How to Cite:
Venkatasubramanian, S. A., & Pragadheeswari, R. (2022). The apparel needs and limitations for people with limb disabilities. *International Journal of Health Sciences*, *6*(S6), 3642–3649. https://doi.org/10.53730/ijhs.v6nS6.10204

The apparel needs and limitations for people with limb disabilities

S. A. Venkatasubramanian
Associate Professor, Fashion & Lifestyle Accessories National Institute of Fashion Technology, Raebareli

Dr. R. Pragadheeswari*
Assistant Professor, Department of Apparel & Fashion Design School of Science, Tamil nadu Open University, Chennai
*Corresponding author

Abstract---The paper tries to understand the needs and wants of "disabled people" regarding apparel items of clothing. The aim of "clothing is to express" the style of an individual and to fulfil the needs of the wearer's security, functionality, and easement. In this paper, the limitations that people with "limb disabilities" face during the selection of any apparel of their choice because of medical restrictions are presented here. The apparel is important as every need of the wearer have to be satisfied in order to fulfil the human needs and obtain the functionality of the garments. Here, the functional clothes needs of the "disabled people" and with the use of 3D "virtual scanning" for a new presentation of the clothing is further presented. In order to gather data in reference to the research topic, *secondary research methodology* has been used here. The data findings and interpretation are also done following that manner. Also, the conclusion and future recommendations have been provided in this paper.

Keywords---apparel, limb disabilities, human needs, 3D virtual scanning, disabled person, garment design.

Introduction

The paper attempted to give much light on the needs and limitations of people having "limb disabilities" for the apparel selection. This research topic has much significance as in addition to security, functionality, and easement, clothing has an appreciative activity, the aim of which is to manifest the personal style of the wearer and stash the disabilities of the human. Although, the fact is evident that apparel cannot always bury the "physical disabilities" of a person that has more

acute disabilities. This is the reason, clothing has to fulfil the needs of a “disabled person” too and for enabling this, the research has been done to reflect on the limitations and needs. In this paper, the review of literature for the selected topic has been done thoroughly to have a more in-depth understanding of the areas of limitation for “disabled people”. Along with that, the *secondary research approach* is also used here to find more accurate and reliable data and to give recommendations based on real-world conditions. Here, the data interpretation is done in a descriptive manner.

Literature review

Functional clothing needs for “disabled people”

The functional needs impacting the design of the garment are the restricted mobility of the wearer and the requirements for an eased apparel that does not lead to more health issues, just as skin rashes, irritation, obstruction of blood flow, and so on. The apparel for disabled individuals must give adjustable comfort in sitting positions and enhance the overall standard of life (Bragança et al. 2018, p. 24). It can be formulated for individuals from a physical and intellectual state of mind, cultural and societal factors, and other external areas in reference to the dynamics of the body. One of the issues that the users of wheelchair faces during dressing have been investigated by various researchers in the past. The issues identified by the past research are as follows:

- Suffering in the upper limb at the time of dressing and undressing.
- The withdrawal of clothes from dormant legs.
- Lack of self-control
- Ulceration that is introduced by the lower level of shifts; and
- Injuries as a reason for traction belts and so on.

In order for the serviceability of clothing and apparel for people having disabilities to be obtained, the following needs have to be fulfilled.

- Moisture absorptive.
- The application of elastic fabrics for the easement.
- The application of a smooth closure system such as zipper, hooks, buttons, and spiral fastener (Nakić & Bogović, 2019, p. 178).
- Easy to use clothing with a lower level of biostatic charging and
- The least level of body odour detention (organic fabrics with microbicidal finishing).

The apparel designed for people having disabilities must fulfil the needs mentioned below:

- Sleeves should be accepted to the back and shoulder, enabling more freedom of shift at the time of pressing a wheelchair.
- Easement should be made sure, without having creases in fabrics made by sitting for a longer time.

- Trousers should be comfortable and not too tight nor too loose as they may create obstruction in blood flow because of huge pressure (Graf et al. 2018, p. 206).
- A loose trouser may create irritation in the skin on the back of the person and in the hips because of the creases in the fabric.
- The trouser should further be high-waisted in the back as differentiated from standard apparel and should not be hardened over the knees and make needless creases.
- The pocket of the trousers should not be stitched on the back of the pants and should be bigger than normal cuts.

Figure 1. Examples of apparel for Wheelchair users
(Source: Graf et al. 2018, p. 206)

3D "virtual scanning" for the basis of personalisation of clothing

The standards of body measurement contrast remarkably among people having "physical disabilities" and non-disabled individuals. Thus, particular requirements of designs should be fulfilled at the time of measuring the "disabled person". In case an individual being in a sitting "position is measured", it is significant for the seat surface to be flat and horizontal so that the upper legs are situated horizontally and the scale is vertical (Beach et al. 2020, p. 260). Also, the feet are situated flat in the horizontal area. The individual has to be barefoot. The measurements of the body can be obtained manually or on a digitalised human body. Relying on the used measurement approach contrasts in the volume of the human body may range from 0.72 cm to 1.71 cm.

The contrasts may also rise in measurement and in "relation to the height and length" of the human body. In order to take measurements of the body applying the non-contact approach, digitalization with a "3D body Scan" is applied, with outcomes in a point cloud of spatial coordinates of the body of a human. The scanning automation can be categorized into various classes such as laser scanning, passive scanning, visual body shaping, white light scan, silhouettes, photogrammetry, and the application of other functional sensors (Ward et al. 2019, p. 1360). The key advantage of a non-contact approach applied for the measurement of the body is that a short time is required for scanning which diminishes the fatigue that happens at the time of maintaining a particular and required posture throughout anthropometric measurements.

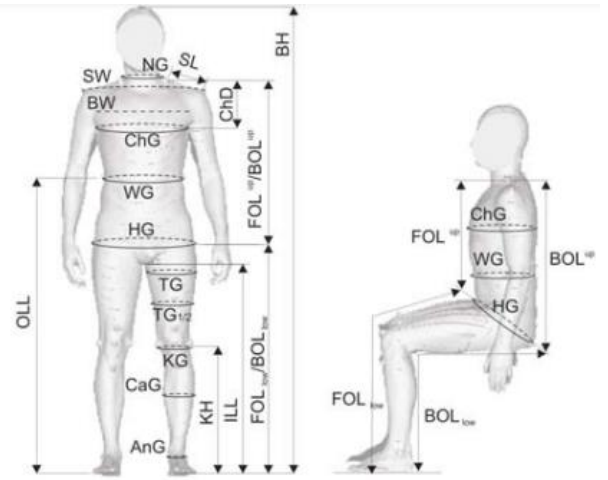

Figure 2. 3D Point Measurement cloud of the Human body
(Source: Ward et al. 2019, p. 1360)

It is probable to gather all the data from the anthropometric, postural, and adjustable viewpoint that is required for the initiation and outlining of apparel accepted to the varied needs of particular areas of wearers. Provided that, anthropometrics gives 2 systems of body measurement static or structural alluding to body variations of an individual, and dynamics or practical (Maryanti et al. 2020, p. 1920). It alludes to postural actors in relation to various shifts and day to day tasks of all the above-mentioned areas that could be incorporated into the basis of ""3D body Scan"ning". Photonic scanners and machines that are dependent on identifying a delineation from one or more than one images. It can be made a structure with various points by applying laser beams or framed lights are used to make an invariable structure of the individual body.

Virtual designing of garments for "disabled people"

The adjustable clothes can be formulated based on the measurements of the digitalised human body. Featured "body parts", such as the neck, chest, back, scapula, shoulder, and lateral parts can be situated relying on the real body image. It can work as a prerequisite for the virtual designing of garments. The research implemented and the methods used have shown that the issue of adaptive design for "disabled people" such as individuals having scoliosis can be resolved with that approach (McAndrews & Brooks, 2020, p. 10). The outcomes of the research thus can be used for mass production, enabling rapid communication among wearers and designers. In that reference, the invariable impact of textiles is critical for adaptive apparel for "disabled people". A particular method has to be taken at the time of designing the apparel for individuals having disabilities. It may be because of contrasting physical deformities of a person that can be used with limb "disabled person"s (McBee-Black, 2021). For this reason, a class of Slovenian researchers had created the CASP approach in the past that was applied to formulate the apparel adopted to 3D virtual dummies having "physical disabilities" that have happened as an outcome of the disease.

The matrix permits some of the points of the 3D scanning to be highlighted. Furtherance is a class related to the normal surfaces in a long-term direction. Apparel symmetry is always acceptable and a zero value indicates perfect symmetry. Proportion mentions the size and span of the surface and is measured as a ratio of the extent and width of the perceived surface (Pendo et al. 2020, p. 1). The whole procedure is dependent on the application of the "Grasshopper Depictive Algorithm" which is an add-in applied with the RH utilisation. Through this, the evaluation of a digitalised surface mathematics is based. With the application of the 3D apparel design approach, garments can be formulated directly.

With the application of a 3D apparel designing approach, the garments can be formulated directly using a 3D imaginary body model, outcomes in 2D types gathered by flattering the pre-existing areas. Adapting garments is drawn by applying a CAD approach for designing the imaginary prototyping of apparel (MEDICA, 2020). This permits the apparel fit examination and the changes of the models of the imaginary body to standard models. Creating an imaginary body structure by applying the 3Ds Max technology is dependent on combining the female body scanning data along with a dynamic template. In order for the vivacity to be understood, the insinuated weights have to be shifted and measured, permitting each body joint to be noticed and partly shifted between the bare bones and the network to have a deformation of the integrated human body.

Methodology

In this part of the research article, the research approach, design, and the method that has been used to collect the data and interpret them have been mentioned. Here, the *deductive type of research approach* has been chosen by the researcher since the methodologies of social science are mostly taken by the deductive approach (Kusumaningrum, Sumarsono, & Gunawan, 2019, p. 624). This is done by using the *qualitative method* of research in *secondary data collection*. The data have been gathered by scrutinising various documents, journals, governmental websites, and practices taken by organisations to fulfil the needs of "disabled people" for clothing. Various journals have been used to reflect on the past research that was implemented on similar topics. Moreover, apart from using the "deductive research approach", "positivism research philosophy" is further selected in the current study since the approach of data collection is extremely structured and has large samples.

Data findings and interpretation

After scrutinising the past relevant literature, it is observed that the methods of simulation of apparel and garments show a significant tool for the designers of clothing and textile. These methods offer various advantages, just like rapid and basic transformations in the development of clothing (Fischer, Rice, & Mazzara, 2019, p. 6). The key advantage of the virtual paradigm is the probability of designing apparel and directly noticing the adaptations of a silhouette to an individual who is disabled physically. Computation of prototyping has a remarkable prospect for manufacturing garments in a current-day manner. This is because it enables a 3D pattern of apparel to be manufactured rapidly.

Various research also indicates that the “3D body Scan”ner acts in a key role in manufacturing transformative clothes for “disabled people”, as it permits body weighing to be taken at the time of deciding the posture and setting of a body in a sitting area (Vitali & Rizzi, 2018, p. 136). Additionally, point clouds manufactured via the procedure of 3D scanning are applied to make an imaginary body, which is assumed to be a standard practice in the practical paradigm of garments. Various governmental publications gave evidence for the fact that the standard network packages that were applied for the practical pattern of apparel could also be utilised for a practical pattern of apparel for “disabled people” or individuals having physical deformities.

A systematic method is required at the time of forming apparel for individuals in wheelchairs. 3D scanning needs to be remodelled to an individual in the sitting posture, specifically in case the person is incapable to sit in the absence of a sit back (Balach et al. 2020, p. 132). At the time of creating a practice tacit body, a personal method is needed, since the point cloud of the human body scanning has to be processed with the application of a 3D picture processing design. Contrarily, different research also mentioned that the algorithm applied for the basic standing posture is not adequate or reliable for an automatic rearrangement of a 3D body in the sitting posture.

It is because of the contrasting form of the body of individuals having disabilities (Mangku & Yuliartini, 2021, p. 276). Different data show that the software packages that are available for the garment design are utilised to sketch a garment directly on a digitalised 3D body structure. It is probable to either sketch and alters a cut to a 3D scan depending on a simulation, or to make apparel directly on the digitised body by drawing out the tailored piece after the 3D structuring. The position of the template is changed with the scanning information. The measures of bones and body muscles are then modified to that particular scan data.

Conclusion and Recommendation

From the discussions made in the paper, it can be concluded that irrespective of the chosen approach of apparel designing, achieving fulfilling outcomes is restricted by the contrasting body shape of a person. It can thus further be concluded that this research has a great significance for the apparel industry to create apparel that suits the needs of “disabled people”. “disabled people” admire to give prominence to their individuality, as clothing that is appreciative and pleasing reforms their physical appearance and permits them to relish the subjectively healthy environment. The recommendations of this paper can go along such as, there should be more understanding for the designers for durability and comfort of the garments. Also, the consideration for “disabled people” should be gathered first. This may help the designer to get an idea of the features to be provided together with the garment. The appearance and service factors of the garment have to be investigated more before making designs and manufacturing.

References

Balach, M., Cichocka, A., Frydrych, I. & Kinsella, M., (2020). Initial investigation into real “3D body Scan”ning versus avatars for the virtual fitting of garments. *Autex Research Journal*, *20*(2), pp.128-132. https://eprints.whiterose.ac.uk/183812/1/ILetters%2002102021.pdf

Beach, S. R., Schulz, R., Friedman, E. M., Rodakowski, J., Martsolf, R. G., & James III, A. E. (2020). Adverse consequences of unmet needs for care in high-need/high-cost older adults. *The Journals of Gerontology: Series B*, *75*(2), 459-470. https://academic.oup.com/psychsocgerontology/advance-article-pdf/doi/10.1093/geronb/gby021/31827734/gby021.pdf

Bragança, S., Castellucci, I., Gill, S., Matthias, P., Carvalho, M., & Arezes, P. (2018). Insights on the apparel needs and limitations for athletes with disabilities: The design of wheelchair rugby sports-wear. *Applied ergonomics*, *67*, 9-25. https://www.research.manchester.ac.uk/portal/files/60739678/Paper_Applied_Ergonomics.pdf

Fischer, W., Rice, D. & Mazzara, A., (2019). Research shows rental assistance reduces hardship and provides platform to expand opportunity for low-income families. *Center on Budget and Policy Priorities, Washington, DC*. https://www.cbpp.org/sites/default/files/atoms/files/12-5-19hous.pdf

Graf, E. S., Bauer, C. M., Power, V., de Eyto, A., Bottenberg, E., Poliero, T., ... & Ortiz, J. (2018, June). Basic functionality of a prototype wearable assistive soft exoskeleton for people with gait impairments: a case study. In *Proceedings of the 11th PErvasive Technologies Related to Assistive Environments Conference* (pp. 202-207). https://digitalcollection.zhaw.ch/bitstream/11475/8182/1/petra_grav_v3.pdf

Kusumaningrum, D. E., Sumarsono, R. B., & Gunawan, I. (2019). Professional ethics and teacher teaching performance: Measurement of teacher empowerment with a soft system methodology approach. *International Journal of Innovation, Creativity and Change*, *5*(4), 611-624. https://www.ijicc.net/images/vol5iss4/Pt_2/54216_Kusumaningrum_2019_E_R.pdf

Mangku, D.G.S. & Yuliartini, N.P.R., (2021). Fulfillment of Labor Rights for Persons with Disabilities in Indonesia. *International Journal of Criminology and Sociology*, *10*, pp.272-280. https://www.lifescienceglobal.com/pms/index.php/ijcs/article/download/7073/3693

Maryanti, R. I. N. A., Hufad, A. C. H. M. A. D., Sunardi, S., Nandiyanto, A. B. D., & Al-Obaidi, A. S. M. (2020). Understanding covid-19 particle contagion through aerosol droplets for students with special needs. *Journal of Engineering Science and Technology*, *15*(3), 1909-1920. https://seap.taylors.edu.my/file/rems/publication/100359_7349_1.pdf

McAndrews, L., & Brooks, E. (2020). One size does not fit all: a qualitative study exploring the apparel wants and needs of people on dialysis. *Disability and Rehabilitation*, 1-10. https://www.researchgate.net/profile/Laura-Mcandrews-2/publication/347319193_One_size_does_not_fit_all_a_qualitative_study_exploring_the_apparel_wants_and_needs_of_people_on_dialysis/links/6126bdf41f50fb262ff19117/One-size-does-not-fit-all-a-qualitative-study-exploring-the-apparel-wants-and-needs-of-people-on-dialysis.pdf

McBee-Black, K. (2021). The Role of an Advocate in Innovating the Adaptive Apparel Market: A Case Study. *Clothing and Textiles Research Journal*, 0887302X211034745. https://scholarworks.uark.edu/cgi/viewcontent.cgi?article=1015&context=ampduht

MEDICA, E.M., (2020). Systematic rapid living review on rehabilitation needs due to Covid-19: update to April 30th 2020. https://slf.se/sfrm/app/uploads/2020/06/systematic-rapid-living-review-on-rehabilitation-needs-due-to-covid-19-update-to-april-30th-2020.pdf

Nakić, M., & Bogović, S. (2019). Computational Design of Functional Clothing for "disabled people". *Tekstilec*, *62*(1), 178. http://www.tekstilec.si/wp-content/uploads/2019/03/23-33.pdf

Pendo, E., Gatter, R., & Mohapatra, S. (2020). Resolving tensions between disability rights law and COVID-19 mask policies. *Md. L. Rev. Online*, *80*, 1. https://digitalcommons.law.umaryland.edu/cgi/viewcontent.cgi?article=1069&context=endnotes

Vitali, A. & Rizzi, C., (2018). Acquisition of customer's tailor measurements for 3D clothing design using virtual reality devices. *Virtual and Physical Prototyping*, *13*(3), pp.131-145. https://www.researchgate.net/profile/Pengpeng-Hu/publication/356640890_Anet_A_Deep_Neural_Network_for_Automatic_3D_Anthropometric_Measurement_Extraction/links/61a62ddb743d9629db2554c0/Anet-A-Deep-Neural-Network-for-Automatic-3D-Anthropometric-Measurement-Extraction.pdf

Ward, L. M., Cooper, S. A., Hughes-McCormack, L., Macpherson, L., & Kinnear, D. (2019). Oral health of adults with intellectual disabilities: a systematic review. *Journal of Intellectual Disability Research*, *63*(11), 1359-1378. https://onlinelibrary.wiley.com/doi/pdf/10.1111/jir.12632

Suryasa, W. (2019). Historical Religion Dynamics: Phenomenon in Bali Island. *Journal of Advanced Research in Dynamical and Control Systems*, *11*(6), 1679-1685.

Eviasty, N., Daud, N. A., Hidayanty, H., Hadju, V., Maddeppungeng, M., & Bahar, B. (2021). The effect of personal coaching on increasing knowledge, attitudes, and actions about lactation nutrition, uterial involution, and lochea in public mothers. International Journal of Health & Medical Sciences, 4(1), 155-163. https://doi.org/10.31295/ijhms.v4n1.1669