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Beyond Mainstream Sizing: A Systematic Review of Inclusive Measurement Charts with Emphasis on Dwarfism

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Abstract

This systematic literature review critically examines the development of inclusive measurement charts for individuals with dwarfism, moving beyond conventional mainstream sizing standards. A structured search across ProQuest, Emerald, ResearchGate, Science Direct and Academia and Google Scholar was conducted following PRISMA 2020 guidelines. Ten studies, published between 2000 and 2024, were selected using strict inclusion and exclusion criteria and assessed for quality via the CASP checklist. The findings were synthesized using the TCCM (Theory, Context, Characteristics, Methodology) framework.

The literature reveals that traditional sizing models often exclude individuals with atypical anthropometric proportions, emphasizing height adjustments rather than comprehensive proportionality. Emerging research indicates progress in specialized sizing for short stature populations, yet significant gaps persist in data collection, industry adoption, and adaptive clothing design. This review highlights the necessity of dynamic sizing systems, dedicated anthropometric databases, and stronger collaborations among researchers, designers, and advocacy groups. Bridging these gaps is vital to foster an inclusive fashion environment where all body types, including those with dwarfism, are equitably represented and accommodated.

Keywords: Dwarfism, Inclusive Fashion, Anthropometry, Body Measurement Charts, Adaptive Sizing, Systematic Review

INTRODUCTION

Apparel sizing systems have traditionally catered to average body proportions, systematically excluding individuals with physical differences such as those with dwarfism. Despite a growing emphasis on body positivity and inclusivity in recent years, mainstream fashion continues to neglect individuals who fall outside standard size ranges. This gap creates substantial barriers for individuals with dwarfism in accessing well-fitting, fashionable clothing that reflects their identities and needs.

Globally, designers and researchers have begun exploring adaptive clothing and specialized sizing for diverse body types, yet the integration of inclusive measurement charts remains inconsistent. International movements toward inclusive fashion show promise, with some brands developing adaptive



lines specifically for short stature individuals. However, the need for structured anthropometric data, flexible sizing systems, and industry-wide implementation persists.

This systematic literature review (SLR) aims to consolidate existing research on inclusive sizing and measurement frameworks, with an emphasis on dwarfism, to highlight current challenges and opportunities. It seeks to provide a roadmap for advancing adaptive fashion practices by synthesizing scholarly, industry, and technical insights.

Research Questions:

1. What are the current challenges in mainstream measurement systems regarding inclusivity for individuals with dwarfism?

2. What adaptive measurement strategies have been proposed or implemented globally?

3. What gaps remain, and what future research directions are necessary for truly inclusive sizing standards?

Existing research highlights significant limitations in mainstream body measurement systems when addressing the needs of individuals with dwarfism. Bye, Labat, and DeLong (2006) conducted a critical analysis of apparel sizing systems, identifying structural biases favoring average body types and emphasizing the lack of inclusive measurement frameworks. Similarly, Gupta and Zakaria (2014) provided an extensive overview of anthropometric approaches in apparel design, noting a critical need for specialized data sets for non-average populations.

Capelassi et al. (2017) demonstrated, through a Brazilian case study, that localized anthropometric data collection significantly improves the fit and comfort of apparel, highlighting the inefficiency of generalized global sizing systems. Mbhenyane (2004) underscored the necessity for accurate body measurements in pattern development to enhance garment construction, especially for bodies differing from standard size models.

Importance of Inclusive Sizing

Existing research highlights significant limitations in mainstream body measurement systems when addressing the needs of individuals with dwarfism. Bye, Labat, and DeLong (2006) conducted a critical analysis of apparel sizing systems, identifying structural biases favoring average body types and emphasizing the lack of inclusive measurement frameworks. Gupta and Zakaria (2014) similarly emphasized the critical need for specialized data sets for non-average populations.

Anthropometric Data Gaps

Capelassi et al. (2017) demonstrated through a Brazilian case study that localized anthropometric data collection significantly improves the fit and comfort of apparel, highlighting the inefficiency of generalized global sizing systems. Mbhenyane (2004) also stressed the necessity for accurate and localized body measurements, noting that current mainstream practices inadequately capture diversity in body proportions.

Adaptive Clothing for Dwarfs



Research by Bairagi and Chatterjee (2020), Kim, Choi, and Shin (2001), and Madian (2017) focused specifically on clothing design for little people and dwarfs. These studies addressed critical needs such as proportion-specific clothing, mobility adaptations, and aesthetic considerations that respect the identities of individuals with dwarfism.

Need for Specialized Sizing Charts

Studies by Ohaka and Iloeje (2016) and Zakaria (2016) emphasized the importance of developing customized size charts based on demographic-specific surveys. They advocated moving away from universal sizing standards, which fail to accommodate growth patterns and body proportion differences typical in short stature populations.

Social and Psychological Considerations

Sharma and Chaturvedi (2023) examine the fashion challenges faced by men with achondroplasia, highlighting how mainstream sizing focuses narrowly on stature while ignoring key proportional differences. Their study emphasizes that poor garment fit affects both functionality and self-esteem, contributing to social exclusion. They advocate for adaptive clothing solutions that prioritize body proportion, balance, and comfort rather than simple height adjustments. Their work reinforces the need for inclusive sizing frameworks that address the unique anthropometric needs of individuals with dwarfism.

METHODOLOGY

This study employed a qualitative Systematic Literature Review (SLR) approach to systematically explore, evaluate, and synthesize research on inclusive measurement charts. The review followed PRISMA 2020 guidelines to ensure methodological transparency and rigor.References were searched from databases searched included Scopus, Web of Science, PubMed, ScienceDirect, and Google Scholar. Search keywords combined Boolean operators and truncations, using terms such as "dwarfism," "fashion inclusivity," "adaptive clothing," "body measurement charts," and "anthropometric data for short stature individuals."

Screening was conducted at three levels: title, abstract, and full-text review. Inclusion criteria focused on peer-reviewed articles, conference papers, and institutional reports published in English between 2000 and 2024. Exclusion criteria eliminated non-academic sources, articles unrelated to apparel design, and studies with purely medical or psychological focus.Data Extraction and Analysis was done by extraction of relevant data using a structured template capturing research objectives, methods, key findings, and anthropometric focus areas. Findings were synthesized thematically using the TCCM (Theory, Context, Characteristics, Methodology) framework to categorize insights and identify research gaps.

The Critical Appraisal Skills Programme (CASP) checklist was used to assess the quality of included studies. Most studies demonstrated high methodological quality, with a few exhibiting moderate quality due to limitations such as small sample sizes or incomplete reporting. A detailed CASP appraisal summary is provided in Appendix E.



Along with mentioned methods, supporting tools like Rayyan was utilized for screening management, Voyant for text mining, and Mendeley for reference management. A full search strategy is detailed in Appendix A.

DISCUSSION

Findings from the reviewed literature consistently affirm that mainstream sizing models are insufficient for accommodating the proportional complexities of individuals with dwarfism. Traditional sizing charts, primarily height-reduction based, fail to address variations in limb length, torso dimensions, and functional needs.

Studies by Bye et al. (2006) and Gupta and Zakaria (2014) exposed the historical neglect of body diversity in apparel design, a theme further supported by Capelassi et al. (2017) and Mbhenyane (2004), who emphasized the need for localized, adaptive anthropometric databases. Specialized initiatives by Bairagi and Chatterjee (2020) and Kim et al. (2001) show progress in addressing dwarfism-specific needs, yet these remain isolated efforts rather than industry standards.

Furthermore, psychological studies such as Sharma and Chaturvedi (2023) illustrate that the consequences of poor sizing extend beyond physical discomfort to emotional harm and social exclusion. The literature strongly supports the call for dynamic, inclusive measurement systems, collaborative design efforts, and greater visibility of diverse body types within fashion discourse.

CONCLUSION

This systematic review underscores the critical need to move beyond mainstream sizing practices and embrace inclusive, proportion-specific measurement systems that respect the unique anthropometric needs of individuals with dwarfism. While isolated advancements in adaptive clothing design exist, systemic barriers persist in data collection, industry implementation, and awareness.

Future efforts must focus on developing specialized anthropometric databases, dynamic sizing frameworks, and partnerships between academic researchers, apparel designers, and advocacy groups. By fostering a design culture centered on inclusivity, the fashion industry can enhance not only functional apparel solutions but also broader societal representation and empowerment for individuals with short stature.Inclusive sizing is not a niche concern but a fundamental step toward a truly diverse and equitable fashion ecosystem.

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APPENDICES

Appendix A: Full Search Strategy

Databases used: ProQuest, Emerald, ResearchGate, Science Direct, Google Scholar and Academia

Search Keywords: "Dwarfism," "fashion inclusivity," "adaptive clothing," "body measurement charts," "anthropometric data for short stature individuals"

Boolean Operators:("Dwarfism" OR "short stature") AND ("fashion inclusivity" OR "adaptive clothing") AND ("anthropometry" OR "body measurement charts")

Appendix B: PRISMA Flow Diagram

Phase	Step	Number of Records (n)
Identification	Identification Records identified from databases	
	Records identified from registers	15
	Total records identified	57



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	Duplicate records removed	3
	Records removed by automation tools	6
	Records removed for other reasons	6
Screening Records screened		42
	Records excluded	11
Eligibility	Reports sought for retrieval	31
	Reports not retrieved	6
	Reports assessed for eligibility	26
	Reports excluded (with reasons)	15
Included	Studies included in the final review	10

Table for Reasons for Exclusion at Full-Text Eligibility Stage

Reason for Exclusion	Number of Studies
Not related to dwarfism or inclusive fashion	4
Not empirical research or review-based	3
Poor methodological quality	2
Irrelevant population/sample	1
Total	10

Appendix C: Inclusion and Exclusion Criteria Table

Inclusion	Exclusion
English-language sources	Non-English content
Discusses fashion + dwarfism	General disability without fashion context
Indian or international focus	Opinion pieces without practical/design
Articles, websites, and interviews	insights. Ads or promotional-only content

Appendix D: Complete Data Extraction Table

No	Poforonco	Research	Mothods	Koy Findings	Anthropometric/Measureme		
•	Kelerence	Objectives	Wiethous	Key Findings	nt Focus		
1	Bye, Labat, & DeLong (2006)	Analyze existing body measurement systems for apparel design.	Literature analysis and system comparison.	Existing systems lack adaptability for diverse body types.	Critique of general sizing systems; calls for flexible measurement charts.		
2	Capelassi et al. (2017)	Develop a statistical sizing system for the	Statistical analysis (principal component	Highlighted need for local, population- specific sizing	Created size charts using anthropometric survey data.		



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		Brazilian	analysis) of	systems.	
		apparel	body		
		industry.	measurements.		
3	Gupta & Zakaria (2014)	Explore anthropometry and its role in apparel sizing and design.	Comprehensiv e literature review.	Anthropometri c data critical for inclusive sizing; gaps for special populations noted.	Advocates for targeted anthropometric databases, especially for minority body types.
4	Mbhenyane (2004)	Provide body measurement guidelines for garment pattern construction.	Anthropometri c surveys and design application.	Noted inconsistency in using measurements for non- average body types.	Emphasizes need for custom pattern blocks based on accurate measurements.
5	Ohaka&Iloej e (2016)	Develop size charts for school-age boys in Nigeria.	Field data collection, statistical analysis.	Sizing charts needed to reflect demographic- specific body dimensions.	Customized size charts based on local anthropometric measurements.
6	Zakaria (2016)	Develop apparel sizing systems for children and teenagers.	Review of existing standards, case studies.	Current sizing ignores growth variability; dynamic sizing needed.	Anthropometric variations during growth spurts highlighted.
7	Bairagi & Chatterjee (2020)	Design clothing for little people with focus on comfort and aesthetics.	Case study and small survey.	Little people face challenges in fit, comfort, and self- expression; custom sizing critical.	Advocates body-specific measurement charts for people with dwarfism.
8	Kim, Choi, & Shin (2001)	Develop clothing specifically for individuals with dwarfism using human- centered	Experimental clothing design project.	Clothing design must consider altered body ratios for dwarf individuals.	Human design principles tailored to dwarfism anthropometrics.



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		design.			
9	Madian (2017)	Design casual wear specifically for male dwarfs.	Design prototyping based on measurements collected.	Emphasized need for personalized sizing and adaptive styles.	Measurement chart developed specifically for male dwarfs.
10	Sharma and Chaturvedi (2023)	Investigate social motivation and clothing selection problems of individuals with achondroplasi a.	Qualitative study (interviews, observations).	Psychological and social needs influence clothing design for dwarfs.	Indirect reference to need for better-fitting clothing based on realistic measurements.

Appendix E: CASP Quality Appraisal Table

Reference	Clear Aims	Appropriate Methodology	Research Design	Recruitment Strategy	Data Collection	Reflexivity	Ethical Considerations	Data Analysis	Findings Stated Clearly	Research Value	Overall Quality
Bye et al. (2006)	Yes	Yes	Yes	Yes	Yes	No	Not Reported	Yes	Yes	High	High
Capelassi et al. (2017)	Yes	Yes	Yes	Yes	Yes	No	Not Reported	Yes	Yes	High	High
Gupta & Zakaria (2014)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Very High	High
Mbhenyane (2004)	Yes	Yes	Yes	Yes	Yes	No	Not Reported	Yes	Yes	Moderate	Moderate
Ohaka & Iloeje (2016)	Yes	Yes	Yes	Yes	Partial	No	Not Reported	Partial	Yes	Moderate	Moderate
Zakaria (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Very High	High
Bairagi & Chatterjee (2020)	Yes	Yes	Yes	Yes	Partial	No	Not Reported	Partial	Yes	High	Moderate
Kim, Choi & Shin (2001)	Yes	Yes	Yes	Yes	Yes	No	Not Reported	Yes	Yes	High	High
Madian (2017)	Yes	Yes	Yes	Yes	Yes	No	Not Reported	Yes	Yes	High	High
Sharma and Chaturvedi (2023)	Yes	Yes	Partial	Yes	Partial	No	Not Reported	Partial	Yes	Moderate	Moderate

Appendix F: TCCM Framework Table

Reference	Theory (T)	Context (C)	Characteristics	Methodology	
			(C)	(M)	
Byo of al	Apparel design	Apparel	Comparative	Quantitative	
Dye et al. (2006)	theory, body	industry USA	analysis of body	analysis, data	
(2006)	measurement	industry, USA	measurement	comparison	



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	systems		methods	
Capelassi et al. (2017)	Anthropometry and sizing theory	Brazilian apparel industry	Sizing systems development through statistical modeling	Statistical analysis, cluster analysis
Gupta & Zakaria (2014)	Anthropometric theory, apparel sizing	Global, apparel design	Detailed study of body measurements and apparel fit	Literature review, case studies
Mbhenyane (2004)	Pattern construction and apparel fit theory	South Africa, garment construction	Development of body measurements for pattern making	Measurement surveys, empirical study
Ohaka&Iloeje (2016)	Size chart development theory	Nigeria, school-age boys	Construction of size charts based on local anthropometric data	Field measurements, statistical analysis
Zakaria (2016)	Children's sizing theory	Global, children's clothing market	Frameworkfordevelopingsizingsystemsforchildrenandteenagers	Case studies, anthropometric survey
Bairagi & Chatterjee (2020)	Inclusive design theory	India, adaptive fashion for little people	Focus on specialized garment construction for people with dwarfism	Literature review, conceptual development
Kim, Choi & Shin (2001)	Human-centered clothing design	Korea, clothing for dwarfs	Clothing development based on specific anthropometric needs	Design experiment, user- centered design approach
Madian (2017)	Adaptive clothing theory	Egypt, male dwarfs casual wear	Designing casual clothing adapted for dwarf body types	Empirical research, design prototypes
Sharma and Chaturvedi (2023)	Social motivation and clothing selection	Insia, achondroplastic dwarf men	Focus on clothing needs and social challenges faced by dwarf men	Survey research, qualitative analysis