Innovations

Determination of Design Features in Child Minder's Clothing in Nigeria

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Abstract
This paper describes the task-related design features in developing prototype for child minders. Clothes that are presently used in child care tasks do not meet the users' needs in performing activities. This makes their task more difficult to carry out while comfort, health and safety are not guaranteed. Therefore, this work aims at identifying task-related design features and developing prototype functional child minders clothing that would facilitate child minding tasks, minimize work hazards while ensuring comfort, protection and safety of this children and users. Purposive sampling technique was used to select 300 respondents. Questionnaire and body measurement were used to collect data and analyzed with mean, percentages and Chi –square. Users were involved in the process of prototype development. The design was tested to assess appropriateness and modified for final fitting.

Keywords: *1.Task-related;2. Design features;3. Determination of Design Features; 4.Child Minder's; 5.Child Minder's Clothing*

Introduction

Every child reserves the right to adequate care and love, protection against danger, play, adequate nutrition, good environment and early child education for optimal development as provided by United Nation Convention on the Rights of the child (CRC) (2009). This helps him/her grow into a useful responsive adult with a bright future (Azonuche, 2016). Many women are employed in the work force to support their families. Consequently, there was the need for child care centres/homes to keep the children while at work. To achieve this, when parents are at work or not readily available to discharge child care duties, child minder services are utilized for child care.

Child minder is someone that takes care of children for payment in one's home. The child minders provide hygienic stimulating environment of the child. Care is targeted at the vulnerable children of ages 0-3 years for early childcare, learning and reading in preparation for school (UNESCO, 2007). In Nigeria child minders are registered professionals with the Ministry of Women Affairs who ensure standard in child care services and skills. Child

minders plan, prepare play based programmes of activities, keep record of children activities, ensure good nutrition, health and safety. The childcare tasks include; feeding, carrying, petting, training (talking, toileting and writing), ensuring clean working environment for the children (American Child care worker, 2012). They move frequently within, in and out of the working environment, exposed to some hazards and continuation for some period of time based on the tasks performed. Extreme hazard conditions can be prevented by wearing appropriate clothing for protection against liquid spills, dirt, dust particles, infectious diseases, heat and friction (Dunne 2004, Shih – Cheng & Augus, 2016).

Existing work clothes pose challenges and interfere with safety, productivity and task accomplishment of the user. Clothes designs restrict body motions, postures, heat dissipation, moisture absorption and conduct of body temperature (Tesman Health and Community Service, 2014). Suitable clothing to a great extent determines functional clothing value of comfort to wearer, mobility, protection from hazards, health and safety. Originally clothing serves the purpose of protecting the wearer's and expressing roles (Dunne, 2010; Azonuche, 2020; Azonuche, 2021). But specific garment functions determine necessary clothing design (Ng, Hu & Wong, 2011) and physical characteristic features that allow freedom and match motions (Grupta, 2011).

Studies on sleepwear and lingerie needs of female breast cancer survivors indicate prototypes incorporating functional design for comfort in seam placement in the surgery scare areas, neckline and torso, with fabric that compensate for hot flashes from chemotherapy (Tulfio-Pow et al (2012). Another study on women's at enable garment with environmental properties and functionality (fit, comfort, movement and protection) (Emerich, 2011). Study shows detachable belt, large pouch pocket, two cargo pockets on a loose garment as functional design features needs of natural disaster survivors (Ashan, 2012). Sailors requested uniform with fitted neckline and armhole that enable quick mobility in a confined work space without restriction (Bye & Hakala, 2005). Chuo & Ashdown, (2002) study shows work clothing of female pear workers provide comfort and free movement in standing posture with arm at 90 degrees angle and upward looking to enhance efficiency at work. Another study found that functional (fit and comfort) and aesthetic satisfaction to meet apparel needs of tennis players (Jin& Black, 2012). Agbo & Igbo, (2017) found that garments for bedridden females or those with disabilities should be designed for easy dressing and un dressing, allow independency, use of limbs and torso and comfort to the wearer without restriction (Curteza et al 2014, Disabled towards tomorrow, 2016). Han, Shin and Chow (2016) found that hydrotherapy wet suits improve rehabilitative health needs of patients. Thus, in order to facilitate child care tasks, it is very crucial to use appropriate clothing. Although several studies have been carried out on developing functional garments to meet users' needs, however, task related design features in child minder's clothing has not been studied among the product design community and the need to develop such garment is yet to be considered. Hence, the need for determination of design features in child minder's clothing. Specifically, the study identified task related design features perceived as necessary in child minder's clothing for child care, developed prototype clothing, tested and modified prototype. In addition this hypothesis was proposed;

Hypothesis: There is no significant difference in the task related design features perceived as necessary between single and married child minders clothing.

To achieve the purpose of the study, the research activities and development of prototype include; product design user needs, focus group discussion, identify task related design features, development of prototype clothing, model testing and modification.

Product Design User Needs

In recent times, clothing design approach has shifted from "industry- need-driven to consumer –need-driven (Stone, 1999) and garment design functionality and appeal are determined by the designer (Dunne, 2010). In order to achieve the needs of consumer in the clothing design process "user- centered or co-design" approach are being adopted in some industries (Wilkinson & De Angeli, 2014).The user need is an important beginning in product design process. The knowledge of the user's needs, task and working objects form the starting point. It helps to acquire real strengths and weaknesses of the object situation used to solve specific needs, meet and improves standard (Watkins, 1995; Azonuche, 2020).

The functional, expressive and aesthetic (FEA) need design process by Lamb & Kallal (1992) was the conceptual framework used in this study with emphasis on product functionality in mobility, protection during activity and easy donning and doffing. As noted the most crucial values in functional clothing are provision of comfort and protection of the user in activity performance (Roseblad – Wallin, 1985). Environmental comfort and protection of the user during task or activity to a large extent determines work efficiency and productivity.

User design need specification

The interaction Matrix of functional specifications for Neonates by Bergen et al (1996), guided the inclusion of users identified design features. The design criteria were cross matched to assess conflict. Any design specification that does not conflict is 1 and accommodated while the one that conflict is labeled 0 and considered unsafe. Specification that conflicts with others is labeled 2 and safe viz; comfortable, safe, accessible, protective and aesthetic.

Materials and Methods

Focus Group Needs Assessment Discussion

Focus group of 10 persons consisted of seven child minders and three parents selected by convenience sample. They were convened in one of the homes that had the facility characteristics. The interactive and discussion were carried out in a session. The focus group members were those that have not less than 5 years of experience as child minders and parents of children in child care homes. This is because they could help to inform the necessary design features that would facilitate tasks on the job. Sketches of clothing were made available during the session to aid quick brain storming and discussion of design features to accommodate. This gave them the go ahead to propose new and novel ideas that are not in conventional styles and designs. The discussion was for one hour (1hr), all participants gave their consent and were fully involved. The researcher used the open and closed ended questions as a guide for the participants to elicit opinions. Discussion was on clothing challenges in performing tasks and desirable corresponding design features. Their opinions were sought regarding different functions, movements, protection, safety and accessibility (donning and doffing).

Research instrument for data and analysis

Sample size of 300 respondents were selected by purposive sampling techniques from Southern Nigeria. Structured questionnaire was developed from the focus group discussion, related literature review and design purpose. The 14 items of questionnaire were of Yes or No options to get their opinions. Aldrich (2006) Standard Body Measurement chart (SBMC) was adopted in taking body measurements and categorized sizes. The body measurements of participants were taken and categorized into small, medium and large sizes. Five research assistants helped in taking the measurements. The data collected were analysed using mean, percentage and chi-square with Statistical Package of Social Science (SPSS) version 16.0. Chi-square x^2 statistical analysis $P < 0.05$ was rejected, $P > 0.05$ was accepted.

Results and discussion

Mean was used to determine the average body measurement for the size categories. Mean of
small size is bust=85cm, waist=82.96cm and hip=96.91cm, medium size bust=94.88cm, waist=87.58cm, hip=104.33cm and large size bust=107.49, waist=98.02cn, hip 114.75cm.

Table1: Percentage of Responses of Child minders on the Necessary Desirable Design Features.

S/n	Design features preferred for functional clothing based on tasks		Responses	Remarks	
			F	%	
	Caregivers tasks in the day care	**Task-related design feature**			
T1.	Receiving and giving babies back to parents	Loose sleeve	276	95.20	Yes
		Detachable sleeve	11	3.90	No
		Sleeveless	16	5.70	No
T2.	Putting babies in the bed and keeping older ones on their chairs.	Loose shoulder, and hip (loose clothing)	276	97.50	Yes
		Tight shoulder and hip (tight clothing)	8	2.90	No
T3.	Raising up children's items/bags to keep	Large armhole	276	95.20	Yes
		Small armhole	11	3.90	No
		Tight armhole	10	3.60	No
T4.	Putting babies on the shoulder	Detachable cape/bib at the shoulder	268	93.10	Yes
		Non detachable cape at the shoulder	14	5.10	No
		No cape at the shoulder	11	3.90	No
T5.	Putting babies on the laps	Loose hip and laps	269	94.70	Yes
		Tight hips and laps	19	6.50	No
T6.	Putting /carrying babies by the side	Loose shoulder	267	94.30	Yes
		Tight shoulder	15	5.40	No
T7.	Carrying /putting babies at the back and front	Detachable sailor collar (cape/bib)	261	91.30	Yes
		Fixed sailor collar	26	9.10	No
		No detachable sailor collar	15	5.40	No
T8.	Feeding the baby	Loose garment	274	96.50	Yes
		Tight garment	13	4.60	No
T9.	Burping after feeding	Detachable shoulder cape	251	89.00	Yes
		Fixed shoulder cape	26	9.30	No
		Bib	73	26.20	No
		No cape	10	3.60	No
T10.	Curdling and petting the babies to sleep	High neckline (3" from base of neck)	15	5.40	No
		Moderately low (4" from base of neck)	09	3.30	No
		Low neckline (5" from base of neck)	260	91.90	No
T11.	Changing clothing, diapers and playing with children	Loose garment above knee length	69	25.50	No

		Loose garment below knee length	210	74.20	Yes
		Tight garment below knee length	12	4.30	No
		Ankle garment	19	6.90	No
		Garment that repels dirt	26	9.50	No
T12.	Making baby's cot/bed cleaning	Short sleeve	260	91.90	Yes
		Three quarter sleeve	29	10.40	No
		Long sleeve	11	4.00	No
T13.	Toilet training	Detachable sleeve at elbow point	257	89.20	Yes
		Detachable sleeve at shoulder point	21	7.70	No
		Sleeveless	19	6.90	No
T14.	Carrying baby's care items for easy reach	Large pockets	257	91.10	Yes
		Small pockets	18	6.70	No
		No pockets	9	3.30	No

N = 293, T = Task, F = Frequency, % = Percentage

Result in table 1 shows that 95.20% respondents indicated loose sleeve in garment for arm stretch to receive children, 97.50% indicated loose hip and laps (loose garment) to allow postures when keeping children on bed and chairs.95.20% indicated large armhole in garment for arm raising, 93.10% indicated detachable cape/bib for putting children on shoulder, 74.20% indicated below knee length garment to allow postures and movement, 91.90% indicated short sleeve and low neckline, 89.2% indicated detachable sleeve at elbow point for toilet training.91.10% large pocket for care items. Indication is that these clothing design features are perceived as necessary by child minders to facilitate child care tasks. This is agrees with McDonagh & Thamos, 2010, Han et l (2016) report that functional product users are in the best position to determine specific garment designs that meet their needs in use and not the designer. Garment that is below knee was desirable silhouette for easy movement (Boorady, 2011) ,is fashionable, trendy and appealing. This study is similar to Honkamen et al (2011) who found that garment with sewn soft pads in a pull up and wrap round styles with Velcro fastener improved external hip protector adherence for efficiency and comfort of caregivers and residents. Neat child care (2011) noted that uniforms are types of garment used for special occupations such as child care. Grannert (2009), Agbo and Igbo (2017) reported shorter sleeve for disabled wearers when using wheel chair in motion to avoid entanglement. Detachable sleeve and bib are easily removed after use to avoid contamination and spread of diseases. This agrees with Mayo clinic (2008) report that following sanitary procedures in care giving prevent spreading of infections,, bacteria and diseases through clothing.

Result in table 2 shows there was no significance difference in the mean responses of single and married child minders on all the items. Probability values ranges from 0.110-0.982 greater than 0.05 level of significance (P>0.05). Hypothesis not rejected. This implies that single and married did not significantly differ in their desired design features of child minder's clothing based on tasks.

Table 2: Percentage and Chi-square (x^2) analysis of responses of single and married child minders on the mean rating of design features.

s/n	Design features preferred for functional clothing based on tasks		Single Married		X^2 value	Sig.	Remarks
			Yes	Yes			
	Caregivers tasks in the day care	**Task- related design features**					
T1	Receiving and giving babies back to parents	Loose sleeve	74	200	0.017	0.898	NS
T2	Putting babies in the bed and keeping older ones on their chairs.	Loose shoulder, and hip (loose clothing)	74	201	0.875	0.350	NS
T3	Raising up children's items/bags to keep	Large armhole	73	200	0.542	0.462	NS
T4	Putting babies on the shoulder	Detachable cape/bib at the shoulder	74	192	0.573	0.449	NS
T5	Putting babies on the laps	Loose hip and laps	73	194	0.389	0.533	NS
T6	Putting /carrying babies by the side torso	Loose shoulder	71	195	0.317	0.573	NS
T7	Carrying/putting babies on torso (back and front)	Detachable sailor collar (cape/bib)	68	192	0.103	0.749	NS
T8	Feeding the baby	Loose garment	73	200	0.052	0.819	NS
T9	Burping after feeding	Detachable shoulder cape	66	185	0.063	0.802	NS
T10	Curdling and petting babies to sleep.	Moderately low (4" from base of neck)	32	79	0.545	0.460	NS
T11	Changing clothing, diapers and playing with children	Loose garment below knee length	59	149	1.148	0.284	NS
T12	Making baby's cot/bed and cleaning work area	Short sleeve	72	186	1.183	0.277	NS
T13	Toilet training	Detachable sleeve at elbow point	72	183	2.059	0.151	NS
T14	Carrying baby's care items for easy reach	Large pockets	69	186	1.445	0.229	NS

Identification of design features and prototype development

The task-related design features needed were selected based on the data analysis from survey. Items options with highest percentages were considered as desirable design features. Pattern pieces were drafted. The necessary desirable design features are; loose garment below knee length and short sleeve with large armhole, detachable sleeve at elbow point, detachable cap/bib and large pockets.

The input responses of the users in relation to needs are as follows:

1. **Loose Fitted, Garment:** The garment design ease gives a better fit and safety to the wearer and children to avoid injury during task performance. Garment fabric is cotton made with open seam that is flat to the body in use. Garment length is below knee to allow different movements striding and postures in sitting, bending and torso twisting to carry babies on laps, side and torso. Sitting to feed babes and carry babies on the laps. Bending to change diapers, play, make cot/bed, lay babies on bed and keep older children on chairs as well as cleaning up any mess. Low neckline for comfort when petting and curdling children when crying or to sleep.

2. **Short Sleeves:** Short sleeve with large armhole for arm stretch to receive and hand over children to parents, raising arm to lift and keep children's bags on shelf.
3. **Detachable Sleeve –** Interfaced with water repellent fabric, attached to the shirt sleeve with Velcro at elbow point and finished with cuff and the wrist. This is used when children want to poo poo and during toilet training. The impermeable fabric protects the arm from liquid spillage. User detaches the sleeve after each use for laundry.
4. **Detachable cape/bib:** This is made with toweling or flannel fabric, interlined with water repellent fabric. To carry babies on shoulder, front and back torso and also for burping after feeding. The fabric absorbs any liquid spill vomit from belching which would not soil the garment due to the water repellent fabric inside. This prevents contamination and communicable disease spread among children.
5. **Large Pockets:** Pockets are large, deep, shaped with elasticized hem as closure to prevent care items from falling off. Carry small care items for easy reach such as; powder, diapers, napkins, Vaseline, among others

Figure 1: Child Minders Clothing Design Features

Prototype Testing and Modeling

This was carried out in two phases.

Phase 1: Three models within the size categories of small, medium and large wore and used the garment by carrying out tasks. This is to assess movement/postures, protection, safety, usage functionality, accessibility (donning and doffing) in the preliminary testing. Areas for modifications were identified and noted by the wearers and judges for modification.

Walking

Hanging Babies Care Bag

Lying baby on the bed

Figure2: Prototype Testing

Adjustment of garment

a. Neckline was widened for ease of donning and doffing over the head since garment has no opening.
b. Pleats were adjusted at knee point for movements/postures.
c. Pockets position was adjusted upward for accessibility
d. Cape/bib was lengthened to accommodate protection of torso. The side tie string was changed to strap with Velcro fastener for ease of opening and closing without support and distraction to children.

Phase 2: Construction and assessment of product

The modified garment was constructed. The American Society for Textiles and materials (ASTM F 1154) was adopted from Fowler (2003) to assess the task – related movements of users in care giving such as bending, arm stretching, lifted up, carrying children and toilet training. Sessions for task operations were recorded in a video and data was analyzed, results and reports from users showed that the garment accommodated necessary design features that are useful in task-related operations.

Playing with baby

Feeding the baby with spoon

Burping the baby

Training baby to work

Figure 3: Models performing tasks with modified clothing

Conclusion

Product for special need particularly in form of user task- related based design is an important approach to user –directed and user -inclusive product development. Thus, this study is in consonance with Kroemer, (2006), who reported that functional product design should fit into user's needs and not the designer. This study has been able to ascertain desirable design features necessary for task performance in child care. P > 0,05 indicates that both the single and married child minders did not significantly differ in their desirable design features for tasks since they carry out same tasks and functions. Since the product was perceived as appropriate it can be introduced to ministry of Women Affairs who are in charge of child care outfit/homes.

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