Abstract

Purpose

Online fashion retailers offer body measurement guidance, alongside their target consumer body size charts and fit information, to help consumers select the right size garment as the garment cannot be tried on. Its use by retailers suggests it can act as a means of mitigating garment returns as there has been a noted increase in returns due to incorrect size selection (British Fashion Council, 2023) even though body measurement instructions are provided online. The purpose of this research is to determine how consumers interact with body measurement guidance, how they interpret it and use it, thereby interrogating its efficacy.

Methodology

An exploratory investigation was undertaken. Thirty participants were recruited and given a choice of fashion retailers body measurement guidance and a tape measure. They took their body measurements over their clothes. A technician repeated the task thereby providing two sets of body measurements. A paired t-Test determined if there was a significant difference in both values in terms of their mean. Technicians also documented their observations of how the participants interacted with the task. The content of the fashion retailer measurement guidance was then compared to that of published anthropometric guidance for surveys.

Findings

Participants were familiar with the guidance and tape-measure; they were able to self-measure. The fashion retailer measurement guidance, however, lacked detail/clarity in visuals and written content when compared to anthropometric guidance. Interpretation of the guidance differed between participant and technician. This resulted in a significant difference in circumference measurements for the bust/chest and hips, yet no significant difference in waist and inside leg measurements. For measurements that were difficult to take unaided, participants devised novel practices which resulted in little divergence from the technician taken body measurements. The results question the guidance efficacy in its current form.

Implications

Fashion retailers’ measurement guidance needs to be more comprehensive but still use accessible language and visuals. The broader implications of this study highlight that traditional anthropometrics for self-taken body measurement needs further investigation and documentation as an emerging concept through clothing-related academic study.

Originality

There has been no study which addresses how consumers interpret and interact with fashion retailers’ online measurement guidance. This is important as this can mitigate garment returns. This research provides insight to influence fashion retailers’ measurement guidance policy. It also adds to the existing body of knowledge surrounding anthropometric practice for clothing.

Keywords: Fashion retailer body measurement guidance, anthropometrics, online retail consumers, self-measurement

Article Classification: Research paper

2 Literature

2.1 Anthropometric practice

Anthropometrics is the practice of obtaining measurements of the human body (Croney, 1980). The practice is long-standing and has been used by the clothing industry for mass production since the early 20th century (Bye et al, 2006) The practice involves observation of the body surface to locate anatomical areas of interest - landmarks - which are then
marked (Croney, 1980, Beazley 1997). This process is the same for contact (manual measurement) and non-contact (3D bodyscanning) practices. Measurements are documented between or around/along the landmark regions (Croney, 1980) using specific equipment developed for this purpose. Anthropometric theory dictates that these measurements are categorised and listed to provide information of body shape and dimension. There are two distinct applications of anthropometric theory and practice: one that used a static posture, which according to Croney (1980) and Bunka (2009), is utilised for garment development/sizing; the other using dynamic posture which is more appropriate for ergonomic design (Croney 1980). This study is focused on manual anthropometric practice (body measurement guidance) for clothing to establish body dimensions, and more specifically consumer interaction with it.

Anthropometric practice for clothing purposes (body measurement guidance) is regularly updated to provide better methods/tools to capture body dimensions for pattern development and to improve garment fit (Bye et al, 2006). Many practitioners have written about the practice including Lohman, (1988), O’Brien and Shelton, (1941); Croney, (1980) and Beazley, (1997). These are used as guides for academics and technicians and are detailed enough to ensure consistency of practice and accurate data collection. The practice of manual body measurement can be challenging as much is left to the judgement of the person undertaking the measurement process (Beazley,1997), and the practice may not be satisfactory for those with non-standard body morphologies (Wren et al, 2014). However, body measurement practice is universally used within the clothing industry (Bye et al, 2006).

2.2 Anthropometrics and garment fit

Body measurements are used in the development of garment patterns/blocks (Beazley and Bond, 2003), garment sizing (Schofield and LaBat, 2005), and the garment fit assessment setting (Bye et al, 2006). Body measurement guidance is also provided by online clothing retailers for consumers. It is seen as a means of enabling consumers to determine their body measurements to select a garment size (Kim et al, 2006). Both Workman (1991) and Song and Ashdown’s (2013) studies found that if consumers know their body dimensions and proportions, they have a better chance of finding clothing that fits their body. Poor garment fit within the ready-to-wear sector is still an issue (Brownbridge et al, 2018) as poor fit impacts on consumer satisfaction (Alexander et al, 2005) affecting consumer confidence, impacting sales, and increasing garment returns (British Fashion Council, 2023; Khorsand, 2023).

2.3 Body measurement guidance – an online service attribute

Body measurement guidance is a set of instructions provided as an online resource by clothing retailers and termed by Kim et al (2006, p52) as an ‘online service attribute.’ The consumer is instructed how to manually measure themselves and to compare their body measurements to the retailer’s offer. Kim et al’s (2006) early work examined the content of 111 clothing retailer websites to establish what online service attributes were available to consumers and how they were formatted. They confirmed that body measurement instructions were available on some websites, but that the content varied with some offering written and/or visual content and others nothing at all.

The lack of being able to physically assess a product against the consumer’s requirements because it is sold online is termed ‘Product Fit Uncertainty’, a concept defined by Hong and Pavlou (2014, pg. 328) as the degree to which consumers cannot assess product attributes against their specific preferences. Their work explored this concept and ways to mitigate it. Their findings were that online retailers need to provide more product description particularly if the evaluation of the product relies on human tactile/sensory processing. Their work recommends more emphasis on resources which allow consumers to align their personal requirements (such as body dimensions and fit preferences) against the attributes of the products to build trust in the product and aid positive sales.

Kim and’s (2010) work examined the relationships between self-discrepancy theory, body dissatisfaction, apparel involvement, garment size and fit through the lens of the consumer thereby providing more clarity for clothing retailers on how to improve their online service attributes. Their sample demographic had an average age of 25 and shopped online for clothing. Their findings indicated that online service attributes for fit and sizing, and more specifically the images/visuals used, had a negative impact on body image and, consequently, sales. Their work demonstrated that the use of aspirational models whose bodies display ‘ideal’ morphologies can negatively impact the consumer experience, leading to returns or lost sales. Their work is another step to improving online clothing service attributes as it promotes the idea of using more realistic visuals as well as promoting technology which allows the consumer to use body measurement values to reduce garment returns.

The findings of Kim et al (2006), Hong and Pavlou (2014) and Kim and Damhorst (2010) provide recommendations for retailers to improve their online body measurement resources but they do not explore how consumers interact with the
guidance. If nothing is known about how consumers interact with the guidance, how can its effectiveness in terms of selecting an accurate sized garment be determined? There has been no academic research examining consumer interaction with body measurement guidance which is noteworthy given over 80% Britons shop online (van Gelder, 2023), and with internet sales increasing to ‘35.2% in January 2021, the highest on record; [when compared] with 29.6% in December 2020 and 19.5% reported in January 2020’ (Office of National Statistics, 2021:2).

Many clothing retailers now have an online presence and online clothing sales are increasing (Mintel, 2017; Mintel, 2018; Zhang et al, 2019). Online appropriate methods are therefore essential to enable the consumer to identify their correct size to improve the consumer experience and to reduce garment returns. Clothing returns from online sales related to issues of garment size, fit and the inability to try garments on before they buy, is said to cost the clothing industry an estimated $60-$62 billion a year (Xia et al, 2018 and Cicural, 2020). Therefore, it is essential to examine the content of fashion retailers body measurement guidance and how consumers interact with it to improve the online shopping experience and to deter the practice of ordering more than one size at a time, termed as bracketing (British Fashion Council, 2023) – a tactic used by consumers who are unsure of what size they need (Xia et al, 2018) and a practice which has become more common due to increased online sales (British Fashion Council, 2023).

2.4 Consumers and sizing

It has been established that consumers do understand a level of anthropometric practice and how this relates to garment size. For example, Chun-Yoon and Jasper’s (1995) early paper explored consumer preferences for size description (size labelling). They provided male and female participants a choice of garment labels: those with visuals and text detailing body dimensions; and those just with size codes. They found that participants favoured the labels which detailed key body dimensions using both written and visual information over those that just contained a size code. This finding demonstrates that consumers are familiar with body and garment size and prefer to refer to dimensional information when looking for the correct size.

2.5 Digital fit technology limitations

Academic research around digital/non-contact sizing and fit technologies is well represented within the clothing discipline. Virtual try-on avatars and size and fit applications, that predict a person’s size based on previous purchases or known body measurements, are thought to contribute to consumers purchasing decisions as they aid the consumer in selecting the best-sized garment (Kim & Forsythe, 2008; Januszuiewicz et al, 2017; Cicural, 2018). The technologies are complex, expensive, and not accurate enough to reflect the complexities of the human form (British Fashion Council, 2023) compared to traditional body measurement. Miell et al’s (2017) examination of sizing, fit applications, and the relationship to consumer behaviour found that the technologies’ interfaces varied and was not yet a replacement for the traditional in-store shopping experience. Their work also confirmed the technology is slow which can deter consumers from using it.

Januszuiewicz et al’s (2017) work explored how fit-for-purpose the virtual try-on and sizing/fit technologies are. They found some virtual try-on technologies either misunderstood body dimensions or the required body dimensions were too limited to be useful. They concluded the application relied upon subjective size selection based on previous bought garments rather than any kind of quantitative prediction mechanism built into the software. Januszuiewics et al’s (2017) work states that there are a limited range of companies that provide the technology with adoption, according to Drapersonline (2020), being more common in North America. Retail Innovation’s (2020) trade article states that the time and cost of providing digital content for both virtual try-on and size selection technologies is prohibitive and erodes budgets, meaning adoption by fashion retailers has not been widespread. Kim & Forsythe (2008), Miell et al, (2017), and Drapersonline (2020) all concur that consumer acceptance of the software is slow also.

2.6 Academic evaluation of self-measurement

Research critiquing the accuracy of self-measurement exists, albeit in early literature from disciplines outside of clothing. Kushri et al (1988) and Roberts et al’s (1997) medically-based studies evaluated the reliability/accuracy of self-measurement of torso girth measurements using participants not familiar with anthropometric practice. Both studies provided participants with a tape measure and a description of how to take each measurement. Both studies found the measurements of waist and hips were reliable and participants were accurate in taking their measurements when provided with clear instructions. Yoon and Radwin’s (1994) study was more clothing focused but its goals were the same - to evaluate the accuracy of self-measurement by providing participants with a tape measure and body measurement
instructions which included torso girth measurements. All three studies were similar in that they found variations in the hip girth where participants over/underestimated the measurements from this area when compared to measurements taken by a third-party. In response to the variations, Kushi et al (1988) stated that it would be useful for participants to have a measurement partner to help keep the tape measure level. Roberts et al (1997) found that participants were successfully able to measure themselves using the instructions and Kushi et al (1988) reported that participants were able to provide repeatable and accurate measurements when asked to self-measure again. These results support the use of manual self-measurement techniques to determine some key body measurements such as waist.

There is an absence of academic research focused on consumers interaction with traditional body measurement guidance, perhaps because it is perceived as being replaced by new technologies. Although as previously stated in section 2.5, virtual try-on is not issue free and its adoption is not widespread by the clothing industry. Only Hernandez et al’s (2019) work examined how individuals interact with body measurement guidance and their focus was on non-contact anthropometric methods/virtual fit technologies. Their work identified that consumers choose a size bigger than their actual body dimensions, suggesting either the customer does not use body measurements and approximate their body size or they do use body measurements but imprecisely. Xia et al’s (2018) work confirmed that many consumers do not know their body dimensions and experience difficulties when taking them. However, their work did not elicit this information directly from consumers.

2.7 Manual fashion retailer body measurement guidance

Kim et al’s (2006) work confirms that manual body-measurement guidance is utilised by many online fashion retailers, though it does not state how it has been developed. Unlike digital fit technologies, nothing academic exists to detail and examine how clothing retailers develop the content of the guidance. Given the industry’s historical use of body measurement to develop garments (Bye et al, 2006) and pattern development textbooks such as Kunick’s (1984) Modern Sizing and Pattern Making book, which titles itself as a textbook for the industry, it can be deduced that the current body measurement guidance has originated from the industry’s historical practice and accompanying literature.

Figure 2.1, sourced from a typical UK High Street retailer, shows retailer body measurement guidance mirrors that of anthropometric survey methods in that the content has visuals and written content (Kim et al, 2006). The guidance does not detail the need for any specialist technology. Privacy can be maintained as the consumer is the only person required to be present during the measurement process. Manual measurement can also be repeated as many times as needed over time to track changes in body dimension. This contrasts with body scanning or virtual try-on technologies where consumers body dimensions and images are required and are often stored by third parties (Youn et al, 2023). The process can be lengthy (Miell et al, 2017) and accuracy of body landmark placement and resulting measurements cannot always be assured (Gill et al, 2014), particularly on individuals with diverse body morphologies due to the method of scanning and algorithms used to define the landmarks (Wren et al, 2014).
2.8 Rationale for study

Notably some digital fit technologies such as Sizeme, and Styleme require the consumer to pre-take manual measurements to upload to their plugin features (Sizeme.com, n.d., Styleme, 2021). Sizeme (n.d) provides a video of the body measurement process for the consumer to follow (Figure 2), and states consumers are very happy to measure themselves. The implication is that the consumer, not measurement partner, can take their body measurements and align them with garment measurements to select the correct size and fit. This reinforces the idea that consumers can take their body measurements. Therefore, for some digital sizing technologies to function consumers need to provide manual body measurements in the first instance, and that they need to be accurate so the clothing will fit.

The British Fashion Council (2023) investigated the UK garment returns issue through a series of surveys to gather both consumers and stakeholders (retailers) data to determine its root cause. The findings of the stakeholder data showed high levels of garment returns, predominately from online sales. The consumer survey showed that 93% of consumers stated they had returned garments because of size and fit issues. The report states size and fit issues are the primary reason for garment returns and cost the UK clothing industry £7bn in 2022. It was also stated that 3% of all returns go to landfill, which is clearly a negative environmental impact. The report also stated that it is the responsibility of retailers to mitigate returns by suggesting they leverage size calculation resources as a part of their returns avoidance initiative. This would enable fashion companies to develop a more sustainable and less wasteful fashion business model. However, if retailers are unaware of how their consumers interact with these resources it cannot influence their effectiveness nor drive further development of resources and so improve the guidance.

Khorsand’s (2023) trade article which discusses the garment returns issue states that retailers are investing in technological solutions which can predict garment size based on body measurements or virtual try-on technologies. However, these solutions are only effective if correct body measurement are uploaded to them in the first instance. Therefore, an understanding of how consumers interact with body measurement guidance is critical to understand if the problem arises from consumer use of the guidance or if the content of the guidance is insufficient in detail. This information benefits both retailers and consumers. Subsequently, this study sought to examine how participants interacted with body measurement guidance through participant observation, examining the content of the guidance itself, comparing it to published anthropometric guidance and determining if there are any statistically significant variations in mean between participant and technician taken body measurements. Research of this nature has not been undertaken in a clothing context and is especially pressing given the growth of online fashion purchasing (Mintel, 2018), and the increased rate of garment returns (British Fashion Council, 2023).

3 Methodology

3.1 Research design

The efficacy of online measurement guidance for the consumer is unknown despite its continued use by fashion retailers. The theory and phenomena of how participants interact with retailers’ body measurement guidance has not been examined or published within an academic context despite the need for it to determine the correct garment size. There is no previous research to draw upon to guide methodological design. Consequently, this study developed an exploratory investigation. An exploratory investigation observes and explores a specific area previously under-investigated by others (Swedberg, 2020) which can include a mixed method approach to examine the following propositions.


3.2 Research propositions

Research propositions are defined as a set of statements developed around a concept (Avan and White, 2001) for which no previous experimental test is available and is therefore suitable for exploratory research. In this study the concept of anthropometric practice and how it is communicated to and interpreted by consumers is analysed to determine its efficacy.

The following set of propositions were developed from a critique of the literature to form the basis of the research question. Each were written as a statement (either true/false) which could be examined using quantitative (body measurements) and qualitative (observations and content analysis) data collection and then analysed. The propositions are as follows:

1. Consumers are familiar with the body measurement process and therefore know how to measure themselves. (Body measurements and observation)

2. Retailer body measurement guidance has sufficient detail to enable anyone to take their own body measurements. (Observation and content analysis)

3. There will be no statistically significant difference in measurement values of the body measurements taken by the participants and those taken by technicians as the guidance used by both is the same. (Body measurements)

4. Fashion Retailers body measurement guidance is sufficient for consumers to follow and therefore needs no improvement. (Observation and content analysis)

3.3 Recruitment and data collection

Thirty participants were recruited from a one-day public event at Manchester’s Science and Industry Museum, UK. A convenience sample of women and men (aged between 20-67) were invited to undertake a body measurement task. The task required them to measure themselves (hereafter self-measurement) and be measured a second time by a technician. Participants were visiting the museum as recreation, so the task had to be engaging and quick to allow participants to see the rest of the museum.

3.4 Data collection tool – online fashion retailer’s measurement guidance (RG)

A set of 20 ‘playing’ cards featuring images of fashion retailers’ online measurement guidance (hereafter RG) were developed and printed. As this study explored how consumers interacted with RG it was determined that this guidance needed to be collated prior to the event and developed into a format which could be used on the day. The final format was a physical ‘playing’ card whereby the participant could ‘pick a card’ and follow the guidance. This format did not rely on electronic technologies and gave the data collection process a sense of gamification encouraging participation. A representative sample of RGs from 20 UK online fashion retailers who sold to both male and female adults was gathered as screenshots from their websites. Screenshots were used so that the appearance of the guidance was not altered when presented to participants. (Figure 3-1).
3.5 Data collection – paper-based form

A task was designed around the RGs and was developed to compare participants self-measurements against those taken by a technician whilst providing an opportunity to observe how participants interacted with the guidance. A paper-based form was used to record both sets of measurements alongside the chosen RG (Table 3-1).

The form had a list of possible body measurement regions based on what was within each of the RGs (Table 3-1).

<table>
<thead>
<tr>
<th>ONLY FILL IN THE MEASUREMENTS LISTED ON YOUR MEASUREMENT CARD. PLEASE MEASURE IN METRIC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retailer:</td>
</tr>
<tr>
<td><strong>Self-taken Measurements</strong></td>
</tr>
<tr>
<td>Chest/ bust</td>
</tr>
<tr>
<td><strong>Technician Measurements</strong></td>
</tr>
<tr>
<td>Chest/ bust</td>
</tr>
</tbody>
</table>

Table 3-1 The form

3.6 The technicians

Four trained technicians (1 male and 3 female) recruited the participants and provided information on the research, gained consent, and measured the participant using the selected RG. The technicians were trained how to take body measurements prior to meeting the participants. They also captured the participants interaction with the RG.

3.7 The task

Participants selected one RG. They were provided with a tape measure and a paper form (Table 3-1). They were asked to take their own measurements over their clothing and record these measurements on the form. The technician
accompanied them, observing/noting any questions/issues the participant may have had with the task. The participant was then re-measured using the same RG and tape measure by the technician and these were captured on the form.

The technician was present throughout the task. Once complete, the participant returned the form to the technician and were given a carbon copy, information about the study and a copy of their consent.

3.8 Data analysis – quantitative body measurements

Both participant- and technician-taken body measurements were entered in Excel for comparison (Table 3-2) and double-checked to verify data accuracy. The numerical difference in each data set was identified. The difference in the two measurements was termed by this study as 'measurement difference'. This would show the range of measurement difference values and any large discrepancies between the two data sets were highlighted by a formula. This prompted further qualitative analysis by reviewing which RG brand was chosen, aligning this to published anthropometric measurement guidance (here after AG) and comparing the technician’s observations.

![Table 3-2 Identification of any measurement differences](image)

A statistical t-Test was chosen to evaluate the quantitative data (Coolidge, 2013) and provide clarity regarding proposition three. The sample of 30 participants was relatively small therefore the t-Test was appropriate as this is utilised with small data sets (, 1997). The samples were determined to be paired and dependent, as the body measurements derived from the same source - the participant. The samples for each region of the body were equal in number as both participant and technician used the same RG. A paired t-Test tests for any significant difference between the mean values of two related dependent groups (Coolidge, 2013) and validated proposition one. The calculation for the paired t-Test is illustrated below (Figure 3-2).

For this study the Probability value (P-value) for two tails was calculated and observed, confirming distribution was normal. The significance level or alpha value was set at 0.05 (5%) as this is the norm (Coolidge, 2013). The P value evaluates how well the sample data supports proposition three and its numerical value can confirm if the statement is true or false. So, the higher the P value, the more likely statement three is true and conversely the lower the P value the more likely statement three is false and so not fact.

\[ t_{calc} = \frac{\bar{d}}{s_d / \sqrt{n}} \]

![Figure 3-2 Paired t-Test calculation, Source: Coleman (2015)](image)
3.9 Data analysis – qualitative content analysis and observation

Comparative analysis of the content of the RG (both visuals and text) alongside the AGs of Beazley (1997), Lohman (1988), Paquette et al (2009), ISO 8559-1:1989 and BS EN ISO 7250-1:2010, (Table 4-3) for both males and females was undertaken to determine similarities and differences and determine the validity of proposition two.

3.10 Recorded observations.

The technicians noted their observations of the measurement task on the form. The observations were collated and tabulated. Observations of participants’ interaction with the RGs provided further context. It afforded insight into how individuals behaved when following the guidance, establishing the validity of propositions one and two.

4 Findings and Discussion

Table 4.1 below shows the RGs that were chosen by the participants.

<table>
<thead>
<tr>
<th>H&amp;M</th>
<th>Zara</th>
<th>Levis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debenhams</td>
<td>Moss Bros</td>
<td>Jack Wills</td>
</tr>
<tr>
<td>Pretty Green</td>
<td>Reiss</td>
<td>Next</td>
</tr>
<tr>
<td>Simply Be</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1 Participant selected RGs

4.1 Comparative analysis RG and AG – proposition two

How retailers have developed their measurement guidance is unknown (2.8). The RGs collated by this study indicated that retailers typically list between 3 and 6 key body dimensions in their measurement guidance. These measurements commonly contain torso girth measurements with some providing guidance on taking length measurements. This is a greatly reduced number of body measurements when compared to those in the AGs, all of which determine how to conduct and gather anthropometric data in an explicit manner.

It is reasonable for fashion retailers to limit their set of body measurements as taking and recording body dimensions can be time-consuming (Beazley, 1997) and the retailer is incentivised to facilitate the purchase. However, it must be noted that to accurately record body measurement, consideration of the body topography, how key body landmarks are determined, and an accurate description of how to take the measurements using the correct instruments is crucial if accurate body measurements are to be captured.

The RG content (examples in Table 4-2) was compared against the full AG in Table 4-3 The AGs.
How to measure yourself for women's clothing

When measuring yourself for any piece of women's clothing, measure yourself in a non-padded bra. We will provide your bust measurement as the difference between your largest natural breasts and your smallest natural breasts. Measurement examples:

- 30C: 26 - 30 = 30 - 26 = 4
- 32D: 27 - 32 = 27 - 26 = 1

1. Bust
   Measure around the fullest part of the bust and across the shoulder blades of your back, while measuring the bust for women's underwear and intemen. Follow the bra manufacturer's guidelines.

2. Waist
   Measure at the natural waistline, just above the hip bone. Remember: women's blouses and knickers will have bigger waist measurements as they are too big and do not all on the natural waistline.

3. Hips
   Measure around the fullest part of your hips, as a guideline this is often 2-3" below your natural waistline.

Debenhams

Next

Zara
MEN
Measurements should be taken directly on your body:

A. Chest - Measure your chest over the fullest part of your chest
B. Waist - Measure your waist at the narrowest point.
C. Seat - Your Low Hip measurement should be measured around the fullest part of your hip
D. Inside Leg is measured from the crotch to the floor

H&M
HOW TO TAKE BODY MEASUREMENTS

CHEST
Measure around the broadest part of your chest, making sure that the tape is just below the armpits.
Keep the tape flat and parallel to the ground.

LADIES
Measurements should be taken directly on your body:

A. Measure your chest over the fullest part of your bust while wearing a bra that fits.
B. If you're shopping for a bra you should take another measurement directly under the bust.
C. Measure your waist at the narrowest point.
D. Your Hip measurement should be measured around the fullest part of your hips.
E. Inner leg length is measured from the top of your inside leg down to the floor.

Moss Bros
HOW TO MEASURE

1. BUST
Measure around fullest part making sure tape is close under arms and straight over shoulder blades.

2. WAIST
Measure around natural waistline, keeping tape a little loose.

3. HIP AT WIDEST
Measure around the widest part over bottoms, keeping tape a little loose.

4. INSIDE LEG
Removing shoes, take measurement along inside leg from the crotch to ankle bone. Alternatively, take measurement from a pair of well-fitting trousers.

Jack Wills
**Table 4-2 Examples of the RGs**

<table>
<thead>
<tr>
<th>Anthropometric guidance (AG)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beazley (1997)</strong></td>
</tr>
</tbody>
</table>

**Table 4-3 Examples of the AGs**

Several significant differences between the RG and AG were identified. The AG was more comprehensive as it provided the following:

- Tools to use
- Who will measure
- Posture adoption
- Clothing to be worn
- Landmark location and demarcation
- Measurement recording
The RG provided none of the above information and instead offered:

- A stylised image showing the front view only (not all RGs)
- List of measurements and their location (not all RGs)
- Indication of measurement regions
- Tool to use (not all RGs)

### 4.2 Tools and number of body measurements

A tape measure was referenced within the RGs of Next, Levi’s, Pretty Green, Moss Bros and Jack Wills (see Table 4-2). However, Simply Be, Debenhams, Zara, H&M and Reiss made no mention of what tool(s) to use. In contrast to the AG provided detailed descriptions of the required tools and provided images and written guidance on their usage. All AGs used a tape measure, and this was the only tool referenced in the RGs.

All five AGs asked for between 25-70 body measurements, The RGs required between 1 and 7 body measurements.

### 4.3 Who measures/records

None of the RGs were explicit about who should take the measurements with the implication the consumer would take their own measurements. The RGs (who provided images) showed a single human body shape with written descriptions accompanying it (Table 4-2). Some of the RGs asked for centre-back measurements which are difficult to take unaided and without an image to demonstrate. In contrast to the RG, the AG were clear that measurements should be taken by a separate person. Kushi et al’s (1988) study states that it is preferable to have another person taking the body measurements which this study confirms.

### 4.4 Descriptions of the measurement

The AGs provided landmark location using anatomical terminology. For example, ISO 8559-1:1989’s guidance for taking a chest measurement lists the landmarks of scapulae and axillae (Table 4-3). The AGs also used common anatomical terms such as chest and waist. The RGs used the same common body terms but made no reference to anatomical terminology.

### 4.5 The images used.

All 20 RGs, except Pretty Green and Zara, contained an image and a description in the same vein as the AGs. However, this is where the similarity ends.

The RG images were stylised/aspirational in format and appeared as either photos of clothed posed individuals or as representations using an idealised standard body size/shape (Table 4-2), which contradicts the recommendations proffered by Kim and Damhorst (2010) (2.3). Measurement regions were marked as a line across the image or were numbered and cross-referenced to the list of descriptions. In contrast, 3 of the AGs (Table 4-3) had photographic images of minimally clothed individuals being measured by a technician and the remaining 2 diagrams were of the human form.

The AGs used for this study were developed for surveys not shopping. The guidance is detailed so accurate measurements are taken and the language used is familiar to those with anthropometric knowledge. Consequently, when comparing both sets of guidance, it was clear that the RGs lacked detail and could be improved by reviewing AGs and the recommendations proffered by Kim and Damhorst (2010).

The RGs differed between brands in written and visual content, confirming Kim et al’s (2006a) early assertions discussed in section 2.6. Therefore, it can be confirmed that retailers continue to use this format to help consumers acquaint themselves with their body dimensions to select a more accurate/suitable size. However, retailers have still not recognised that providing detail makes the guidance more accessible to the consumer, as has been outlined to in Hong and Pavlou’s (2014) work (2.3). Proposition two states that ‘retailer body measurement guidance has sufficient detail to enable anyone to take their own body measurements’ (3.2), but comparison of RGs against AGs demonstrates a lack of detail in the RGs.

### 4.6 Observations of the task

This study found participants’ interpretation of the guidance varied with some developing their own methods of measuring themselves to avoid needing help. Kushi et al (1988), Yoon and Radwin, (1994) and Roberts et al’s (1997) work all confirm that participants can take girth measurements on their own with varying degrees of accuracy. However, Xia et
al’s (2018) work confirmed that many consumers experience difficulties when taking measurements (2.6). None of these studies comment on how the participants interacted with the measurement guidance as they did not observe participants’ behaviour once provided with the guidance.

<table>
<thead>
<tr>
<th>Observational comments from the technicians of the measurement task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some participants, took their measurements in imperial and were asked to measure in metric</td>
</tr>
<tr>
<td>The participants found the inside and outside leg measurement (5 out of 9 retailers asked for this measurement) was difficult to measure. Some people stood on the tape measure with their leg angled and held the tape at the top (crotch point) to take the reading some asked for help.</td>
</tr>
<tr>
<td>The dress/body length measurement (Debenhams) was difficult to take because although it gave a defined place to start the measurement it did not state where to end the measurement.</td>
</tr>
<tr>
<td>One participant thought to take a chest measurement, you just stretch the tape across the front of the chest only. No back measurement was taken. Participant commented on this when being measured by the technician.</td>
</tr>
<tr>
<td>One participant thought to take a bust measurement you need to first take a front and then a back measurement separately as the guide indicated this (Debenhams).</td>
</tr>
<tr>
<td>All participants understood what the tape measurement was for, but some found it awkward to use as it slipped over their clothes, particularly taking circumference measurements.</td>
</tr>
<tr>
<td>One participant (male) tried to put their clothes measurements into the (questionnaire) boxes without measuring themselves. They were asked to measure themselves to check their chest was still the same size.</td>
</tr>
<tr>
<td>No one queried why they were being measured clothed</td>
</tr>
<tr>
<td>Participants appeared happy to be given a choice of measurement guidance</td>
</tr>
<tr>
<td>Participants were familiar with a tape measure</td>
</tr>
</tbody>
</table>

### 4.7 Results of observations and discussion

Observations identified some participants used both metric and imperial measurements even though metric was stated on the form. One participant – who selected Moss Bros RG – input his chest measurement without measuring himself, stating he knew his measurements. He was asked to measure himself to confirm his chest dimension and it was found to be 5.5cm larger than that of the technician’s measurement and smaller than his initial estimate which confirms the earlier work of Hernandez et al (2019) (2.6). If consumers do not take body measurements and rely on size-codes or sizing dimensions to select garments it is unsurprising there are issues with size/fit and garment returns.

All participants were familiar with a tape measure and understood how to use it, supporting proposition one and supporting assumptions already in place by fashion retailers (2.7). They also appeared happy with the choice of RGs. No one queried why they were being measured clothed even though some of the RGs showed images of minimally clothed people. However, some participants commented that it was difficult to use the tape measure over clothing as the tape slipped against the cloth supporting Kushi et al’s (1988) earlier assertion that a measurement partner would help with the measurement task (2.6).

Six out of the ten RGs chosen required a leg-length. Five of the six provided written and visual information and one written only (Table 4-2). The technicians observed that leg-lengths were challenging for participants as they attempted to take the measurement on their own (Table 4-3). Participants began to devise novel ways of taking the measurement by standing on the tape measure with their leg angled outward contradicting the posture advised in the image on the RG or asked the technician for help. In contrast, AG is clear on posture adoption for each measurement. However, as the RG was vague on posture adoption this allowed participants to deviate and follow the written rather than the visual information. The results revealed that despite challenges, all participants elected to take a leg length measurement showing participants followed the guidance and showed resourcefulness, again supporting proposition one (3.2).

Two of the RGs chosen required a dress/body-length measurement. One participant chose Next and a further 2 Debenhams. The participant who chose Next was able to provide a length measurement as it is taken from the front of the body at the side neck point downwards (Table 4-2). Of the two participants that chose Debenhams, the first provided a dress-length measurement. The second did not provide a measurement as the RG was vague and asked for the measurement to be started at the back neck with no end point stipulated. No observations were recorded on how the
first participant took this measurement. In contrast, AGs are very clear on where measurements begin and end (Table 4-3).

One participant misinterpreted Zara’s chest RG as the guidance only offered a visual (Table 4-2). The technician observed that the participant measured the front of his chest by extending the tape measure over his chest only, mimicking the visual (Table 4-3). The participant realised that the measurement was a circular body measurement only when the technician came to measure him. This finding indicates that written information alongside visuals could have provided more clarity here. The resulting measurement values differed greatly when compared to each other, which will be discussed when presenting the results of the t-Tests.

Finally, it was found that Debenhams bust measurement was unclear (Table 4-2). The wording describes two measurement areas which were interpreted by one participant as two different measurements. Typically, the bust or chest measurement is taken as a circular measurement as confirmed by the work of Beazley (1997) who used clear visuals and detailed descriptors. Again, the lack of clarity in the RG meant the participant misinterpreted the information.

4.8 Results of the quantitative data: Discussion and t-Tests

Chest/Bust
Twenty-nine chest/bust measurements were recorded. Of the 29 participants, only 4 had the same reading as the technician indicating the participants followed the guidance in the same way. This aligns with the early research of both Roberts et al (1997) and Kushi et al (1988), which found that participants can take accurate and repeatable measurements (2.6). The other 26 chest/bust measurements had a measurement difference of between -40cm and +8cm. This is a substantial difference between the two measurements sets. As many standard grade increments for circumference measurements of the torso are between 2.5-6cm. This difference in participant and technician readings means some participants would be selecting more than a size up or down depending on who has measured them. This discrepancy can explain the results in Hernandez et al’s (2019) study (2.5) where participants were choosing a bigger sized garment than their actual body dimensions. However, it was found in this study that large differences in measurement values were the result of two participants not interpreting the measurement descriptions and images in the same way as the technicians (Table 4-3).

The t-Test P value was calculated at 0.0234205 which is smaller than the alpha value of 0.05. This opposes proposition 3 (3.2) as the difference in mean is significant. This finding supports the idea that retailer measurement guidance is not detailed enough for the bust/chest and more could be done to improve it.

Waist
Twenty-four waist measurements were recorded. Only one participant had the same reading as the technician. The measurement difference between the participant and technician values ranged between -10cm and +15cm. This measurement difference is not as great as the chest/bust.

The t-Test P value was calculated at 0.92696983 which is larger than the alpha value of 0.05. This supports proposition 3 (3.2) as there is no significant difference in the mean. This finding shows that participants understood how to take the waist measurement, supporting proposition 1 (3.2). It was noted that some RGs used wording such as ‘around’ indicating a circular measurement. Other RGs describe waist as ‘at the narrowest point’ or ‘natural waistline’ yet all participants were able to understand this measurement as circular which supports proposition 2 and 3 and demonstrates that individuals regardless of experience can take an accurate waist measurement (3.2).

Hip
Twenty-five hip measurements were recorded. The participant and technician taken measurements were all different and ranged between -35 and +5cm in measurement difference. The t-Test P value was calculated at 0.001029411 which is much smaller than the alpha value of 0.05 indicating a significant difference in the mean, opposing proposition 3 (3.2).

Analysis of the 8 RGs requiring a hip measurement revealed that the detail of how to take the measurements was scant when compared to the AGs. Seven of the RGs used the word fullest or widest to indicate that the measurement was the low hip or widest part of that region of the body. The RGs for males (except Zara) termed the hip measurement ‘seat’ which indicates that the measurement is to be taken around the buttocks. All the RGs for women termed the hip measurement ‘hips’ with Zara giving no written instruction and instead used images which indicated the measurement lay on or around the crotch point. Reiss and Jack Wills both mentioned that the measurement should include the bottom. Four of the RGs used the word ‘around’ indicating the measurement was circular. Debenhams suggested that the hip measurement is located 20cm below the waist. All 8 RGs indicated that the participant should stand whilst taking the measurement.
This measurement can be difficult to take. For example, the trochanter landmark can be difficult to locate especially if the participant is obese which is why the buttocks are used (Lohman, 1988). Additionally, there is more than one hip measurement for clothing purposes. These hip measurements can fall into three areas of high, mid, and low hip as determined by the skeletal/muscular/fat structures. Beazley (1997) includes both an upper hip and hip girth in her measurement guidance as well as mentioning a mid-hip region being midway between the waist and hip regions. Paquette et al (2009; p 34) use one hip measurement terming it ‘buttock circumference’. They describe it as ‘the horizontal circumference of the trunk at the level of the maximum buttock protrusion’. Likewise, Lohman (1988; p 46) terms the low hip measurement ‘buttocks (hip) circumference’ stating ‘Buttocks (hip) circumference is a measurement of the external pelvic size that reflects the amount of adipose tissue in the region. [It] is more properly called buttocks circumference.’ Analysis indicates the RGs are referring to the lowest hip or buttocks measurement. However, lack of detail within the RGs, resulted in differing interpretations of the measurement resulting in a significant difference in recorded measurements which refutes proposition 2 and 3 (3.2).

**Inside-leg**

Fifteen inside-leg measurements were recorded. One participant matched the technician’s measurement. The difference between participant and technician taken measurements ranged between -53cm and +7cm - a large measurement difference.

One participant selected Jack Wills. The guidance was detailed as it asked the participant to remove shoes and take the tape measure from the crotch point to the ankle bone (Table 4-2). It also stated that participants could use pre-existing measurements from a garment. As a result, this participant recorded their inside-leg as 24cm. The technician then recorded 77cm as the inside-leg measurement showing a 53cm difference. No observations were recorded around this so it cannot be determined how such a discrepancy occurred. AG for clothing, such as Beazley (1997), do not recommend using garment measurements for body measurements as garments have +/- ease within their dimensions.

Next was selected by another participant. Their inside-leg measurement differed to the technician’s by 29cm, a large measurement difference. Next mirrors Jack Wills in that it requires the participant to measure from the crotch point to the ankle bone. However, it does not recommend garment measurements as a replacement for body measurements.

The t-Test gave a P value of 0.101275295 which is larger than the alpha value of 0.05. Remarkably this finding supports proposition 3 (3.2) as there is no significant difference in the mean. This finding is interesting given participants found it a challenging measurement to take unaided and that two participants had very large measurement differences compared to the technicians. From this can be determined that the methods the participants developed for leg-lengths were largely successful, also supporting proposition 1 and 2 (3.2) as 13 of the participants measurements were either the same or had small measurement differences compared to the technician. The study found that participants could take an inside-leg measurement with some success on their own, something which clearly benefits online fashion retailers and supports the assumption that consumers can use the guidance (2.7).

**5 Summary conclusion**

**5.1 Summary findings and recommendations**

The purpose of this research was to determine how consumers interact with body measurement guidance (RGs), how they interpret it and use it, thereby interrogating its efficacy. The findings of the RG content showed that visuals are not sufficiently detailed and requires development to encompass more body regions to indicate circular measurements or mid points between the start and end of a measurement. The development should also include less stylised visuals. This would include images showing the required posture for measurement on bodies which are appropriately attired for the measurements. This study also recommends that more detailed written instructions are required and that these too should include measurement start and end points using common parlance.

The study also found that RGs make no mention of a third-party assistance taking measurements implying that the consumer can take these measurements themselves. However, difficult to take measurements such as back neck length would benefit from third-party assistance.

This study has further found that the practice of using garments as a replacement for body measurements exacerbates fit and size selection issues and recommends retailers not to use them.

The quantitative findings indicate that participant-taken body measurements are close to those taken by trained technicians in the areas of waist and inside leg meaning consumers understand how to measure themselves for these areas. This study also highlighted that in the absence of someone to help them, participants devised novel ways of
undertaking the measurement, giving impetus for future research in this area to add to existing anthropometric theory and practice.

Measurement differences for bust/chest and hips measurements were significantly different between participant- and technician-taken. This study recommends a greater emphasis needs to be placed on these measurement definitions and descriptions when reviewing existing RGs so consumers can understand where and how to take these circular measurements.

5.2 Implications for future research

According to existing AGs, body measurements are always taken by a third party. However, digital size selection technologies not reliant on bodyscanning technology make no mention of third-party intervention and none of the RGs referred to a third party to take measurements. This study’s findings highlight that manual anthropometric methods can be undertaken by consumers and that both retailers and size selection apps encourage this with their visual and written content. Garment returns, however, are increasing despite the availability of RGs. With this issue in mind, the self-measurement process for consumers needs further analysis to identify more novel practices that can be adopted for self-measurement, and to determine whether these practices are accurate enough to incorporate in wider anthropometric practice.

5.3 The study’s contribution

This study has determined how consumers interpret and interact with RGs, which will benefit fashion retailers and sizing apps when they develop visual and written content for their body measurement guidance. The recommendations provided by this study would further ensure the body dimensions provided by the consumer are more accurate. Accurate body measurements aligned with retailers’ body size charts will assist the consumer to select an appropriately sized garment mitigating garment returns due to issues over size and fit, which is the primary reason for consumers to return garments. More accurate size selection by the consumer contributes to more sustainable fashion business model as returns are reduced and less garments are going into landfill.

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