ADAPTIVE CLOTHING DESIGN CONCEPT TO FACILITATE THE ACTIVITIES OF PEOPLE WITH CEREBRAL PALSY DISABILITIES

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Abstracts:
Clothes for human life function as self-protection, communication, and representation of who the wearer is. Before representing oneself, the main thing is that clothing must have functional comfort. One part of society that needs available clothing is people with disabilities. The subjects in this study were people with moderate spastic Cerebral Palsy (CP). Based on their characteristics, people with average spastic CP usually have limitations in carrying out activities. The regulations they have will affect their daily activities, one of which is the activity of dressing. So adaptive clothing is needed to support the characteristics of people with moderate spastic CP disabilities. This study aims to facilitate the actions of people with moderate spastic CP disabilities—data collection in this study by observation and in-depth interviews on the subject. In addition to interview data, researchers recorded pictures and videos of the dressing process on the upper clothing types, namely shirts, and t-shirts. The study's results showed that the design of adaptive clothing facilitates activities for people with moderate spastic Cerebral Palsy disabilities.

Keywords: Adaptive clothing, easy movement, cerebral palsy disabilities

INTRODUCTION

In Indonesia, there are 866,770 people with Cerebral Palsy (CP) disabilities, most of which are people with spastic type CP disabilities(Cantero et al., 2021). Cerebral Palsy (CP) is a condition in which there is a paralysis of the brain that inhibits the growth and development of children. In general, people with CP disabilities experience abnormalities in the central system (brain) characterized by abnormalities in movement, attitude, or body shape and coordination disorders accompanied by psychological and sensory disorders due to damage during brain development (Al-Dababneh et al., 2012).

The condition of people with moderate spastic CP disabilities results in them needing special assistance and services at certain levels, one of which is the activity of dressing. The difficulty of dressing is an important problem for people with moderate spastic CP disabilities. Not only is it a matter of independence in putting on or taking off clothes, but people with average spastic CP also still have difficulty finding the right clothes for them on the market. So, it is difficult for people with moderate spastic CP disability to fulfill their needs in dressing according to their characteristics. People with moderate spastic CP disabilities usually adapt existing clothing to their physical characteristics. The lack of clothing that suits the physical aspects of people with mild spastic CP disability is one of the obstacles for people with moderate spastic CP disability in mobility, for example, in social activities such as work, establishing a relationship, and daily life (Kabel et al., 2017).

Based on this, it is time for designers and the fashion industry to realize the needs experienced by people with disabilities, namely the need for adaptive clothing. Adaptive clothing is designed based on the needs and abilities of people with varying degrees of disability, including congenital disabilities, acquired and temporary disabilities, and physical disabilities. In creating an adaptive clothing design, paying attention to several aspects, including the functional, comfort, and beauty parts, is necessary. Problem-solving on functional and comfortable clothing design using the FEA (Functional, Expressive, Aesthetic) model(Lamb & Kallal, 1992) . This research only looks at one of the indicators in the FEA model, namely, the functional indicator. This is because there is no adaptive clothing for people with moderate spastic CP disabilities with comfort, safety, modesty, and good aesthetic values. Functionality in adaptive clothing relates to its utility, protection, comfort, fit, and ease of movement as one of the functional requirements sought (Ramirez, 2014). Functionality defines the meaning of the dress, in this case, in adaptive clothing products intended for people with disabilities.

Adaptive clothing can address expected comfort and improve self-confidence. Appropriate clothing can prevent people with disabilities from being discriminated against from social activities and any connection with others(Kabel et al., 2017). For a person with a disability, clothing is not only a basic need. Still, it plays an essential role in achieving one's identity as a social person and should not be neglected for people with disabilities(Kabel, 2019). With attention to clothing, this is an effort to position people with

disabilities to be equal to society in general, and they can contribute socially according to their abilities (Lamb, 2001). The concept of adaptive clothing can facilitate companionship and increase the psychological value of self-confidence in the social psychology of persons with disabilities, especially persons with moderate spastic CP disabilities. According to(Na, 2007), adaptive clothing is clothing specially designed for individuals who have problems with sensory abilities that are sensitive to certain textures and materials. Na's statement reinforces that adaptive clothing follows the characteristics of people with disabilities.

Adaptive clothing is specially modified to make dressing easier, increase comfort and enhance independence for individuals with disabilities or limited mobility (Na, 2007). Many designs for adaptive clothing have fine seams that cut friction and are even modified to be consistent with the latest fashion norms as much as possible. Adaptive can be defined as customization or habituation in clothing for people with disabilities. Adapted clothing can make a positive difference in a person's life by allowing them to continue dressing or allowing caregivers to dress them easily and comfortably. Customizing clothing also includes choosing the proper headgear to use for adaptive clothing. This study aims to show that adaptive clothing can facilitate activities for people with moderate spastic cerebral palsy disabilities.

RESEARCH METHODS

The subjects in this study are people with moderate category spastic cerebral palsy disabilities who are members of the Indonesian Cerebral Palsy House Community—the age of the issues in this study namely adolescents at 13 years with female gender. There were 16 participants involved in this study. The sampling technique is purportedly following the objectives and research. The method used is a qualitative approach.

The first stage of this research procedure is to identify problems in people with CP disabilities. Based on interviews and initial observations, researchers found problems, namely the dressing process for people with CP disabilities. The problem is caused by the body condition of people with CP disabilities, which is different from the body condition of people in general. The second stage, namely determining the category of people with CP disabilities based on the results of interviews and initial observations. The selected person with CP disability is in the moderate category.

Furthermore, the third stage is carried out in the process of examining the characteristics of people with moderate category spastic CP disabilities based on the theory of degrees of limitation. Then, in the fourth stage, after determining the type and category of the subject, the interview and observation process is carried out on the subject, namely persons with moderate spastic CP disabilities. The interview and observation process are also carried out with assistants assumed to significantly influence dressing activities for people with moderate spastic CP disabilities. The fifth stage, based on the results of the previous process, is then triangulated. The data triangulation process identifies the problems and needs of dressing people with moderate spastic CP disabilities. In the last stage of this research, an analysis technique with triangulation was carried out, which resulted in a recommendation for clothing characteristics for people with moderate spastic CP disabilities.

RESULTS AND DISCUSSION

Based on the results of observations and recordings, and interviews about the characteristics and problems of dressing for persons with moderate category spastic cerebral palsy. In addition to the effects of observations, recordings, and interviews, researchers also use indicators of the degree of limitation of people with Cerebral Palsy (CP) disabilities to see their ability to carry out daily activities. The results of observations and interviews are in the form of a description of the problem of dressing people with moderate spastic CP disabilities.

The subject's physical condition, namely stiffness, the right hand is more rigid than the left hand. The subject can sit, usually walking by dragging his thighs and pelvis. In motor conditions, namely in gross motor, the subject can hold a pencil in the right hand. The subject can also raise his hand. The subject communicates through expressions with a companion or other people he does not know. Based on the degree of limitation, the subject falls into the category of people with moderate spastic CP disabilities. The theory explains moderate spastic with (1) There are obstacles experienced by the subject when walking; (2) Reduced speed and quality of the subject in performing an activity; (3) The subject requires additional time to convey and receive information with known and unknown people. Figure 1 illustrates the process of dressing in a t-shirt.

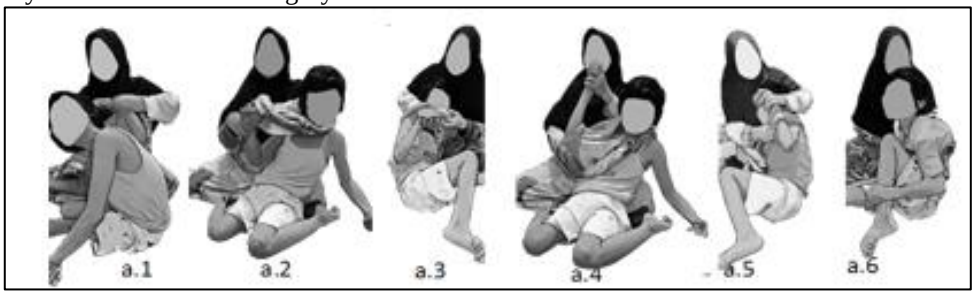

Figure 1: Dressing process with T-shirts

While wearing a shirt, the mother or companion tries to calm the subject first. The wearing process begins at the head and positions the body tilted to the right in a sitting position. When the shirt is to be worn, it is rolled up to the neck circle of the shirt, after which it is inserted into the subject's head (a.1). The t-shirt has entered the neck, the mother takes the right hand, which is quite spastic/stiff (a.2 and a.3) slowly inserted into the sleeve hole of the t-shirt. The sleeve of the t-shirt that has been entered is gradually lowered to the elbow using the mother's right hand (a.4), and the position of the mother's left hand holding a little slowly pulled the subject's hand so that the part of the hand is slightly raised to facilitate the t-shirt down. Next, inserting the shirt's left sleeve, the mother held the subject's right fist again (a.5). In this position, the hand becomes spastic/stiff, making it difficult for the mother to insert the sleeve of the shirt. However, in the end, after approximately 1 minute, the shirt sleeve. In Figure 2, you can see the process of removing t-shirt-type clothing.

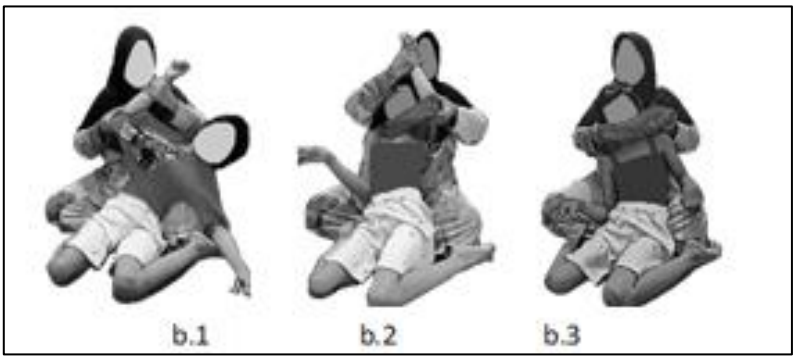

Figure 2. The process of removing clothes with t-shirt clothing types

In the process of releasing the subject's position on the mother's body. The mother's left hand held the subject's right hand firmly because the condition of the subject's hand became spastic/leg, so the t-shirt had to adjust the state of the subject's hand. The mother's right hand took the bottom of the shirt, and the sleeves of the sweater were put together to be simultaneously removed from the subject's right hand (b.1). Similarly, when pulling the shirt on the left hand. The mother holds the subject's left fist. The mother's right hand takes the bottom of the shirt, which is simultaneous with the sleeve hole of the shirt to be removed from the subject's left hand (b.2). After both hands were successfully released from the sweater, the mother removed the shirt from the subject's neck with the condition that the neck circumference of the shirt was stretched and pulled to be released slowly (b.3). The time spent to remove the sweater was approximately 1 minute. In Figure 3, we can see the dressing process with the type of shirt.

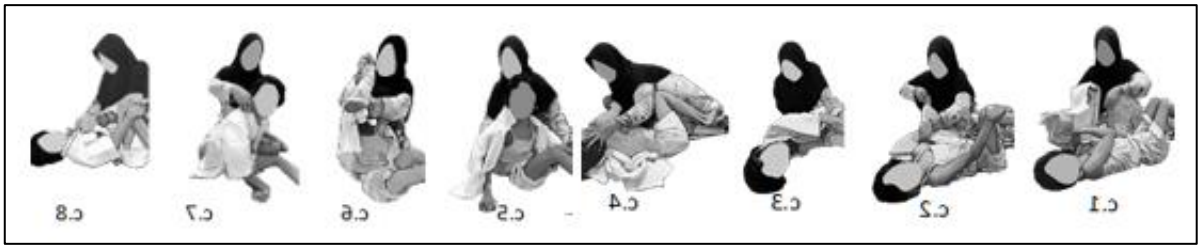

Figure 3: Dressing process with shirt type of clothing

The body position in the process of wearing a shirt slightly differs from how to wear a t-shirt. The subject's position when wearing a sweater is trying to be laid down by the mother so that it is easy to wear (c.1). The mother unbuttoned all the shirt buttons first, and then the shirt sleeve was inserted into the subject's right hand. When inserting the shirt sleeve, the mother's left hand pulled the subject's right hand by slowly holding the subject's fist. In contrast, the mother's left hand put the shirt sleeve into the hand (c.2). Before putting on the left sleeve of the shirt, the mother tilted the subject's body first to smooth the body of the sweater downward (c.3). Next, the subject's body was tilted back in a different direction, with the mother's hand supporting the subject's head. Then the mother slowly took half of the shirt from under the body (c.4), like a mother putting on buttoned clothes on a baby. In positions c.3 and c.4, the subject was sulking, so it was difficult to control, so the mother tried to calm down by lying down. When the issue began to feel calm, the subject's body tried to sit down and continued by inserting the shirt sleeve into the subject's left hand (c.5); even though the subject's left hand was automatically spastic/stiff, the mother looked difficult in this part. Then, before putting on the shirt leg to the subject's left hand, the mother inserted her hand into the shirt sleeve from the outside to grab the subject's left fist. The subject's left hand was pulled until the shirt sleeve was perfectly attached. After both shirt sleeves were successfully inserted in both hands of the issue, the mother smoothed the shirt collar (c.7). The final part of

putting on the shirt was attaching the buttons of the shirt with the position of the subject being laid back by the mother because the issue could not stay still (c.8). The time spent to put the shirt on the subject was approximately 1 minute 30 seconds. In Figure 5, you can see the process of removing clothes with the type of shirt.

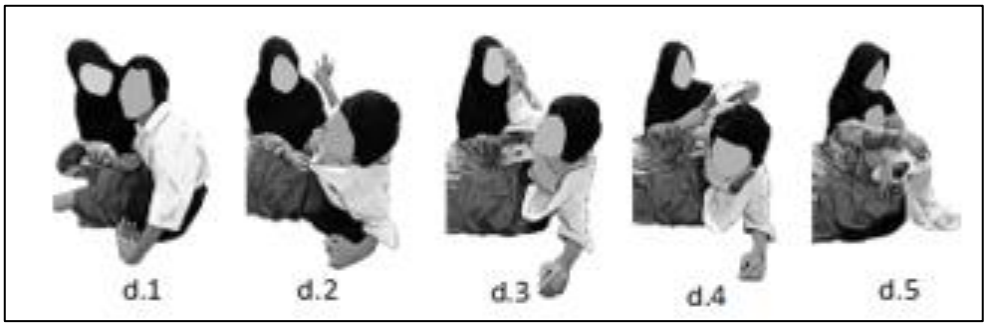

Figure 5: The process of undressing a shirt-type garment.

The process of removing the shirt begins with opening the front opening of the shirt and the subject is in a sitting position (d.1). Before finishing unbuttoning the shirt, the issue already felt uncomfortable because it took too long in the process of unbuttoning (d.2). The mother tried to calm the case at the same time as the mother's left hand held the subject's right hand by positioning to release the shirt sleeve assisted by the mother's right hand (d.3). In this section the issue experienced stiffness so that the subject himself had difficulty when he was about to release the shirt sleeve, the mother tried to position the subject's right hand out of the shirt sleeve (d.4). After the right sleeve of the shirt was released, the mother placed the subject's body and head to lean on the mother's body so that the mother could quickly release the left sleeve of the shirt on the subject's left hand (d.5). The process of removing the sweater by the companion from the issue took approximately 1 minute.

Dressing problems for people with moderate category spastic CP disabilities, seen from their characteristics with a degree of limitation or category. Based on the results of interviews and observations, the subject, namely a person with moderate type spastic CP disability, still needs a companion, in this case, the mother, to do activities, one of which is dressing. The condition of stiffness experienced by the subject sometimes comes when the dressing process is felt to be long-winded or too many items of clothing. The clothing is considered less reflective of functional adaptive clothing, as in Na's research (2007). The purpose of adaptive clothing is to have easy access to body parts without removing all clothing and making it easier for people with disabilities to wear. Examples include using Velcro and magnets as an alternative to closing and opening clothes(Poonia & Pinki, 2020). Since the clothing is not designed explicitly for people with moderate spastic CP, the characteristics of the parts in the dress also do not consider the convenience for the subject and companion.

The companion or mother has difficulty dressing using upper clothing types such as t-shirts and shirts. Problems that arise during the dressing process are not only caused by medical issues characteristic of people with moderate category spastic CP disabilities, but problems also arise from the characteristics of the clothing. Based on research from Na (2007), one factor that encourages adaptive clothing is the specificity for individuals with problems with sensory abilities that are sensitive to certain textures and materials. The t-shirt and shirt materials worn by the companion to the subject in this study pay less attention to the subject's sensitivity to the surface of the material, as in the comfort indicator in the design features that should be considered when designing clothing for people with disabilities by Na (2007), clothing and other textiles in close contact with the body should not cause any discomfort.

The assistant said it was challenging to put on a button-down shirt for the subject, for fear of being eaten, which harms health. The issue in his daily life is that he usually wears T-shirts or clothes with zippers on the back. Seeing from previous research conducted by Na (2007) showed that conventional clothing can be modified in a form that makes it easier for users to access it, for example, front closure bras, side-opening pants, sandals that adjust in width to accommodate swollen feet, and ankles and seamless socks are additional modifications that make life easier. In addition, there are also lap-over back-style garments with snaps for individuals who cannot lift their arms. Such changes can minimize the time in completing the process of putting on and taking off clothes. This is corroborated by research from (Nevala et al., 2003) on increasing patient independence and reducing the workload of caregivers when clothing is modified into functional adaptive clothing. Thus, the size, texture, items, and parts of clothing must be considered for adaptive clothing for people with moderate spastic CP disabilities. Discussion related to clothing modification for people with moderate spastic CP disabilities, as shown in Figure 6. The process of wearing t-shirt clothes.

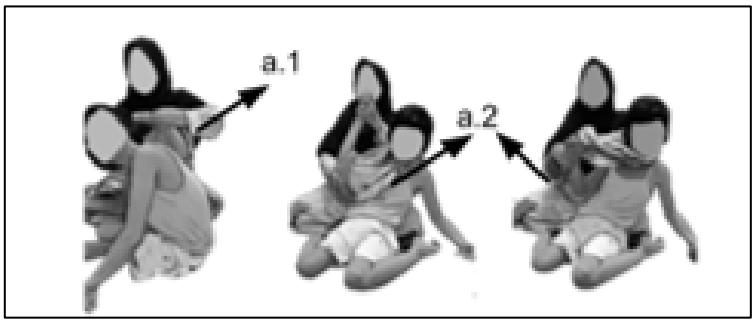

Figure 6: The process of putting on the adaptive t-shirt.

In the process of putting on the T-shirt from step 1 to step 6, the neckline of the T-shirt needs to be pulled until the circumference can be inserted into the subject's head (a.1). This shows that the flexibility of the T-shirt is a consideration for the mother or companion to facilitate the process of putting on and taking off clothes. In addition, the shape of the neck can also be a consideration for the type of t-shirt subject, namely from the round and V-neck shapes.

The next option, namely the T-shirt's neckline, requires a size larger than the circumference of the neckline of a conventional T-shirt for teenagers. This is because the condition of the subject's head is not as flexible as teenagers in general following the shape of the neck. Furthermore, the collar of the T-shirt sleeves was also made more significant because the mother or companion experienced the same difficulty during the stage of wearing the sleeves on the subject (a.2). An option to make it easier to wear at the collar of the sleeve can be made a pattern of a tie sleeve with a size 2-4cm more extensive than the actual size. If you still use the standard size and slippery sleeve type for the T-shirt, add Velcro to the sleeve's side. In addition to the size, the texture of the T-shirt is also a consideration for the mother or companion. The mother's stretching activities while putting on and removing parts of clothing from the subject's body require a flexible and elastic T-shirt texture (a.3), as shown in Figure 7.

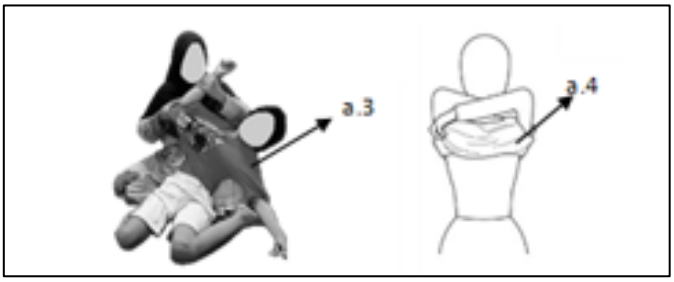

Figure 7. Adaptive clothing texture

A sweatshirt texture with a high degree of elasticity can make it easier for the mother or companion to put on and take off the sweatshirt to the subject. There is a difference between images (a.3) and (a.4), where (a.3) requires a t-shirt texture with high elasticity due to the subject's spastic body characteristics. So that in the process, there needs to be a higher pulling force, adjusting the subject's spastic hands. Based on the results of putting on and taking off the T-shirt, there are difficulties for the mother or companion, one of which is because the parts of the T-shirt have not been modified. These parts need to be changed according to the characteristics of the subject. Modifications to clothing parts, such as the shoulders, sides, neckline, and armhole circumference, can be seen in Figure 8.

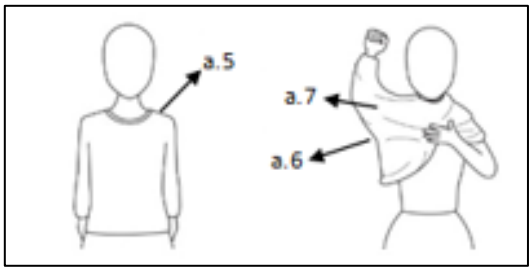

Figure 8. Adaptive clothing modification results

The shoulders and sides are modified like baby clothes that have buttons as openings. However, in this study, the parts that need to be modified are the shoulders and sides. The controls can be changed to Velcro or magnets.

Features (a.5) and (a.6) can be limited using openings such as Velcro or magnets. Then the sleeve collar (a.7) can also be modified into a tie sleeve. Based on the results of observations and interviews, if the subject experiences discomfort in the dressing process, it can cause the subject to become stiff in certain parts, such as the hands. So, to reduce this stiffness, features of the T-shirt can be added with items, such as on the shoulder line of the T-shirt, Velcro, or magnets can be attached as shown in Figure 9.

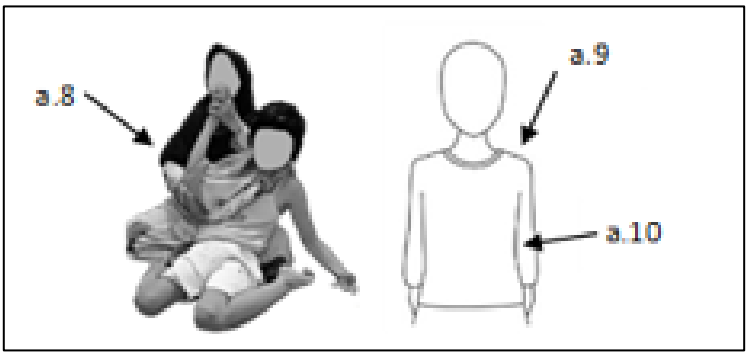

Figure 9. Velcro (magnet) on clothing

Adding these items can facilitate putting on and taking off the T-shirt. As seen in (a.8), the companion struggles to wear the sweatshirt's sleeves. The sweatshirt model can be made like the collar of baby clothes with an opening on the shoulder (a.9). Velcro or magnetic clothing items can also be added to the sides of the T-shirt. The sleeves (a.10). The addition of these items are intended to prevent the subject from raising their arms too high, which causes discomfort to the topic.

The result of the activity of putting on and taking off the shirt by the assistant to the subject can be identified that the size of the shirt used by the issue is one size larger than the clothes usually worn by the subject. The shirt size larger than the subject's body size was chosen because the mother or companion had difficulty putting on and removing the shirt from the issue, as shown in Figure 10.

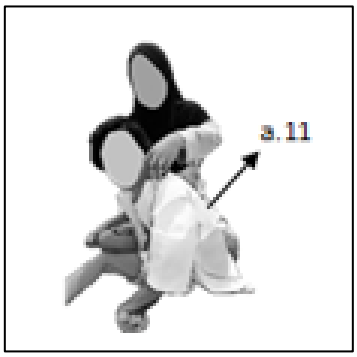

Figure 10. The sleeves look oversized

Since the size of the shirt chosen was not based on the subject's actual body size, the shape of the sweater worn became oversized and less beautiful to look at (a.11). Therefore, for the shirt size to fit the subject's body, it is necessary to modify the shape of the sleeves, collar, and sides of the shirt. The process of putting on and taking off the shirt by the mother or companion to the subject also considers the shirt's texture. The texture of the conventional shirt used by the mother or companion to the issue has not paid attention to the subject's comfort level both during the dressing process and when it is worn. Figure 11 The results of the sleeve modification.

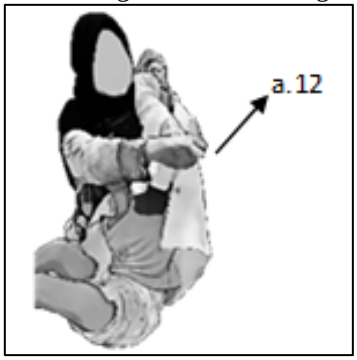

Figure 11. Modification result

It can be seen that the mother needs intense energy when inserting the subject's arm into the sleeve of the shirt (a.12). If the texture of the shirt fabric is stiff and rough, the process will hurt the subject's sensitive skin. The type of material on the shirt is better to use materials with more natural fibers than artificial fibers (polyester). The material that uses high natural fibers produces a softer texture compared to polyester fibers. Materials with a higher percentage of polyester fibers usually have a stiff and less absorbent surface.

People with disabilities are people with the inability to perform activities like the majority of everyday people in general. The International Classification of Impairments, Disabilities, and Handicaps (the ICIDH), first published by the World Health Organization (WHO) in 1980, describes disability as a person who has limitations or deficiencies as a result of impaired ability to perform activities in a manner or within the range considered normal for humans. There are three categories of people with disabilities: (1) Impairment, which is a person who is physically helpless due to psychological abnormalities or abnormalities in the structure of his body organs. The level of weakness is an obstacle that results in the non-functioning of other limbs, such as mental functions. Examples of this category of impairment are blindness, deafness, paralysis, amputation of limbs, mental disorders (mental retardation), or abnormal vision; (2) Disability, which is the inability to perform activities at the level of ordinary human activities, as a result of the impairment condition. As a result of damage to some or all of the limbs, a person becomes helpless to perform normal human activities, such as bathing, eating, drinking, climbing stairs, or going to the toilet alone without having to be assisted by others; (2) Handicap, which is a person's inability to carry out their socio-economic role as a result of physiological and psychological damage either due to the cause of functional abnormalities (impairment) or due to disability as above. External factors of the individual influence disability in the third category with a disability, such as being isolated by their social environment or due to cultural stigma, in the sense that people with disabilities must be pitied or depend on the help of other ordinary people.

People with CP can be classified based on the degree of disability, the topography of the deformed limbs, and the physiology of the movement disorder—classification of persons with CP disabilities based on the degree of disability. According to the degree of disability, there are three groups: mild, moderate, and severe. The characteristics of people with CP disabilities based on the moderate category: (1) Requires special assistance or training to speak, walk, and take care of themselves; (2) Requires special tools to assist their movements, such as a brace for leg support and crutches or sticks as a support in walking; (3) With exceptional help, people with moderate CP disabilities are expected to take care of themselves (Kurniawan & Rahman, 2021). To determine the ability of people with CP disabilities in their daily activities, researchers use indicators of the degree of limitation of people with CP disabilities (Pérez et al., 2017) in the process of designing clothing that suits the characteristics and needs of people with moderate spastic CP disabilities using Gross Motor Function Classification System (GMFCS) and Manual Ability Classification System (MACS) scores(Palisano et al., 1997).

Based on these categories, making clothes for people with moderate spastic CP disabilities needs to pay attention to various aspects according to the characteristics of people with moderate spastic CP disabilities and related to design aesthetics because clothing must be integrated with the context of social life. Dress is closely associated with social class, religious groups, symbols, communication, ethnicity, etc. Clothing should also not be exclusive and ignore certain social types, including people with moderate spastic CP disabilities. Meanwhile, the clothing needs of people with disabilities are also related to improving the quality of life. Providing clothing for people with disabilities is an effort to create equal opportunities and reduce social discrimination.

Adaptive clothing is specially modified to make dressing easier, increase comfort and enhance independence for individuals with disabilities or limited mobility (Na 2007). Many designs for adaptive clothing have fine seams that cut friction and are even modified to be consistent with the latest fashion norms as much as possible. Adaptive can be defined as customization or habituation in clothing for people with disabilities. Adapted clothing can make a positive difference in a person's life by giving them the freedom to continue dressing themselves or allowing caregivers to dress them easily and comfortably. Customizing clothing also includes choosing the right military to use for adaptive clothing. The following below includes millinery that could be used to modify adaptive clothing(Hayton et al., 2020).

CONCLUSION

Based on the results of research for people with moderate spastic Cerebral Palsy (CP) disabilities, upper clothing is needed, must pay attention to the size of the neck and arm circumference by making it looser than the size in general, using a type of material that has a soft texture, replacing buttons with Velcro or magnets, and modifying parts of clothing such as shirt sleeve models made into balloon sleeve models to provide space or looseness. One solution is to replace the wrist circumference of long shirts using rubber. T-shirt and shirt-type clothing on the shoulders, neckline, sleeve collar, and sides must be modified to make putting on and taking off clothes more effective and efficient.

Clothing for people with spastic CP disabilities is finding the needs of parts of clothing that need to be modified. Later, this research can be used as a reference in making adaptive clothing designs with comfort,

safety, modesty values well as good aesthetic value. Adaptive clothing design can be an alternative to clothing for people with moderate spastic CP disabilities following their characteristics and problems. This makes adaptive clothing one of the solutions to the problem of dressing for people with moderate spastic CP disabilities. The limitations of new research examining the female gender at an intermediate level need further research with samples of all genders and high levels.

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