children at the stage could understand other people's feelings; it is plausible that evidence that would effectively understand hand-washing. Also, the theory of mind (Premack & Woodruff, 1978) stated that children at an early age have the mental capacity to process information effectively. It is the cognitive ability of children to understand what other people think and feel. This theory is central to the cognitive development of children. The chronological age of a child and cognitive fitness are critical factors in children's manifestation of the theory of mind. Human beings have the tendency to attempt to read other people's minds through their facial expressions, statements, and other physical displays. By reading other people's minds, it means attributing some feelings and thoughts to them. The cognitive ability to engage in mind reading has been reported to develop at three years of age. The skill becomes refined as a child develops the executive function of the brain. Executive function is domiciled in the forebrain that handles information processing, and it advances as children increase in chronological age.

The theory is central to projective tests of human behavior. Though infants are capable of taking a cue from looking at their mother or caregiver's face before engaging in some behaviors, they may not be capable of processing information adequately. The ability to engage in the theory of mind is dependent on the development of the brain. In pictorial tests, children are required to describe inanimate objects. It is only children who have developed the theory of mind that can project their thoughts and feelings into pictorials. Pictorial psychological tests have proven to be useful instruments to elicit information from people of different levels, including children who may not be able to use pencil and paper.

### **The challenges of assessing hand-washing behavior**

Regular hand-washing behavior seems not to be a common practice among children. This is because the importance of hand washing is not well appreciated by adults who are meant to

inculcate the habit in children. In Nigeria, children rarely wash their hands after playing. Rather, a common norm is to wash hands after using the toilet, before eating food and after eating food. However, playing at the playgrounds has the potential to contract and spread viral and bacterial diseases. Worrisomely, other environments where children operate are not taking into consideration for hand-washing practice for children such as playgrounds, classrooms, prayer-ground, and shopping malls among others. Unfortunately, there is no standardized instrument to assess children's understanding of hand-washing behavior. Thus, the present study aimed to provide a reliable and valid tool that can assess children understanding of hand-washing practice.

### **The Present Study**

The present study developed a measure of children's mental and emotional capacity to understand hand-washing behavior, referred to as the hand-washing pictorial measure. It drew strength from perceived competence and social acceptance for young children (Harter & Pike, 1983), a pictorial measure of school stress and wellbeing (Murray & Harrison, 2014), and an incomplete sentence blank (Weis, 2015). It is a projective test that shows a child washing their hands and a woman pouring water and detergent on the child's hands while other children queue up to wash their hands. The responses are scored qualitatively and quantitatively. The qualitative scoring ranges from identified, undecided, and not recognized. That is, if a child is able to recognize the picture of another child-washing their hands and the activities going on. On the other hand, the quantitative scoring format is in line with the incomplete sentence blank, which ranged from 0 to 6. The quantitative scoring used a seven-point response pattern, where 0, 1, 2 represent negative (NE) responses, 3 stands for neutral or ambivalence/indifference (N) responses, and 4, 5, and 6 represent positive (P) responses. Specifically, NE 0 = worst, NE 1 = worse, NE 2 = bad; N 3 = neutral/ambivalence; and P 4 = good, P 5 = better, and P 6 = best. Based on the scoring format, the summation of responses in each scenario indicated the adjustment state of the pupil for that particular scenario.

The Hand-washing Pictorial Measure was utilized for assessment, and five questions were asked, namely:

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- (1) What is the child in the picture doing?
  - (2) Why does the child in the picture doing it?
  - (3) How does the child in the picture feel?
  - (4) Have you ever felt that way?
  - (5) What do you think will happen next?

### **Face and Content Validity and Inter-Rater Reliability Assessment**

The picture, the five assessment questions, and the response patterns were circulated among eight expert raters drawn from the Department of Psychology, Nnamdi Azikiwe University Awka; the Department of Early Childhood Education, Nnamdi Azikiwe University Awka; the Department of Measurement and Evaluation, Nnamdi Azikiwe University Awka; and the Pediatrics Unit, Chukwumeka Odumegwu Ojukwu Teaching Hospital, Awka. They agreed that the picture is age-appropriate, clear, and self-explanatory. The questions and responses were also confirmed to be age-compliant. The collation of the ratings from the 8 assessors showed 98% accuracy. Interestingly, the International Test Commission (2017) accepted an inter-rater reliability ratio of 98% as highly acceptable. The outcome of the above basic validity and reliability measure gave impetus to proceed with the study.

See figure 1, Appendix A the hand-washing pictorial measure

This scale is important because it is a projective technique with both qualitative and quantitative scoring patterns. Projective tests have been shown to be critical to unraveling latent personality factors (Lilienfeld et al., 2017). A projective test is a performance-based test that requires the respondent to perform a task that has little structure, direction, or guidance (Marchant, 2022). In the study, children are required to describe the pictures, thereby indirectly letting out latent information about their feelings in similar situations. Unlike other projective tests, the hand-wash pictorial measure has revealed the capacity to unravel children's cognition and emotion in understanding hand-washing behavior (O'Farrelly et al.,

2019). It is a special scale because of its capacity to reveal normal children and children experiencing difficulties in recognition.

### **Participants**

A total of 300 kindergarten pupils were selected from six public and private nursery schools in Urban and semi-rural areas in Anambra State, Nigeria. The ages ranged from 5 to 7 years, with a  $M = 6$  and  $SD = 2.1$ . Their genders consisted of boys (145, 45%) and girls (155, 55%). The participants classes were in nursery 2, 3, and primary 1, and 2 respectively.

### **Procedure**

The pupils that took part in the study were only those whose consent forms were approved. Additionally, before the commencement of the interview, pupils' assents were obtained. Four research assistants were selected and trained on test administration, and they helped with data collection. They visited the classes of pupils that were selected three times for familiarization before the commencement of the study. The test was administered individually to each pupil. The interview sessions were during lunch break. In each school, fifty (50) pupils were selected. The average duration of an interview session with a pupil was 8 – 12 minutes.

### **Research Design**

It is an exploratory survey design that allows the researcher to test how consistent and whether the hand-washing pictorial measure (HWPM) is a consistent construct in the new population (Nigerian sample). Exploratory design is a type of research design that allows a researcher to test a new measure on a different sample.

### **Statistics**

Consistent with the research objectives, qualitative and quantitative analyses were adopted. In the qualitative approach, content analysis was done. In the quantitative approach, Cronbach's alpha and exploratory factor analyses were done.

Qualitative Analysis

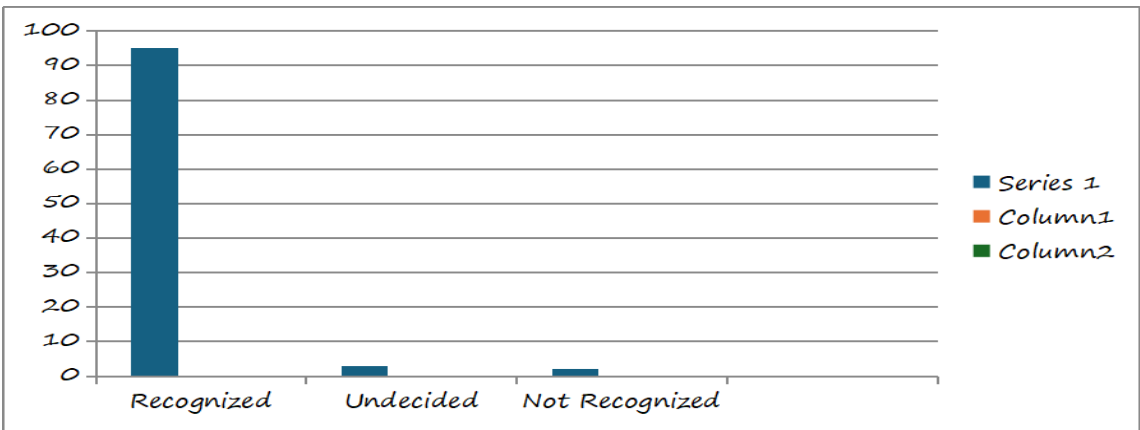
Results

Table 1, Content analysis of data

Recognized	Undecided	Not Recognized
95	3	2

Table 1, and Figure 1 graphic illustration of the content analysis of the picture, which showed the result of children ability to describe activities happening in the picture. The description is expected follow the five questions asked. Children that gave extra explanation beyond the questions asked earned maximum score and it shows high intelligence quotient.

Figure 1 content analysis data



Result of Wellbeing, Stress and Borderline

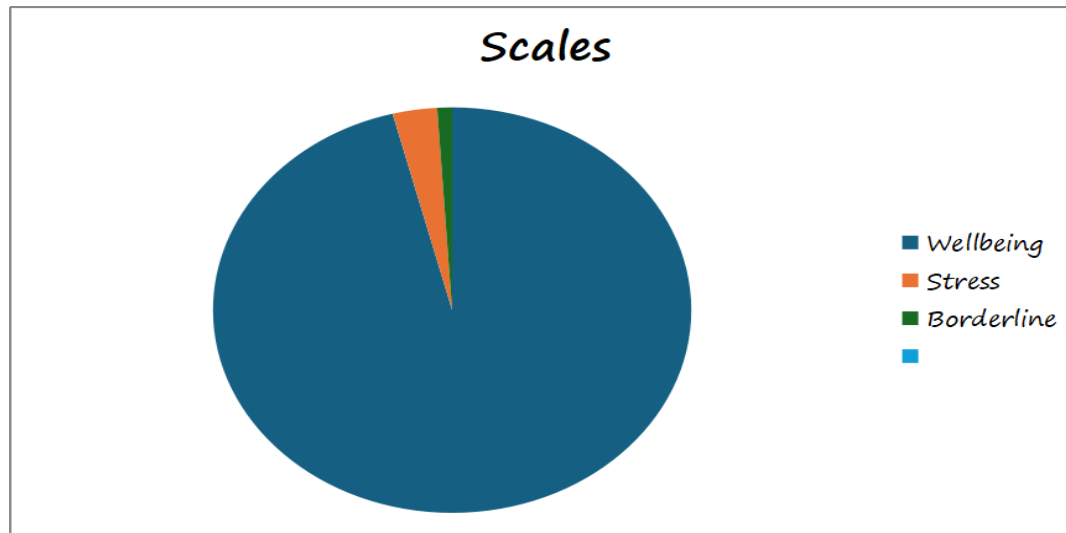


Figure 2, illustration of the mood of the participants, which was derived from questions 2, 3, 4 and 5 respectively. Children that described child in the picture as happy and maintained that they have felt happy washing their own hands were adjudged to have wellbeing. However, children that described the child in the picture as sad, angry, and crying were adjudged to have stress. On the other hand, children that responded I don't know to questions assessing feelings were described as borderline. On the importance of handwashing as elicited by interview guide number 2, majority of the participants stated that their mothers, father aunts and teachers will be happy with them for washing their hands.

### **Conversion of Interview responses to quantitative data for Objective scoring**

In order to convert qualitative data to quantitative data, incomplete sentence blank (Weis, 2015) procedure was adopted. The criteria for assigning any number were based on the appropriateness of responses, clarity, depth of understanding of a concept and emotional attachment to a response. For example, the pupil's responses to the question "How does the child in the picture feel? The word "happy" indicates a positive feeling. Another pupil may "the child in the picture feels very very happy for washing hand to avoid contamination". The two responses above would not gain similar



score because of differences in depth, and clarity in their responses. The second question, Have you felt that way?, requires a pupil to clearly describe reasons for the child's happiness. For example, the child is happy washing his/her hand with a soap and water. Then comes the prompt, which asks the child if they have ever felt that way. A child who says yes with additional explanation will earn the maximum mark. Also, the last question, "What do you think will happen next?" is expected to yield effective coping responses for a pupil to be classified under stable adjustment. Omissions and incomplete responses are not scored. Examples are when the child is silent, responds with "because" but fails to continue the sentence, is incoherent, or uses ehmm, among others. Similarly, if a child omits half of the total responses, the child's response is cancelled. The quantitative scoring used a seven-point response pattern, where 0, 1, 2 represent negative (NE) responses, 3 stands for neutral or ambivalence/indifference (N) responses, and 4, 5, and 6 represent positive (P) responses. Specifically, NE 0 = worst, NE 1 = worse, NE 2 = bad; N 3 = neutral/ambivalence; and P 4 = good, P 5 = better, and P 6 = best. Based on the scoring format, the summation of responses in each scenario indicated the adjustment state of the pupil for that particular scenario. For instance, scores from 16 to 30 indicate a positive response (well adjusted), whereas scores from 11 to 15 indicate neutral or indifference, and 0 to 10 signify a negative response (maladjusted)

### Quantitative analysis

Table 2, Cronbach Alpha Coefficient.

Reliability Statistics	
Cronbach's Alpha	N of Items
.722	5

The reliability parameter of the pictorial measure yielded accepted score of  $\alpha = .722$ , which is well above the International Test Commission (ITC, 2017) of Cronbach Alpha coefficient of .55 minimum benchmark.

**Table 3, KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.734
Approx. Chi-Square		614.345
Bartlett's Test of Sphericity	Df	21
	Sig.	.000

Exploratory factor analysis (EFA)

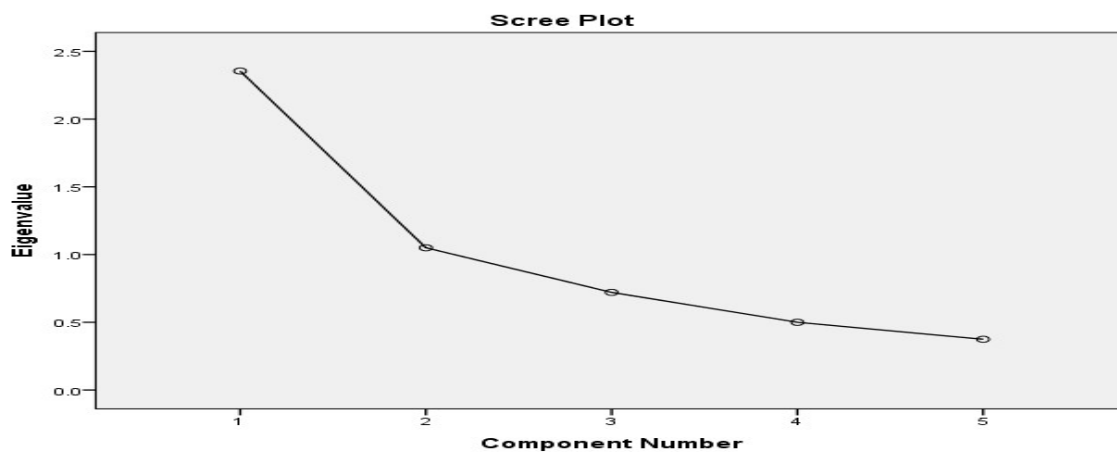
The KMO test yielded acceptable score adequate for exploratory study.

**Table 4, Communalities**

Factor	Initial	Extraction
P1Q1	1.000	.537
P1Q2	1.000	.696
P1Q3	1.000	.528
P1Q4	1.000	.710
P1Q5	1.000	.688

Extraction Method: Principal Component Analysis.

Figure 3, scree plot



The eigenvalue showed that a significant factor emerged in the scree plot.

## Discussion of findings

The results showed that the hand-washing pictorial measure was well understood at the early and middle childhood periods. The relevance of the pictorial measure manifested in the level of recognition and clear description of the activities in the card, see table 1, and figure 2. Specifically, out of the 300 participants, 3 reported undecided and 2 did not recognize and could not describe activities in going on in the picture. Notably, demographics and academic records of the five participants who could not recognize the picture were struggling academically and were not stable socio-emotionally. The finding conforms to the International Test Commission's (2017) findings on qualitative analysis. The findings showed that the hand-washing pictorial measure is compliant with the children developmental stages, which is a critical factor in psychological measurement. A scale would only be classified valid if the target population could respond to it. In the present study, the qualitative analysis has yielded parameters that confirmed the construct validity of the scale.

On the other hand, the quantitative data obtained from the conversion of interview responses were subjected to exploratory and confirmatory factor analysis and the following psychometric properties Chronbach Alpha, Kaiser-Meyer-Olkin Measure (KMO), communalities and scree plot were established. The Cronbach Alpha coefficient is a measure of internal consistency of measurement instrument and it is central to scale utility. According to Cronbach and Meehl (1955), assessment of the internal consistency of measurement instruments is paramount to scale development, validation, and utilization. Internal consistency is a type of reliability that serves as a foundational requirement for the use of any psychological scale (ITC, 2017). The required benchmark for the internal consistency score is  $\alpha \geq .55$  and above. Given that the internal consistency yielded in the study is  $\alpha = .722$ , See table 2 above. Additionally, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and the Bartlett Test of Sphericity are types of exploratory factor analyses that measure the robustness of a data of a scale. The KMO score was .734, and the Bartlett test, which measures the suitability of the data, was .21  $P < .000$ . The finding is highly significant and compliant with ITC (2017). The confirmatory factor analysis of communalities showed that factor extraction ranged from .528 to .696. The ITC acceptable benchmark is .300 minimum. Thus, the present finding is above the requirement of the ITC; therefore, it is correct. Also, the scree plot showed that one clear distinctive factor emerged, and the eigenvalue is .30, which represents 30% of the variance of the total sum.

## Conclusion

The development of an instrument to measure children's understanding of hygiene protocol is a step towards improving their wellbeing. Globally, hand washing seems to be a basic and quite effective means of preventing diseases across different age brackets but is most useful among children because of their fragile immune system. Children, especially in infancy and the early childhood stage, are fond of indiscriminately picking things from the ground, touching any object at sight, and putting their hands in their mouths. The behavior was succinctly explained by erogenous zone of the psychosexual stages of personality (Freud, 1917). The theory stated that at a particular stage in human life, satisfaction of the oral part of the body is the ultimate responsibility of the child; hence, continual putting hands in the mouth serves as confirmation of the theory. Unfortunately, the innate behavior of putting hands in the mouth exposes children to diseases because the hand that would be put in the mouth may have contracted a viral or bacterial infection from the environment. Therefore, the sure way of prevention is to train the children on regular hand-washing (Ekwere & Okafor, 2013; Haque, 2020). To ascertain those who need training, it is important to measure children's understanding of hand-washing. Thus, the goal of the present study was the development and validation of hand-washing pictorial measures among children. It is believed that this scale will contribute substantially to the wellbeing and optimum functioning of children and the larger society.

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