Preferred attributes of sportswear products among South African females

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ABSTRACT

Sports bras, as a subcategory of sportswear, represents a large and growing marketing opportunity for manufacturers. It is believed that the manufacturer who wins the hearts and minds of consumers in the sports bra category, will also gain the entire shopping basket of the female athletic shopper.

A sports bra is an apparel product composed of physical attributes. When considering a product purchase, consumers compare and contrast alternative products through the evaluation of product attribute combinations. Preferences for the apparel items may depend on the joint influence of these product attributes.

This study aims to determine the relative importance of the product attributes that influence the buying behaviour of sports bras. A second objective is to segment the market based on the relative importance of the attribute rankings, and a third objective is to understand the consumer channel preferences when purchasing sports bras.

The identification of the relative importance placed on product attributes will assist manufacturers to enhance their marketing strategies and new product development efforts.

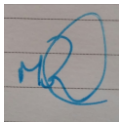
Data was collected through an online and face-to-face survey using a structured questionnaire from a convenience sample of 326 female respondents. Conjoint analysis was performed on the data to determine the relative importance of the product attributes. A cluster analysis was then conducted on the results of the conjoint study to determine whether differentiated consumer segments exist. The channel preferences were determined using a distribution-fitting approach with ANOVA tests.

The results show that South African females consider brand as the most important product attribute, followed by fit, price, function and design/style (the latter two attributes show no significant difference in ranking). The cluster analysis revealed that females display relatively homogenous behaviour and prefer speciality sports stores when purchasing sports bras.

DECLARATION

I, Michelle Hutcheon, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Michelle Hutcheon



Signed at Johannesburg

On the 28th day of February 2018

DEDICATION

To those with courage to chase their dreams

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- My husband, Donovan Hutcheon, for his love, support and endless patience.

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CHAPTER 1. INTRODUCTION

1.1. Purpose

The purpose of this study is to understand the relative importance of the product attributes influencing the purchasing behaviour of sportswear, in particular, sports brassieres (bras). The second objective is to segment the target market based on the relative importance of the product attributes, and the third objective is to understand channel preferences when purchasing sports bras.

1.2. Context of the study

The sportswear market is growing as a consequence of the promotion of physical activity and healthy lifestyles (Edwards & Tsouros, 2006; Rahulan, Troynikov, Watson, Janta, & Senner, 2015). The global growth in female sportswear is driven by an increase in female sports participation and a change in consumer lifestyles popularising fashionable, yet comfortable sportswear (Kell, 2014; Nielsen, 2014; Team, 2013).

Historically, manufacturers did not include women as a target market, and female sportswear were male designs, made in smaller sizes and feminine colours. Female consumers are, however, becoming more discerning and the "*shrink-and-pink-it*" strategy is no longer viable or accepted (Chitrakorn, 2017).

The purchase and usage of sportswear brands in South Africa has seen significant growth, but little is known about the consumer purchasing behaviour (Pillai, 2014). Euromonitor (2017b) states that South African women struggle to purchase sportswear as they have unique fit and sizing requirements which are not met by international retailers.

It is therefore essential for marketers to improve their understanding of the South African female consumer, and the specific attributes she seeks in her product choices to develop more precise products and effective marketing plans (Rahulan et al., 2015).

1.3. Research problem statement

This study seeks to understand the following **research problem**:

Identify the most important product attributes for females when purchasing sports bras

Research questions:

a) **Research question 1:** What is the relative importance of product attributes that influence purchase decisions of sports bras?
b) **Research question 2:** How do the product attributes identified in (a) rank by age cohorts?
c) **Research question 3:** How does the level of sports involvement influence the ranking of the product attributes identified in (a)?
d) **Research question 4:** What consumer segments can be identified based on the purchasing behaviour identified in (a)?
e) **Research question 5:** What are the most preferred channels when purchasing sports bras?

1.4. Significance of the study

Several companies and academic institutions have researched sportswear purchase influencers, but limited academic research exists focusing on sports bras, and the female buying behaviour in South Africa (North, De Vos, & Kotze, 2003).

The available research concentrates on the sportswear buying behaviour of Generation Y (aged ~18-40 yrs.) and Baby Boomers (aged ~51-70 yrs.), with limited coverage of Generation X (~41-50 yrs.) (O'Sullivan, Hanlon, Spaaij, & Westerbeek, 2017; Rahulan et al., 2015).

This study contributes to the existing body of research by providing insight into the South African female consumer's buying behaviour and supplements the existing generational data.

1.5. Delimitations

- **Who**? The study focuses on South African females who have purchased or intend to purchase a sports bra in the next 12 months.
- **What**? The consumer decision-making process is multifaceted and complex. This study evaluates one step of the buying process, i.e. product evaluation.
- **How**? This study identifies female segments based on product attribute importance.

1.6. Practical and social implications

Manufacturers and marketers will obtain insight to improve product development, mix and marketing decisions pertaining to sports bras (May-Plumlee & Little, 2001).

1.7. Originality / value

This study addresses a gap in literature concerning the understanding of consumer behaviour of females when purchasing sports bras. It provides insight to enhance the design and marketing of sports bras to South African women (Rahulan et al., 2015).

1.8. Keywords

Consumer behaviour, consumer segment, sportswear, sports bra, product attributes, female purchasing criteria

1.9. Paper type

This paper provides an empirical analysis of consumer buying behaviour focusing on the product attribute importance.

1.10. Definition of terms

- **Athleisure**: Clothing designed for exercising, which is worn for streetwear and daywear (Ahmed & Berg, 2017).

- **Consumer behaviour:** The actions displayed when consumers search for, buy, use, assess and dispose of products to satisfy their needs (Schiffman, Kanuk, & Hansen, 2008).
- **Casual sportswear:** Fitness-oriented clothing bought for lifestyle usage (Chi & Kilduff, 2011)
- **Fashion**: A currently accepted or popular style of apparel (Kotler & Keller, 2012).
- **Fit:** The conformance of a garment to an individual's body type or size (Oladele & Ogundipe, 2016). The term is also referred to as "cut" and is a crucial aspect of garment selection in sportswear (Lau, Chang, Moon, & Liu, 2006).
- **Form**: The size, shape, or physical structure of a product (Kotler & Keller, 2012).
- **Generational cohorts**: Generational theory groups people born in certain years to suggest likely behaviours according to shared values (Schewe & Meredith, 2004). These groups are: Baby Boomers, born between 1946 and 1964 (aged ~51-70yrs); Generation X, born between 1965 and 1976 (aged ~41-50yrs); Generation Y or Millennials, born between 1977 and 1994 (aged ~18-40yrs); and Generation Z born between the early 1990s and early 2000s (Igel & Urquhort, 2012)
- **Product attributes**: Refers to product utility and the characteristics that make it capable of meeting consumer needs (Pedersen, Laucella, Kian, & Geurin, 2016)
- **Sport**: Any activity that requires physical involvement, in which participants engage in a structured or unstructured environment, to declare a winner (SRSA, 2005).
- **Sports bra:** A sub-category of sportswear and brassieres, created for consumers participating in physical activities (Tsarenko & Lo, 2017).
- **Sportswear**: Clothing designed for sport or exercise. The term is used interchangeably with "sports apparel" (O'Sullivan et al., 2017).
- **Style**: A visual appearance or a distinctive mode of expression, for example formal, business, casual or sporty (Khoei, 2014; Kotler & Keller, 2012).

1.11. Assumptions

- The consumer behaviour patterns of the sample are representative of females in South Africa.

- Researchers differ on the age ranges of generational cohorts. This study assumed:
    - ages 18 to 24 form part of Generation Y;
    - ages 25 to 34 form part of Generation Y;
    - ages 35 to 44 form part of Generation X; and
    - ages 45 and older form part of Baby Boomers.
- Product attributes considered for sports bra purchases include brand, price, fit, function, design or style and colour.

CHAPTER 2. LITERATURE REVIEW

The following topics are discussed in this literature review:

- **The sports bra market:** Background and size of the female sportswear market globally and in South Africa.
- **Female sportswear market trends**: Sportswear trends globally and in South Africa.
- **Consumer buying behaviour:** A review of clothing attributes influencing female product choice.
- **Market segmentation:** A review of consumer segments as identified in other studies.

2.1. The sports bra market

The economic importance of the sporting goods industry has grown in recent years (Andreff, 2008; Lim, Kim, & Cheong, 2016). Augmented levels of sports participation and increased expenditures on sportswear have stimulated this growth.

Few research studies have sought to identify the consumer context of women in sportswear. This knowledge gap limits the industry's ability to effectively market to and design apparel for females (O'Sullivan et al., 2017).

Women constitute more than half (51%) of the South African population of 56.5 million people (Statistics South Africa, 2016). According to Mastercard, South African women have growing discretionary income and make 75% of transactions in the country (Le Roux, 2017). According to Wray and Hodges (2008), women influence an estimated 80% of all consumer goods purchases, and therefore, represent a large and lucrative target market.

11% of South African females (~2.7 million women) participate in sport (SRSA, 2005) and this number is growing as women have more time and money to spend on preventative health care as they delay motherhood and pursue careers (Euromonitor, 2015; Pillai, 2014).

Women's increased interest in sports and fitness, in conjunction with the athleisure trend, has significantly boosted the market for women's sportswear (Business Wire, 2016). The global sportswear industry is projected to reach a value of between $74 - $125 billion by 2019 and a category growth of 6% (Heitner, 2015; Lucintel, 2012). Sportswear purchases are also growing in South Africa, with the category expected to maintain a compound annual growth rate of 2% over the next five years (Euromonitor, 2017c).

Statista (2017) valued the global sports bra category at $7.1 billion in 2014 (~10% of sportswear) and estimated a compounded annual growth rate of 10.2% for the period 2016-2020 (Business Wire, 2016).

2.2. Female sportswear market trends

a) Females as a viable market segment

According to Fowler (1999), until 1996, most manufacturers and retailers designed and marketed sportswear to men, even though women were the primary shoppers.

1998 saw a significant turnaround in the commercialisation strategies of sportswear companies, led by Champion Jogbra, the founder of the sports bra. Reebok changed its store formats to include female graphics, and Columbia Sportswear appointed a female executive to oversee the women's division (Fowler, 1999). In 2015, Under Armour, the second largest sportswear brand in the United States (US), launched a marketing campaign targeting women (O'Reilly, 2015) and Nike opened female-only stores in the US, China and the United Kingdom. 2016 saw Adidas appointing a marketing executive to drive the female agenda (Segran, 2016) and Nike identified leggings and sports bras as the future growth opportunities in female sportswear.

The focus on females has paid off as a strategy, with both Adidas and Nike reporting strong growth from this segment. Women now constitute a fifth of Nike's global sales (Euromonitor, 2015; Kell, 2014; Team, 2015).

b) *"We" experiences*

Unlike men, women are not inspired by the prowess of top sports players, but are motivated by being part of a community. Females are influenced by other women, purpose, as well as health and wellness (Segran, 2016).

Females prefer to participate in physical activities in groups, explaining the global growth in the popularity of sports clubs and stores that provide engaging consumer experiences by combining social and active lifestyle activities (Abdellah, 2017).

c) *The versatile female athlete*

Brands have recognised the consumer need to integrate physical and lifestyle activities, and have adjusted their marketing and product strategies accordingly. Adidas, for example, believes that female consumers will respond to images of women who incorporate their athletic pursuits into their busy lifestyles (Segran, 2016); and Nike has created sports bra and legging ranges that fit into consumer's daily clothing choices (Kell, 2014).

d) *Function meets fashion*

Sportswear aids performance and absorbs sweat, yet it is also a tool to express oneself, which is a function of fashion. While fabric technology is the main feature of sportswear, fashion adds value and helps sportswear gain mass appeal (O'Sullivan et al., 2017).

Today, the female shopper requires sportswear to combine fashion with function and comfort (Bain, 2017; Chang, Cho, Turner, Gupta, & Watchravesringkan, 2015; Mellery-Pratt, 2015; O'Sullivan et al., 2017; Wiebe, 2013). The growth in sports-inspired apparel or "athleisure" is a manifestation of the consumer need for functional fashion.

In 2016, sports-inspired apparel in South Africa grew by 6% in nominal terms and by 36% over the past five years (Euromonitor, 2017c). According to Nike, sports bras have become a fundamental component of the athleisure trend as women adopt it in everyday wear due to the high degree of comfort, function and fashion (Bahler, 2017;

Kell, 2014). As the trend gains momentum, new fabrics are introduced to deliver improved shape, comfort and moisture-management.

2.3. Factors influencing consumer buying behaviour

Schiffman et al. (2008) define consumer behaviour as the actions displayed when consumers search for, purchase, use, evaluate and dispose of products to satisfy their needs. Kotler and Keller (2012) suggest that consumers follow five stages when making purchasing decisions: problem recognition, information searching, alternative evaluation, making the purchase decision, and post-purchase evaluation.

According to Dolan (2001), when analysing consumer behaviour, marketers must understand the process and attributes considered when consumers' evaluate one purchase alternative over another. Therefore, understanding a consumer's perception of the relative importance of a product's attributes, is an essential component of understanding alternative evaluation.

2.4. Influence of product attributes on buying behaviour

Tong (2014) and Oladele and Ogundipe (2016) suggest that consumers compare and contrast combinations of product attributes when considering apparel purchases. The combination of attributes that offer the greatest perceived benefit, has the biggest influence on whether the product is purchased (Kotler & Armstrong, 2010; Kotler & Keller, 2012; Li, 2005; Rahulan et al., 2015). The analysis of product attributes provides an insight into the consumer preferences to make product development, mix and marketing decisions (May-Plumlee & Little, 2001).

Tong (2014) found that apparel products are composed of intrinsic and extrinsic attributes, which are perceived differently by consumers. Intrinsic attributes include aesthetic criteria such as colour, style and fabric; quality attributes such as durability, and performance attributes such as the garment's ability to enhance or inhibit the athlete's performance (Rahulan et al., 2015). Extrinsic attributes are applied by the manufacturer or retailer. These include brand and price (Tong, 2014; Wheat & Dickson, 1999).

2.4.1. Ranking of product attributes

International

Oladele and Ogundipe (2016) and Tong (2014) argued that consumers use price, brand, quality, design/style, colour, durability and fit as the most important attributes when evaluating apparel products.

Wheat and Dickson (1999), Fowler (1999) and Dawes (2012) found that brand was not the most important factor influencing sportswear purchases and showed that consumers rated functional attributes such as comfort and fit as more important.

Fowler (1999) explains that relative to men, females place high importance on fit due to a lack of availability of sportswear designed for the feminine silhouette. Sanad (2016) supports this argument and found that females display widespread dissatisfaction with fit and sizing, therefore emphasising these attributes when evaluating sportswear.

Casselman-Dickson and Damhorst (1993) also show that comfort, fit and quality of construction were attributes required by female consumers to be satisfied with their purchases. The satisfaction with the purchased sportswear improved confidence, which in turn, enhanced their performance.

South Africa

Pillai (2014) shows that South African consumers place emphasis on price and will switch brands because of the price. South Africans seek quality, performance enhancement, comfort, and style as mandatory variables of sportswear (Pillai, 2014).

Summary

Table 1 provides a summary of the most cited product attributes from the literature review.

Table 1: Product attributes influencing the choice of sportswear (researcher's summary)

Attributes influencing product selection	Korean females (Hwang, 2008)	American female students (Fowler, 1999)	Australian females (O'Sullivan et al., 2017)	American female students (Wheat & Dickson, 1999)	South African male and females (Pillai, 2014)	UK males and females (Casselman-Dickson & Damhorst, 1993)
		Ranked	***Not ranked***			
Brand	2	5	x			
Colour		3	x	x	x	
Design or Style	3	2	x	x	x	x
Fit or cut		1	x	x	x	x
Function	1		x		x	
Price		4			x	

The section below describes the most common cited product attributes:

2.4.2. Brand as a product attribute

Ambler and Styles (1997) define a brand as the promise of a bundle of attributes that individuals purchase to provide satisfaction. The attributes that constitute a brand may be real or deceptive, rational or emotional, tangible or invisible (Oladele & Ogundipe, 2016). The brand name shows the product source and creates product awareness and differentiation (Keller, 2003).

2.4.3. Price as a product attribute

Perceived consumer value is a trade-off between product price and quality. Price and quality have different and differential effects on the perceived value for money of a product. Some consumers perceive value when the price of a product is low, while others require a balance between quality and price (Sweeney & Soutar, 2001). Consumers also use a brand name as a cue to assess quality, therefore justifying a willingness to pay a higher or lower price for a product (North et al., 2003).

Five price zones are used in apparel, namely designer, bridge, better, moderate and budget or mass (Oladele & Ogundipe, 2016). Sportswear typically falls into the categories budget and bridge (bridge meaning brands that bridge the gap between

contemporary and designer labels such as Stella McCartney sportswear) (Oladele & Ogundipe, 2016).

While price is regarded as a part of the marketing mix, this study views price as an indicator of quality with a clearly defined scale. Price is therefore regarded as an indicator of perceived consumer value.

2.4.4. Design/Style as a product attribute

According to Kimmel (2015), design refers to a product's aesthetic or style. In clothing, it represents usability or intended purpose. Consumers make design/style choices by considering an item's comfort, practicality, durability or alignment to the latest fashion trends (Oladele & Ogundipe, 2016). In sportswear, the garment has the additional requirement to enhance the athlete's performance (Rahulan et al., 2015).

2.4.5. Fit as a product attribute

Ashdown and Loker (2010) and Fowler (1999) shows that females place greater importance on "fit" than men when purchasing sportswear. The importance of fit is strongly associated with body satisfaction.

Females express disappointment with the fit, as discontentment with their bodies. Sportswear, therefore, becomes an expression of self-esteem, femininity, sex-appeal and fashion image (White & Scurr, 2012).

Few sports bra consumers wear sports bras that fit. 70-80% of women worldwide wear ill-fitting sports bras, with concerns including chaffing and uncomfortable shoulder straps (Brown, White, Brasher, & Scurr, 2014).

Euromonitor (2017b) highlights that South African women tend to be fuller figured and struggle to find clothing sizes as manufacturers design for size zero models. Manufacturers and marketers, therefore, need to understand the South African fit requirements when designing and communicating products.

2.4.6. Colour as a product attribute

Colour is an attribute considered when making product choices in high involvement categories such as clothing. It elicits an emotional response and plays a role in the aesthetic appeal of clothing (Grossman & Wisenblit, 1999; Radder & Huang, 2008).

A conjoint study by Oladele and Ogundipe (2016) on clothing attribute preferences, showed that colour is not the most important determinant for apparel decisions. Colour has, therefore, been excluded from this study to limit the number of attributes surveyed. Colour is regarded as a component of "fashion" for this study.

2.4.7. Fabric function as a product attribute

Fabric function impacts the product's performance quality and complements the design or style. Marketers can promote superior fabric benefits to draw the attention of brand switchers (Lau et al., 2006). Attribute levels relating to high-performance fabrics include breathability, moisture-management, odour control and the ability to prevent chafing (Lau et al., 2006).

The summary of product attributes influencing product choice, leads to the development of the first research proposition:

Proposition 1: South African females rank the following product attributes as most important when purchasing sports bras: fit is most important, followed by design/style, function, price and then brand (Casselman-Dickson & Damhorst, 1993; Fowler, 1999).

2.5. Influence of age cohorts on buying behaviour

A woman's generation influences her sportswear purchase behaviour (O'Sullivan et al., 2017). Table 2 summarises the findings from the literature review.

Table 2: Influencers of product choice by generational cohort (summary of available research)

Most important product attributes required	Baby Boomers	Generation Y
Preferred sporting activity	• Walking (Rahulan et al., 2015)	• Running/jogging • Cycling • Soccer/football • Netball (Rahulan et al., 2015)
Attributes – top two ranked	• Design/style (in particular durability) • Fit (Biggs, Phillipson, Leach, & Money, 2008)	• Design/style (in particular fashion) • Brand (O'Sullivan et al., 2017; Rahulan et al., 2015)
Functional attributes	• Anti-odour (O'Sullivan et al., 2017)	Anti-chaffing (Rahulan et al., 2015)
Marketing consideration	• Considers less advertising information than Generation Y consumers (Rahulan et al., 2015)	• The technical aspects and price are important as these consumers are tech-savvy and knowledge-hungry (Rahulan et al., 2015)
Price consideration	• Price not important as a result of greater spending power (Rahulan et al., 2015)	• Price-sensitive (Rahulan et al., 2015)

The active lifestyle of Generation Y carries both physical and social value. The need for social validation has been a driver in the growth of fashionable sportswear and the preference for global over local brands (Euromonitor, 2017a). Generation Y also demands performance from sportswear, citing anti-chaffing as an important functional attribute (O'Sullivan et al., 2017).

Baby Boomers' connect with sportswear advertising that best reflects their cognitive age. This generation has a practical approach to sportswear, preferring durability and fit as opposed to fashion (Biggs et al., 2008). Baby Boomers are less price sensitive than Generation Y and prefer physical stores where they can see, feel and try items on (O'Sullivan et al., 2017).

The study of generational cohorts indicates a difference in the ranking of the product attributes. This leads to the development of the second proposition:

Proposition 2: The relative importance of product attributes differ by age cohorts.

2.6. Influence of sports involvement on buying behaviour

Leksrisompong (2010) shows that highly active consumers (self-reported as the number of active hours per week) place a greater emphasis on the functional attributes of sportswear. These consumers are also twice as likely to spend greater amounts on sportswear than those who do not take part in sport (O'Sullivan et al., 2017).

Leksrisompong (2010) found that females, who actively participate in sport, aged 41-45 years, are twice as likely than any other age group to purchase sportswear as a result of their greater spending power.

Sports participation and activity level may impact on the attributes considered when purchasing sportswear. This leads to the development of the third proposition:

Proposition 3: South African females with high involvement in sport, rank functional attributes as more important than those that participate less frequently in sport.

2.7. Identification of consumer segments based on buying behaviour

Smith (1956) defines market segmentation as a way of dividing a heterogeneous market into smaller homogeneous groups with similar product preferences or behaviours.

Kotler and Keller (2012) suggest that a market can be segmented according to the product attributes preferred by different consumer groups. Market segmentation according to product attributes includes the clustering of consumers by identifying the hierarchy of attributes that guide consumer decision-making. Each consumer segment will have distinct demographics, psychographics and media usage (Kotler & Keller, 2012).

Market segmentation and product positioning are interrelated as both assume that groups of consumers exist, that display similar product choices and preferences.

Preference is influenced by personal factors such as demographics, psychographics, and brand loyalty, or situational variables such as purchasing for oneself. Companies can respond to consumer preferences by modifying their product distribution and servicing strategies, advertising and promotion plans or brand positioning (Green & Krieger, 1991).

Market segments can be examined using several consumer characteristics (Kotler, 2000). Examples of these include:

- **Demographic**: Includes age, life stage, family size, gender, income, religion, social class, education and occupation. Age and life stage have a significant impact on the purchase decisions of sports bras due to the changing needs of the female body (Tsarenko & Lo, 2017).
- **Psychographic**: Includes lifestyle and personality;
- **Behaviour**: Buyers are segmented on their knowledge of, attitude towards, use of, or response to a product; and
- **Geographic**: Includes dividing a market into geographical units, such as provinces, regions or cities.

Examples of sportswear segmentation:

- **Psychographic - lifestyle**: Fowler (1999) identified three female segments who purchase sportswear; the serious athlete, the weekend athlete, and the woman seeking comfort. These segments were based on sports involvement and benefits sought from sportswear (Pedersen et al., 2016).
- **Psychographic - values**: d'Astous and Chnaoui (2002) suggest that consumers respond to different types of marketing based on their consumption purpose. Consumers who purchase sportswear for pleasure, prefer fashionability at a reasonable price instead of expensive high-performance apparel. Conversely, consumers who value athletic performance, require sportswear to guarantee quality performance (Leksrisompong, 2010).
- **Psychographic - personality**: Berlei, an Australian brand, achieved high advertising recall in a sports bra advertising campaign using personality variables to segment the market. The segmentation dimensions included introversion/extroversion and natural/alternative lifestyles (AFA, 2002).

- **Behaviour - product benefits**: Hwang (2007) identified two sportswear segments, i.e., consumers who are brand- or function-oriented. The brand-oriented group seeks sex appeal, fashion and prefer international brands with prestigious imagery. The function-oriented group wants comfort, favour domestic brands and prefer simple, active brand imagery (Hwang, 2008).

This study segments the market based on the product attribute preferences which influences buying behaviour.

Proposition 4: Distinct consumer clusters or segments can be identified based on the ranking of product attributes.

2.8. Influence of channel on buying behaviour

There is a large array of channels in which to present and deliver products (Rahulan et al., 2015). Shopping channels include department stores, discount stores, wholesalers, speciality stores, online shopping or social media (O'Sullivan et al., 2017). Social media and online peer reviews are increasingly being used when reviewing and considering sportswear purchases (Rahulan et al., 2015).

According to Hart and Dewsnap (2001) and O'Sullivan et al. (2017), sportswear consumers prefer physical stores and will patronise outlets that offer a depth of range, size availability and specialist advice.

Generation Y sees shopping as a social activity and retailers need to meet this need regardless of an online or physical presence. Similar to older generations, Generation Y consumers prefer physical stores, but online shopping has a higher incidence of usage (O'Sullivan et al., 2017). Baby Boomers, are less concerned with the establishment of a social space and prefer fewer choices (De Bruin et al., 2007).

Proposition 5: Physical stores are the most preferred channel for purchasing sports bras. Younger age cohorts have a higher preference for online shopping relative to older age cohorts.

2.9. Research propositions to test

Based on the literature review the following research propositions are posed:

- **Proposition 1:** South African females rank the following product attributes as most important when purchasing sports bras: fit is most important, followed by design/style, function, price and then brand (Casselman-Dickson & Damhorst, 1993; Fowler, 1999).
- **Proposition 2:** The relative importance of product attributes identified in Proposition 1 differ by age cohorts.
- **Proposition 3:** South African females with high involvement in sport, rank functional attributes as more important than those that participate less frequently in sport.
- **Proposition 4:** Distinct consumer segments can be identified based on the ranking of the product attributes.
- **Proposition 5**: Physical stores are the most preferred channel for purchasing sports bras. Younger age cohorts have a higher preference for online shopping relative to older age cohorts.

CHAPTER 3. RESEARCH METHODOLOGY

3.1. Research approach

Through a conjoint analysis, the study determines the relative importance of product attributes when females make sports bra purchase decisions. Spearman correlations provide the differences in the product rankings, based on age and sports involvement.

A cluster analysis of the product attribute importances provides insight to the segmentation of the sports bra market, and the channel purchase preferences are determined using a distribution-fitting algorithm approach and ANOVA tests.

3.2. Research population

The target population consists of South African females that have purchased, or are considering purchasing sports bras in the following 12 months.

3.3. Research sample

Non-probability, convenience sampling was used for data collection. This method of sampling was considered to be the most economical method and appropriate for the study (Pillai, Soni, & Naude, 2002). The study collected 440 surveys of which 326 were viable for the conjoint analysis (Cattin & Wittink, 1982).

3.4. Research instrument

A structured, self-completion questionnaire was created using an adapted mixed method and the Sawtooth Software SMRT Market Simulator. The literature review informed the product attributes and attribute levels, which were refined through qualitative interviews and a pilot survey. Table 3 lists the attributes tested in this study.

Table 3: Attributes and attribute levels

Attributes or Utilities	Attribute or Utility Levels	Reasons	Authors referenced
Brand	**Nike**	Top 3 brands in Africa: Brand Africa (Sunday times brands survey 2017). These brands are international brands.	(May-Plumlee & Little, 2001)
	Puma		
	Adidas		
	Boost Gymwear	South African brand	
	Cotton On	Clothing manufacturer	
	Triumph	Lingerie manufacturer	
	Lorna Jane	High-end/luxury brand	
Price	**R250**	Low (mass or budget)	(Fasanella, 2009; Hansen, 2005; Lau et al., 2006)
	R500	Mid (moderate)	
	R750	Mid (better)	
	R950	High (bridge)	
Design / Style (Product is designed for…)	**Comfort**	Benefit sought by consumers	(Biggs et al., 2008; Lau et al., 2006; Wu & Chalip, 2014)
	Durability (the useful life of the garment)		
	Fashionability (seasonal style or extensive range of colours)		
	Performance enhancement (functional qualities that improve performance)		
Function	**Moisture-wicking** (quick dry)	Fabric function (Lau et al., 2006)	(Biggs et al., 2008; Kimmel, 2015; May-Plumlee & Little, 2001; Wu & Chalip, 2014)
	Anti-odour (odour resistant)		
	Anti-chaffing (no rubbing)		
	Anti-bacterial (anti-microbial)		
Fit	**Adjustable** straps or cups	Fit or cut requirements	(May-Plumlee & Little, 2001; Wu & Chalip, 2014)
	Uplifting or push-up cups		
	Shaping silhouette		
	Compression limits bust movement		
	Coverage		

The respondents answered questions covering the following:

- **Demographics:** gender, age, race, and sports bra size.
- **Psychographics**: sporting activity (frequency per week), types of sports activity or/and intensity of exercise (Gill, Gross, & Huddleston, 1983).
- **Behaviour**: channel used for purchase and the importance of specific attributes of sportswear.

APPENDIX A contains the questionnaire used in this study.

3.5. Data collection

Data was collected through online and in-person questionnaires. This survey was pre-tested to minimise misinterpretations.

Online survey: The questionnaire was distributed via email to health clubs, sporting clubs and sportswear brands.

In-person survey: Questionnaires were distributed at health clubs and sports events.

3.6. Data Analysis

Conjoint analysis to determine consumer behaviour

Conjoint analysis was used to determine the relative importance of the product attributes. The benefit of using the conjoint approach is that it is an academically accepted method of market simulation based on consumer preferences, used to identify promising marketing actions (Cattin & Wittink, 1982).

The pair-wise product bundle approach was used to maintain realism in the study. The disadvantage of this approach is that respondents may experience information overload, resulting in a lack of rigour applied when answering the questions. The implication is that the study needs to limit the ranking factors to five or six (Green & Srinivasan, 1978). This study contains five product attributes or ranking factors.

ANOVA tests determined whether the attribute rankings were statistically significant, and Spearman's correlations tested significance between age, sports involvement and the attribute rankings.

Cluster analysis for market segmentation

Aaker, Kumar, and Day (2001) recommend cluster analysis to marketers who want to segment a market using characteristics such as consumer behaviour and product preferences.

The product importance values of the conjoint study were used to segment females based on the similarity of their preferences (Green & Krieger, 1991). The intended output was to identify consumer segments, with similar preferences, across a full set of product attributes.

Application of the distribution-fitting algorithm approach to determine channel preference

Channel preference was determined using a distribution-fitting algorithmic approach which changes the ordinal level scales into interval level data, to allow for a greater degree of data manipulation (Stacey, 2005). This approach was chosen as an alternative to correspondence analysis, as it is proven to be a more reliable multivariate technique for the geometric representation of a contingency table in a low-dimensional space (Stacey, 2005). ANOVA tests were used to establish significance across the age groups.

3.7. Validity and reliability

External validity:

External validity is the ability to generalise the research results beyond the sample of the study (Lucas, 2003). The convenience sample of this study could generalise the research results (Lucas, 2003). This limitation was overcome through the large sample size (440 questionnaires completed of which 326 were valid) and using multiple distribution lists (for example, online and in-person distribution).

Internal validity:

Internal validity determines whether the results of the research are legitimate because of the way the data was recorded and the analysis performed (Handley, 2017). Internal validity was ensured through a pilot study to ensure the respondents understood the questionnaire and identified with the brands.

The data from the questionnaire was captured in Microsoft Excel and imported into Sawtooth Software SMRT Market Simulator, SAS and SPSS for analysis. Incomplete records were excluded from the data analysis (Cattin & Wittink, 1982). Various

statistical research instruments were used to ensure the accuracy of conclusions drawn. These are discussed in the relevant sections.

Reliability:

A sports bra is a product with critical fit, and most consumers purchase the product for themselves. According to May-Plumlee and Little (2001), this minimises outside influences on the purchase and hence offers greater accuracy in the research results.

The reliability of the study was further ensured through the large sample size and evaluated by calculating Cronbach's Alpha (Santos, 1999), ANOVA, t- and chi-square tests.

Ethicality of research:

Ethical principles were followed in the process of collecting and analysing the survey data. Research participants received a clear statement of the research objective and the impact of their participation. Respondents confirmed voluntary participation before completing the questionnaire and anonymity was guaranteed.

3.8. Pilot study

A qualitative study was conducted with ten respondents to develop the product attributes. The questionnaire was adapted based on the pilot findings:

- The survey time was shortened by limiting the number of product attributes to five; and
- Descriptive attributes were developed to allow for self-completion.

CHAPTER 4. PRESENTATION AND DISCUSSION OF RESULTS

4.1. Demographic profile of respondents

The data for gender, race, age category and sports bra size is nominal, that is, the data collected could be classified, counted, and there is no particular order to the categories (Lind, Marchal, & Wathen, 2012).

Sample details:

440 respondents completed the survey, of which 414 were female (94% of total respondents). The sample of 414 was reduced by removing:

- 35 records of females who had not purchased or did not intend to purchase a sports bra; and
- 53 incomplete records of where survey respondents were younger than 18.

The analysis was conducted on 326 respondents. Figure 1 summarises the reduction of the sample.

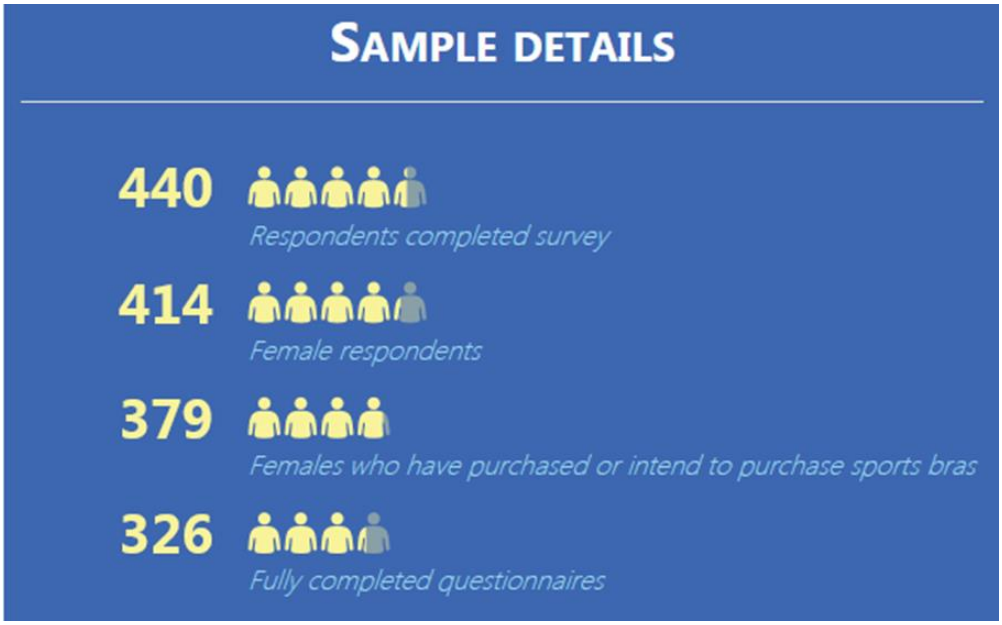


Figure 1: Survey sample breakdown

a) Age

Figure 2 provides the age distribution of the sample. 12% of the respondents were younger than 25 years old, 38% were 25 – 34 years old, 33% were 35 – 44 years old, while 14% were aged between 45 and 54 years and 4% were older than 54 years.

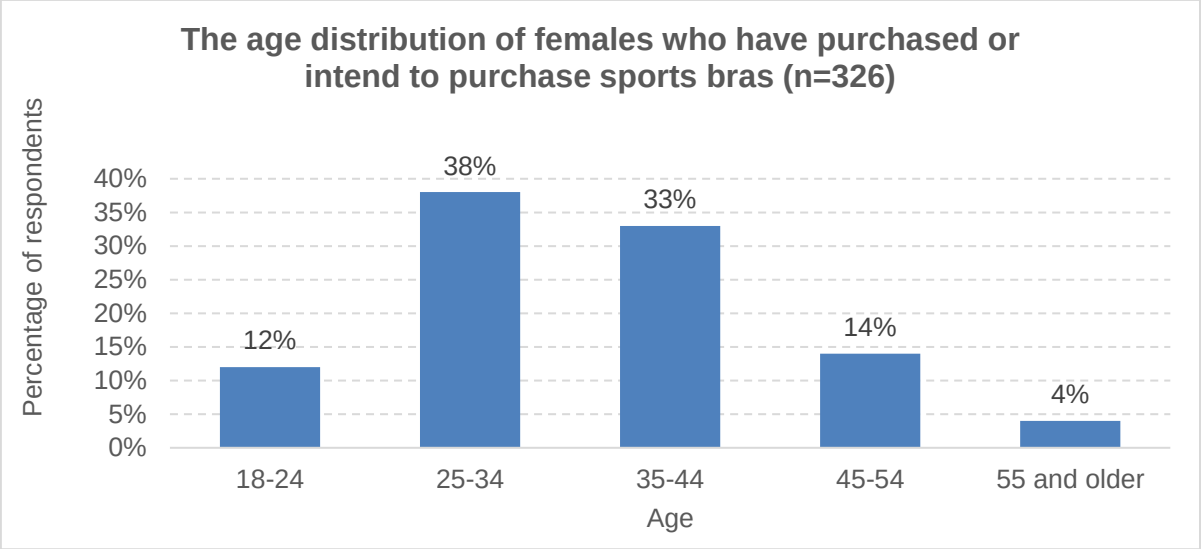


Figure 2: Age distribution of sample

b) Race

Most of the respondents (68%) were Caucasians, 14% Black and the other races constituted the remaining 18% (Figure 3).

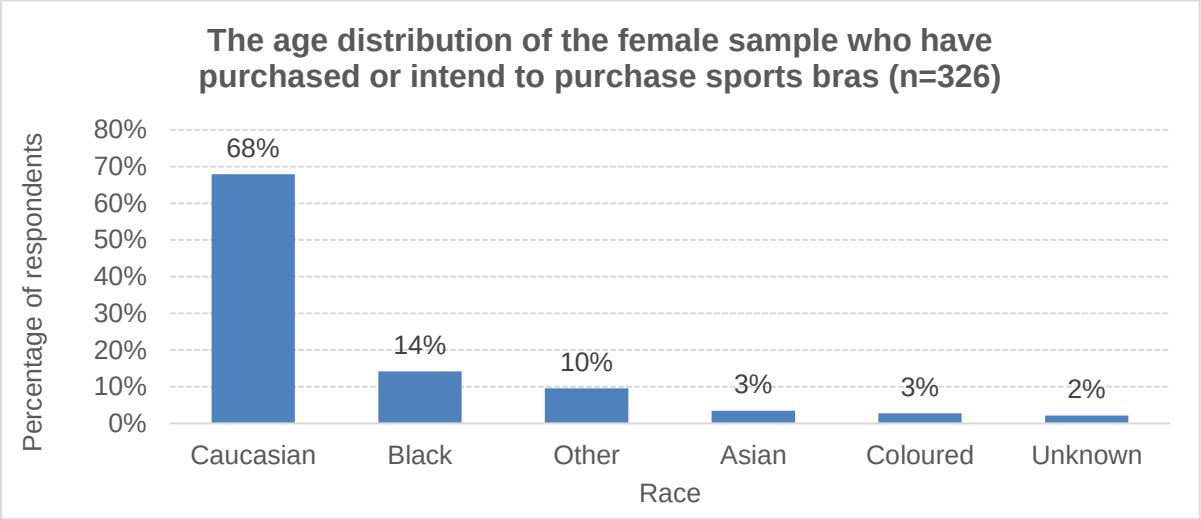


Figure 3: The sample race distribution

c) Level of sports involvement

Most of the sample is actively involved in sport, with the majority (51%) participating in sport for social interaction (Figure 4)

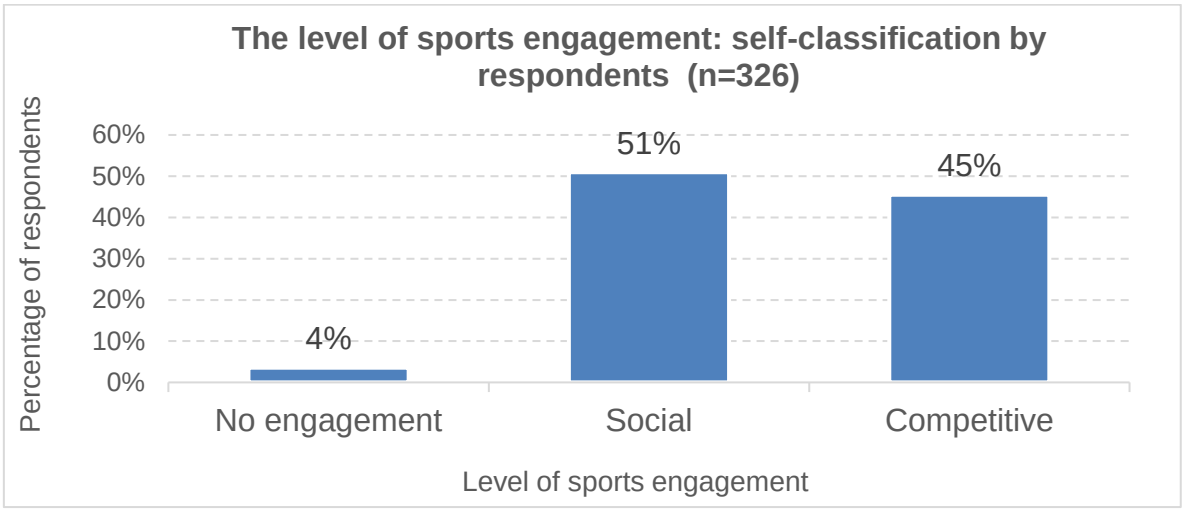


Figure 4: Level of sports involvement

The frequency of sporting activities for the women in the sample is summarised in Figure 5. It can be noted that 16% of the sample exercised 1–2 days a week, 41% for 3–4 days a week and 39% for 5-7 days a week. There was a 4% proportion that specified no participation in sporting activities.

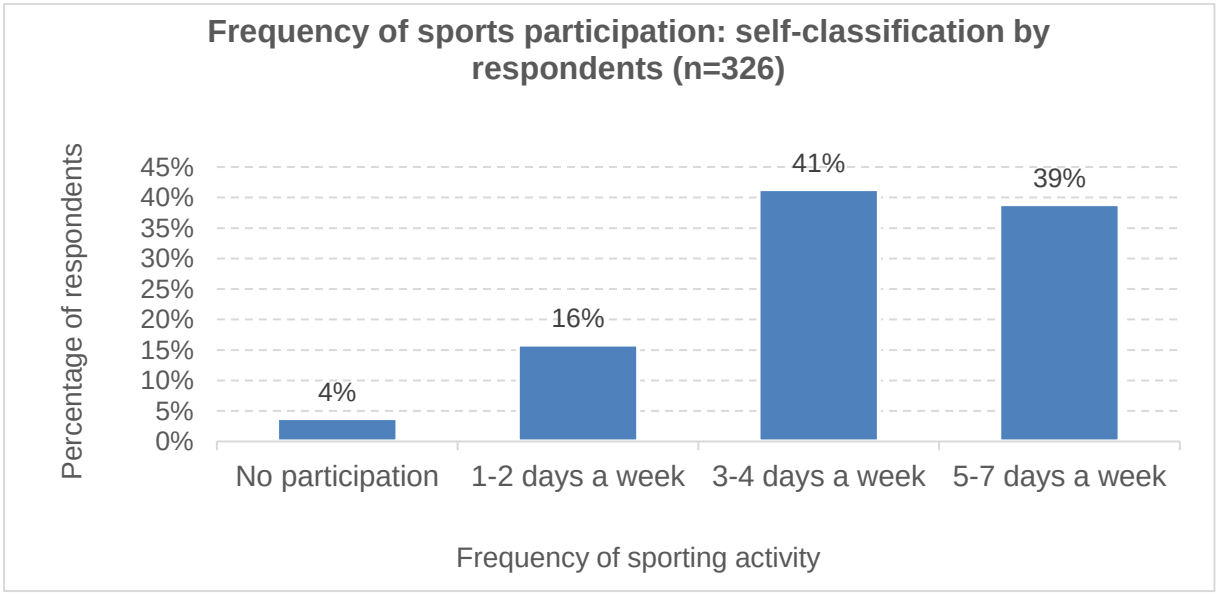


Figure 5: Frequency of sports participation

Figure 6 presents the respondent's self-classification of sports impact level. 62% of the respondents classify their activity level as high impact, which includes sports such as running, CrossFit and high impact interval training (HIIT) (White, Scurr, & Smith, 2009).

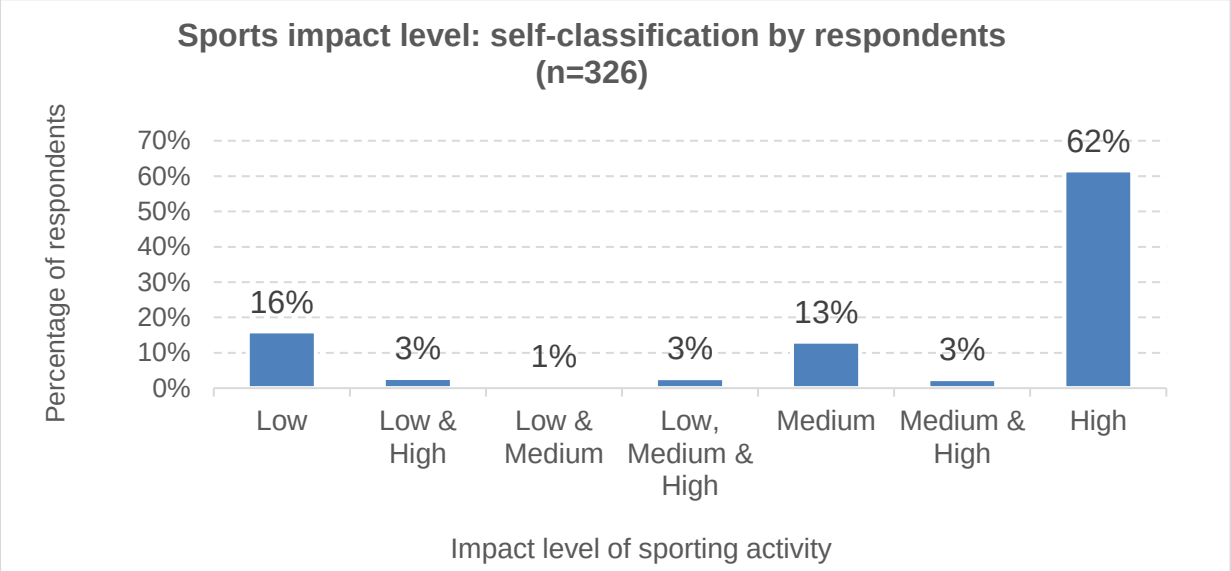


Figure 6: Sports impact level

d) Sports bra sizes

More than half of the respondents categorised themselves as having a bra-cup size of B-C (Figure 7).

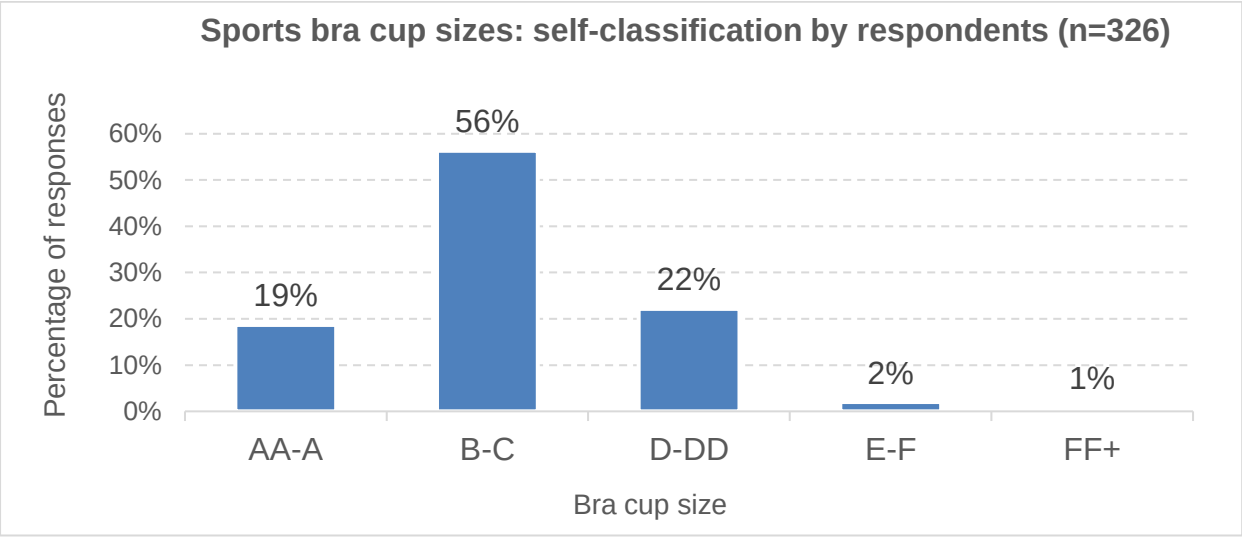


Figure 7: Sports bra cup sizes

e) Sports bra usage

Figure 8 shows that most respondents (76%) use sports bras exclusively for sporting activities.

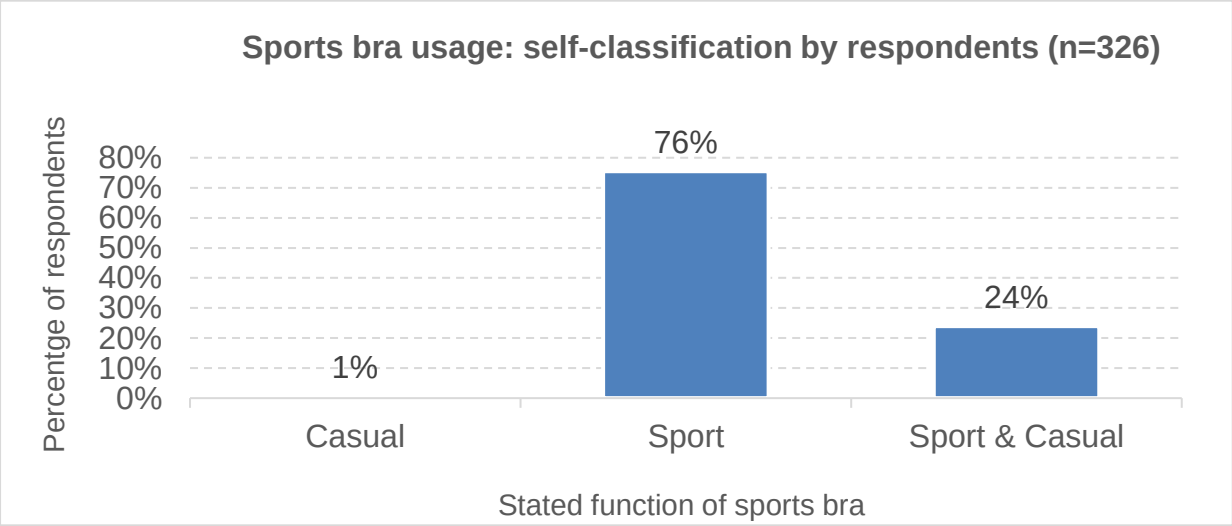


Figure 8: Sports bra usage

Finding:

The sample consists of fitness conscious females, aged 25-44 years, who wear sports bras exclusively for social and competitive sporting activities.

The sample does not reflect the population of employed, South African females aged 15 years and older, but could be representative of the target market.

4.2. Results pertaining to Proposition 1

4.2.1. Relative importance of product attributes

Proposition 1: South African females rank the following product attributes as most important when purchasing sports bras: fit is most important, followed by design/style, function, price and then brand (Casselman-Dickson & Damhorst, 1993; Fowler, 1999).

Respondents were asked to choose between two pairs of sports bras and to indicate their degree of preference. Conjoint analysis was then used to determine the importance of each product attribute.

The conjoint analysis produced conjoint importance values. The higher the value of the importance, the more critical the attribute to the consumers. The importance values were ranked from the most important to the least important attribute.

Table 4 shows the relative importance of the product attributes tested with female sports bra consumers.

Table 4: Descriptive statistics for the conjoint importance of the bra attributes

Descriptive Statistics						
Position	**Attribute**	**N**	**Minimum**	**Maximum**	**Mean (%)**	**Std. Deviation**
1	**Brand**	326	.00	98.76	31.75	15.004
2	**Fit**	326	.00	66.25	23.84	13.999
3	**Price**	326	.31	100.00	17.34	18.553
4	**Function**	326	.00	53.20	13.61	7.385
5	**Design/Style**	326	.00	46.85	13.47	7.421

ANOVA (analysis of variance) and pairwise comparisons tested whether the means between the utilities were significantly different. The following hypothesis was tested at a 5% level of significance:

- H_o: there is no difference between the means of the utilities,
- H_a: at least one sample mean is different to the others.

The null hypothesis was rejected since the p-value (<=2.2e-16) is less than the significance level, concluding that there is a significant difference in the means of the utilities, i.e. each product attribute is sufficiently different from each other.

The results show that South African females ranked Brand as the most important attribute (mean importance = 31.75), followed by Fit (mean = 23.84), then Price (mean = 17.34) on number three, Function (mean = 13.61) on number four and the attribute with the lowest importance score was Design/Style (mean = 13.47).

A pairwise comparison between Function and Design/Style shows that there is not a significant difference between these two attributes. APPENDIX C contains the detailed pair-wise ANOVA test results for the utility combinations.

The most striking finding from the conjoint analysis was that Brand was more important than Fit or Function. This was surprising as previous studies on sports apparel showed Fit and Function as more important than Brand (Casselman-Dickson & Damhorst, 1993; Fowler, 1999; Oladele & Ogundipe, 2016). Table 5 provides a comparison between the findings of this study and previous research.

Table 5: A comparison of the attribute rankings between this research and other authors

This research: *Sports bras*	**Research by Oladele and Ogundipe (2016): *Fashion clothing***	**Research by Fowler (1999) & Casselman-Dickson (1993): *Sportswear***	**Research by Pillai (2014): *Sportswear***
Brand	Fit	Fit	Quality
Fit	Design/style	Design/style	Price
Price	Price	Price	Brand name
Function	Colour	Brand	Brand sponsorship
Design/Style	Brand		Country of manufacture

A discussion follows of the top three ranked attributes:

a) Brand:

According to Tsarenko and Lo (2017), female consumers place high utility on branded products when shopping for bras. Functional bras, such as sports bras, are associated with higher levels of risk, and therefore brand names play an important role in

alleviating the pressure present in the decision-making process (Hume & Mills, 2013; Tsarenko & Lo, 2017).

b) Fit:

Hart and Dewsnap (2001) and Tsarenko and Lo (2017) indicate that functional consumers want to be brand loyal, but bra fit is an obstacle to brand loyalty. Several authors identified that females place high importance on fit due to a lack of availability of sportswear designed for the feminine silhouette (Fowler, 1999; May-Plumlee & Little, 2001; Oladele & Ogundipe, 2016; Sanad, 2016).

c) Price:

The research results reflect prior research that identified price as an important attribute when people consider bra purchases, especially as price is often used as an indicator of product quality (Hart & Dewsnap, 2001; Risius, Thelwell, Wagstaff, & Scurr, 2012).

Finding:

Marketers should concentrate their efforts on building the brand and its meaning to consumers of sports bras. If females can identify with the brand and view the purchase as low-risk, they are more likely to buy the product (Tsarenko & Lo, 2017). A critical element of lowering the purchasing risk is to ensure that the product fit meets the target market's sizing and cut requirements. An ill-fitting sports bra is an obstacle to brand loyalty (Hart & Dewsnap, 2001).

4.2.2. Relative importance of product attribute levels

Table 6 shows the utilities for each attribute level and Appendix B contains a visual representation of the data. Marketers can use this information to enhance their product offering in the South African market.

Table 6: The utilities for each attribute for sports bras (source: conjoint estimates)

Attributes	Levels of Attributes	Utility estimates
Brand	Nike	18.28 *
	Adidas	18.25
	Puma	5.40
	Lorna Jane	-5.67
	Triumph	-8.20
	Cotton on	-11.54
	Boost Gymwear	-16.53
Fit	Compression	30.81 *
	Full coverage	8.20
	Adjustable	-6.90
	Shaping	-10.00
	Push-up	-22.11
Price	R250	47.22 *
	R500	8.33
	R750	-16.05
	R950	-39.50
Function	Anti-chaffing fabric	5.99 *
	Anti-bacterial fabric	0.33
	Anti-odour fabric	-2.31
	Moisture-wicking fabric	-4.02
Design/Style	Designed to enhance performance	7.59 *
	Designed for comfort	1.67
	Designed for durability	-2.85
	Designed for fashionability	-6.41

* *Shows the most preferred level in the attribute*

***Note**:*

The mean per attribute is equal to zero. Therefore the positive values indicate that the utility levels are above average, and the negative values indicate that the utility levels are below average.

a) Brand:

Nike (U=18.28) and Adidas (U=18.25) were the most popular brands of sports bras followed by Puma, with the least popular being Cotton On followed by Boost Gymwear. There is no significant difference in the mean utility ratings between Nike and Adidas (the pairwise ANOVA test shows a p-value variance between the brands of <0.00000001). Refer to APPENDIX C for the complete list of p-values.

The respondents preferred international sportswear brands such as Nike and Adidas as opposed to female-focused, fashionable or domestic brands such as Lorna Jane, Triumph, Cotton On and Boost Gymwear (Wickramasinghe & Liyanage, 2009).

Nike and Adidas are rated the top two sports and fitness brands globally, in Africa and emerging markets (Brand Africa, 2017; Credit Suisse, 2017). Credit Suisse (2017) explains the popularity of these brands owing to their market dominance, and the low penetration and market share of domestic sportswear brands. According to consumers, these brands are perceived as high quality, trustworthy and lower risk purchases than domestic brands (Jegethesan, Sneddon, & Soutar, 2012).

b) Fit:

Compression (U=30.81) is the attribute most preferred by consumers, followed by full coverage (U=8.20). These attributes provide maximum support and reduce breast movement during physical activities, which is crucial to women's wellbeing (PRWeb, 2018; Zhou, Yu, & Ng, 2011). Adjustability of straps, shaped and push-up cups were the least preferred product attributes.

These findings are consistent with studies conducted by Brown et al. (2014) and Zhou, Yu, and Ng (2013), who found the most effective sports bras shared features such compression, high neckline coverage with a slight elasticity, and no padding with non-adjustable straps.

c) Price:

Females show sensitivity to price as illustrated in

Figure 9. The lower the price of the sports bras the more attractive they are to women (utility levels decrease as price increases).

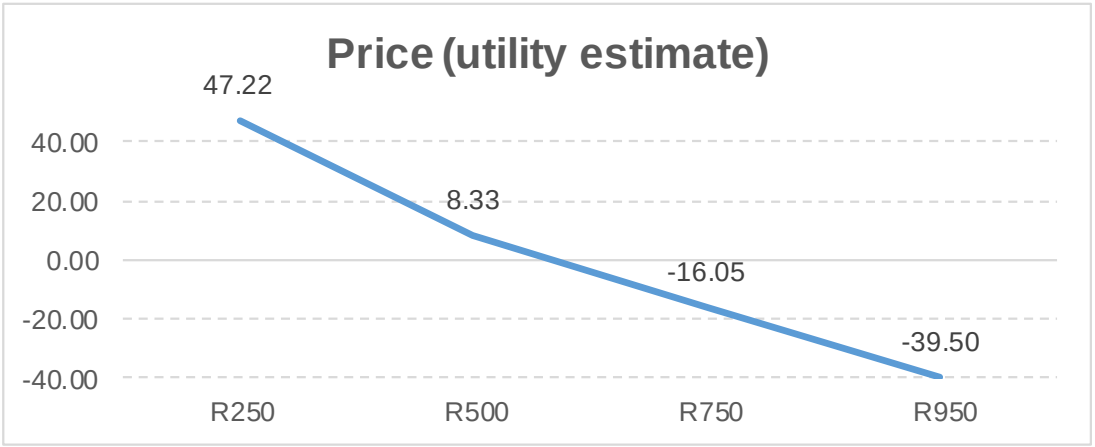


Figure 9: Price sensitivity of females purchasing sports bras

Sports bras priced at R950 had the lowest mean utility value (U=-39.50). Respondents preferred sports bras priced between R250 and R500, suggesting price-sensitivity at upper levels. The survey results indicate that consumers are unlikely to buy sports bras that cost more than R500 (U=-16.05 for R750 and U=-39.50 for R950).

Value for money is a priority among female shoppers (Financial Times, 2017) and research by Bui (2013) suggests that the state of the country's economy plays a significant role in consumer's tendency to focus on price to make purchasing decisions. The South African economy is strained, and consumers have to deal with rising prices for clothing (Statistics South Africa, 2017). This may influence the consumer's price sensitivity, as evidenced by the research results (News24wire, 2016).

According to Allemann (2017), the South African consumer does not link premium to price. This is supported by research which shows that although the price is an important consideration when purchasing bras, consumers do not necessarily link price to higher product quality (Oladele & Ogundipe, 2016).

d) Function:

The most popular fabric function was anti-chaffing (U=5.99), followed by the anti-bacterial material (U=0.33). Consumers did not favour anti-odour (U=-2.31) or moisture-wicking fabric (U=-4.02).

e) Design/Style:

Despite being the least important product attribute, respondents preferred performance enhancement (U=7.59) and comfort (U=1.67), over durability (U=-2.85) and fashion (U=-6.41). This is consistent with prior studies that found consumers make sportswear choices on the basis of practicality (Jegethesan et al., 2012).

Finding:

Marketers targeting active females should focus their efforts on building the brand image with performance enhancement as a key theme. Product fit is critical to ensure

the delivery of the performance enhancement message and manufacturers must ensure that they do not out-price relative to competitors.

Table 7 shows the best and the worst possible product bundles that can be offered to active females.

Table 7: The best and the worst product bundles

Best possible bundle	***Worst possible bundle***
Nike sports bra at R250 offering compression in anti-chaffing fabric designed to enhance performance	Boost Gymwear sports bra at R950 offering push-up cups or padding in moisture-wicking fabric that is fashionable.

4.3. Results pertaining to Proposition 2

Proposition 2: The relative importance of product attributes differ by age cohorts.

Spearman's rank correlation coefficient is a technique which can be used to summarise the strength and direction (negative or positive) of a relationship between two variables on non-parametric data. The correlation coefficients were generated by comparing the conjoint utilities and age categorisation data using SAS.

Table 8 shows the Spearman rank-order correlation results, which indicate a weak intercorrelation between age and the product attributes: brand (p=0.021; r=0.712), price (p=-0.118; r=0.033), design/style (p=0.075; r=0.179), function (p=0.038; r=0.179) and fit (p=0.102; r=0.067).

Table 8: Spearman's correlation between age and the ranking of product attributes

Variable:	Utility	Spearman Correlation Coefficients (r_s)	Prob > |r| under H_0: ρ_S=0	
Attribute importance	**Brand**	0.021	0.712	
	Price	-0.118	0.033	**
	Design/Style	0.075	0.179	
	Function	0.038	0.493	
	Fit	0.102	0.067	
Brand	**Nike**	-0.008	0.881	
	Puma	0.030	0.588	
	Adidas	-0.121	0.029	**
	Boost Gymwear	0.055	0.322	
	Cotton On	-0.144	0.010	**
	Triumph	0.126	0.023	**
	Lorna Jane	-0.004	0.941	
Price	**R250**	-0.112	0.043	**
	R500	0.038	0.501	
	R750	0.008	0.889	
	R950	0.113	0.042	**
Design/Style	**Comfortable**	0.034	0.546	
	Durable	-0.069	0.213	
	Fashionable	-0.069	0.219	
	Performance	0.134	0.016	**
Function	**Moisture-wicking**	0.045	0.415	
	Anti-odour	0.069	0.213	
	Anti-chaffing	-0.060	0.285	
	Anti-bacterial	-0.090	0.107	
Fit	**Adjustable**	-0.023	0.674	
	Uplifting	-0.111	0.047	**
	Shaping	-0.074	0.184	
	Compression	0.102	0.068	
	Coverage	0.059	0.288	

*Note: If abs(r_s) >=0.5 large correlation; >=0.3 medium; >=0.1 weak. Values with ** are significant at a 95% confidence level*

Across all age groups, brand is the most important attribute. Price and fit make the top three attributes in three of the four age categories, with the exception of the 45 years

and older age group where the top three attributes were brand, fit and design/style. The results are shown in Table 9.

Table 9: Importance of attributes by age group

Age	Factor	Mean	Mean Importance	95% Confidence Interval	
				Lower Bound	Upper Bound
Younger than 25	**Brand**	28.704	1	23.913	33.495
	Price	23.734	2	17.877	29.591
	Design /Style	12.213	5	9.845	14.582
	Function	15.009	4	12.656	17.361
	Fit	20.341	3	15.922	24.761
25-34	**Brand**	32.565	1	29.891	35.239
	Price	17.896	3	14.628	21.165
	Design /Style	13.616	4	12.294	14.938
	Function	13.348	5	12.035	14.661
	Fit	22.575	2	20.109	25.042
35-44	**Brand**	31.386	1	28.544	34.228
	Price	15.086	3	11.612	18.560
	Design /Style	13.639	4	12.234	15.044
	Function	12.821	5	11.425	14.216
	Fit	27.069	2	24.448	29.691
45 and older	**Brand**	33.978	1	29.526	38.431
	Price	13.432	5	7.988	18.875
	Design /Style	14.525	3	12.324	16.726
	Function	14.182	4	11.996	16.368
	Fit	23.882	2	19.775	27.989

The rank correlation coefficients of Spearman's rho indicate ***limited support for the proposition and weak correlation with age***, with specific instances of significance. These include:

- **Price**: The greater the age, the lower the importance of price. Rahulan et al. (2015) found that female Baby Boomers were less price sensitive due to their greater spending power.
- **Brand**: The greater the age, the lower the preference for the Adidas and Cotton On brands and the greater the preference for the Triumph brand (Table 8).

Hollensen and Opresnik (2015) indicate that although the Triumph brand has a broad consumer base, the brand is strongest in the older age group (ages 35-years and older).

- **Fit**: The greater the age, the greater the preference for sports bras that provide an uplifting fit (Table 8). Upliftment offers breast support to overcome breast sag (Risius et al., 2012). Biggs et al. (2008) show that fit is particularly important to females older than 45-years.
- **Design/style**: An increase in age is significantly related to the need for high-performance sports bras.

Finding:

Most age groups rank brand, fit and price as the top attributes, with specific instances where preferences differ by age category. Most notable, older females (aged 45 years and older) are less price sensitive, prefer bras with an uplifting fit and choose traditional bra brands over the more popular and youthful sportswear brands.

4.4. Results pertaining to Proposition 3

Proposition 3: South African females with high involvement in sport, rank functional attributes as more important than those that participate less frequently in sport.

Sports involvement was tested using two items: self-reported level of engagement (social or competitive sports participation) and physical activity level (the number of days participating in a sport per week) (Leksrisompong, 2010).

The t-test was selected to determine if there are significant differences in product attribute preference based on the level of sports involvement. The items were tested at a $p<.05$ significance level.

4.4.1. Social versus competitive sports engagement

The t-test on the mean conjoint utilities for the social and competitive engagement populations indicate that there is no significant difference in the ranking of the product attributes. Brand is most preferred, followed by fit, price, design/style and function.

An unequal variance t-test indicates that there is a significant difference in the mean scores for the product attribute "function" (p=0.0329<alpha value of 0.05). Females who competitively engage in sports place a higher value on fabric function relative to women who participate in physical activities on a social level. Table 10 contains the t-test results for the level of sports engagement.

Table 10: T-test results of sports engagement

Product attribute	Group Means		Equality of Variances	
	Social	Competitive	F Value	Pr > F
Brand	31.645	31.8661	1.06	0.7125
Price	17.1584	17.5558	1.27	0.1316
Design/Style	13.7734	13.1144	1.13	0.4422
Function	13.3186	13.9354	1.40	0.0329**
Fit	24.1070	23.5290	1.00	0.9753

*** Significant difference in mean scores between two groups; 95% confidence level*

A deep-dive into fabric function attribute shows that females who competitively participate in sport, have a higher preference for anti-chaffing fabric and a lower preference for anti-odour material compared to the social group (Figure 10).

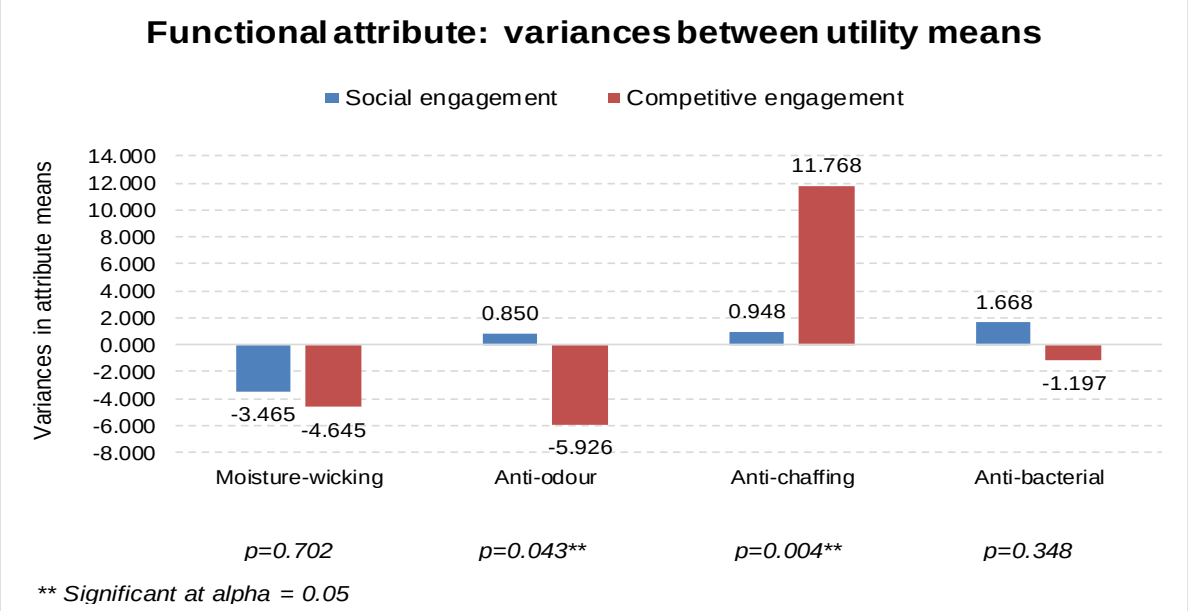


Figure 10: Functional attribute levels: variances between the attribute means

4.4.2. Frequency of activity

The t-test was applied to (1) a group of females who exercise 1-4 days a week, and (2) to a group who exercises 5-7 days a week.

The t-test on the mean conjoint utilities for the two groups indicates that there is no significant difference in the ranking of the product attributes. Brand is most preferred, followed by fit, price, design/style and function (slight, but insignificant, differences noted in the scoring of the latter two attributes between the two groups) (Table 11).

Table 11: T-test results of the frequency of sporting activity

Product Attribute	Group Means		Equality of Variances	
	1-4 per week	5-7 per week	F Value	Pr > F
Brand	32.477	30.628	1.13	0.4567
Fit	22.769	25.475	1.25	0.1610
Price	18.099	16.188	1.17	0.3323
Design/Style	13.248	13.801	1.03	0.8613
Function	13.409	13.908	1.04	0.7996

95% confidence level

Significant differences were noted in how the two groups scored the attribute levels.

Figure 11 shows that Nike and Adidas are the top two most preferred brands in both groups. These are international, unisex brands focusing on performance (Lim et al., 2016). An equal variance t-test analysis (significance level 5%) shows significant differences ($p<0.05$) in the mean scores for some of the brands following Nike and Adidas.

Active females display a greater preference for the brand ‘Lorna Jane’. This brand is a dedicated female fitness fashion brand (Horton, Ferrero-Regis, & Payne, 2016; Nash, 2016). Females with a lower activity level have a greater preference for the brands Puma and Triumph. These brands have a greater focus on lifestyle and fashion as opposed to sport. Triumph is a mass fashion brand (Seth, 2016; Wickramasinghe & Liyanage, 2009) and Puma is positioned as a lifestyle sports brand (First, 2009).

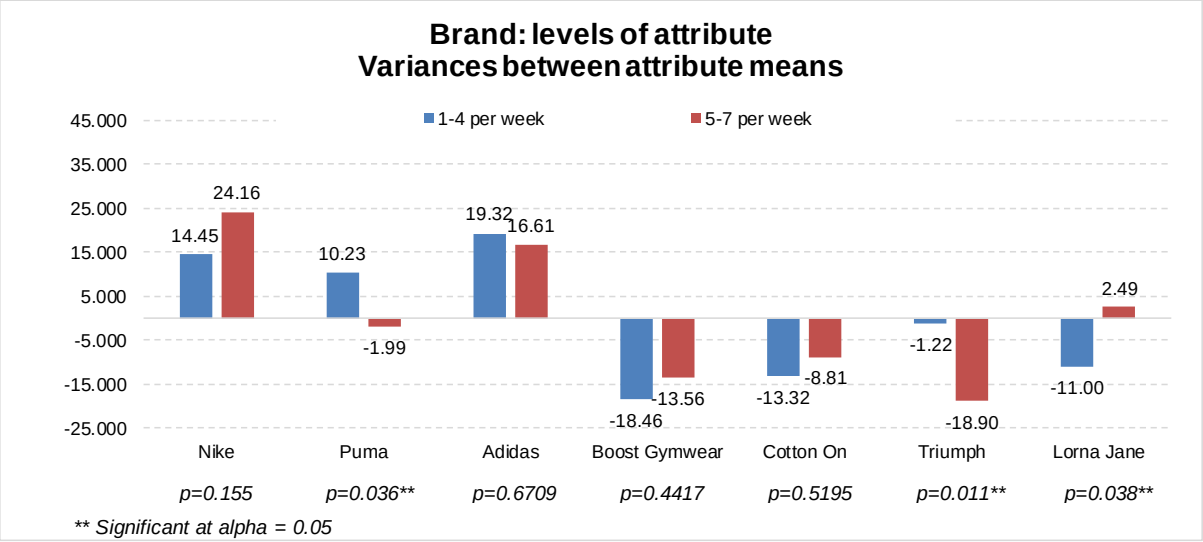


Figure 11: Brand attribute levels: variances between the attribute means

'Designed for performance' is the most preferred Design/Style attribute for sports bras across both groups. Figure 12 shows that in addition to performance, females who exercise 5-7 days, need durability. Less active females prefer performance and comfort.

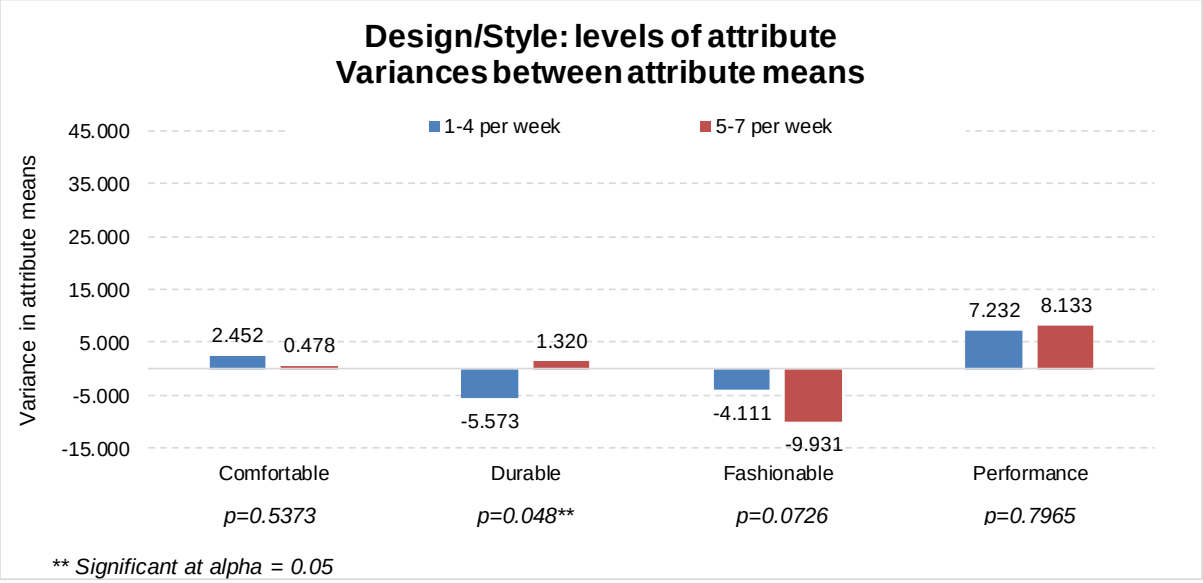


Figure 12: Design/Style attribute levels: variances between the attribute means

Both groups require anti-chaffing fabric. Females who exercise 1-4 days, have a higher preference for anti-odour fabric compared to the more active group (Figure 13).

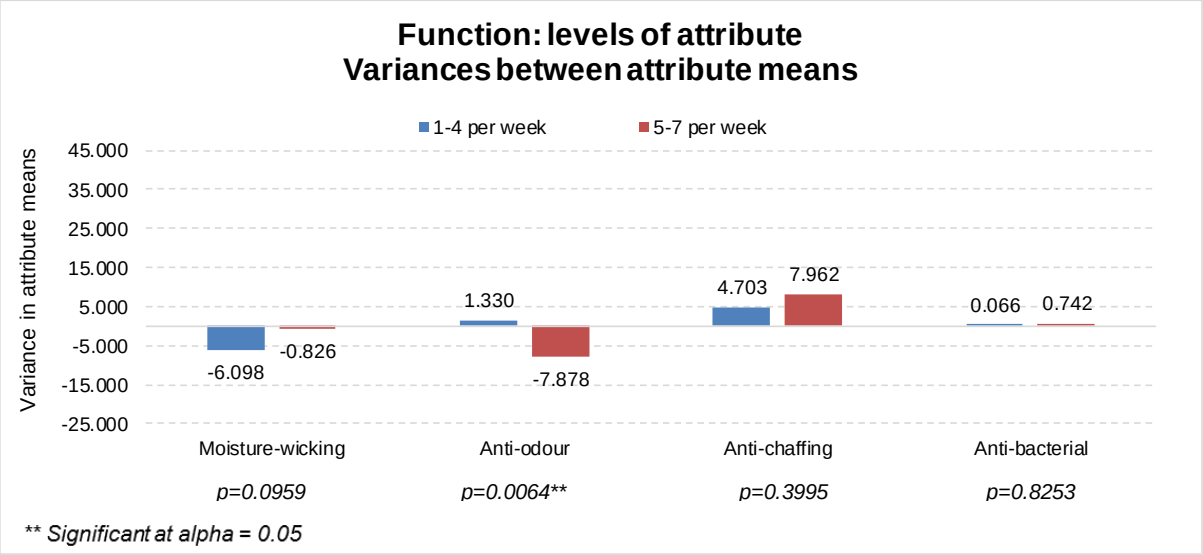


Figure 13: Functional attribute levels: variances between the attribute means

Compression and coverage are the most preferred Fit attributes for both groups. Sports bras that offer compression are significantly more preferred by females who exercise more than five days a week. Less active females have a greater preference for uplifting/push-up bra cups than those who exercise more frequently (Figure 14).

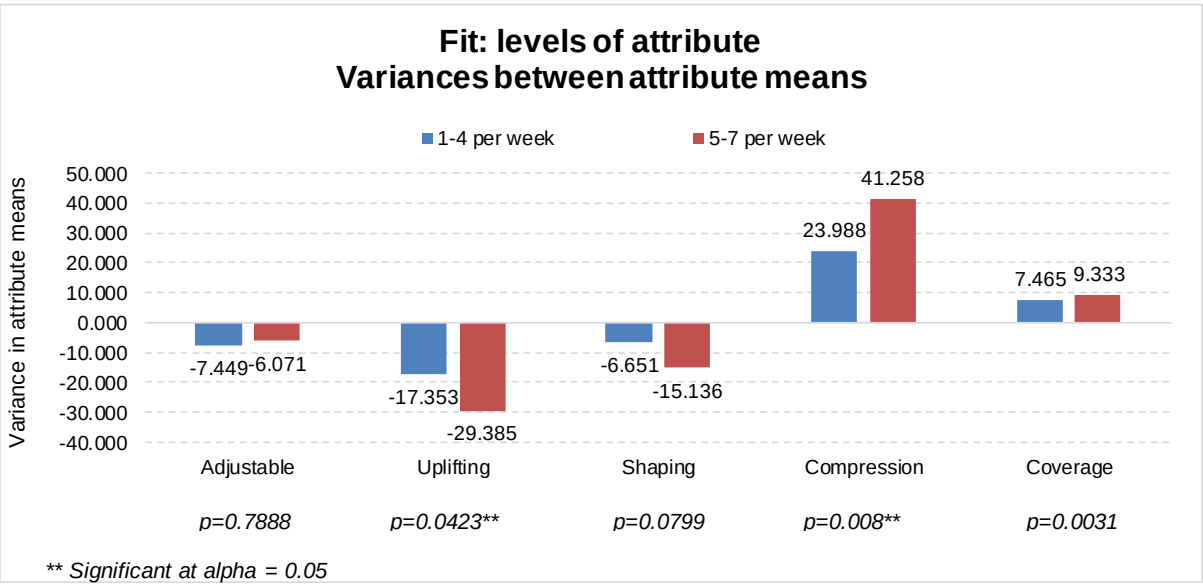


Figure 14: Fit attribute levels: variances between the attribute means

Finding:

Females who competitively engage in sport, have a greater preference for functional, anti-chaffing fabric compared to those who participate socially.

Females who participate more frequently in sport, prefer durable, performance-oriented sports bras which limit breast movement through compression in anti-chaffing fabric.

In addition to anti-chaffing fabric, less active females also display a greater preference for anti-odour fabric with uplifting bra cups.

4.5. Results pertaining to Proposition 4

Proposition 4: Distinct consumer clusters or segments can be identified based on the ranking of product attributes.

The attribute utilities of the conjoint analysis were fed into SAS and used in a cluster analysis to group respondents based on their product attribute preferences.

The objective of cluster analysis, as a statistical technique, is to segment respondents with similar characteristics into groups (Mooi & Sarstedt, 2011).

Before performing the analysis, data was visually inspected for outliers. Outliers representative of the sample were retained, and all other outliers, as well as clusters of single respondents, were removed (Mooi & Sarstedt, 2011). A hierarchical cluster analysis was first performed to identify the number of segments based on a scree plot (Figure 15). This information was then used to run the k-means clustering.

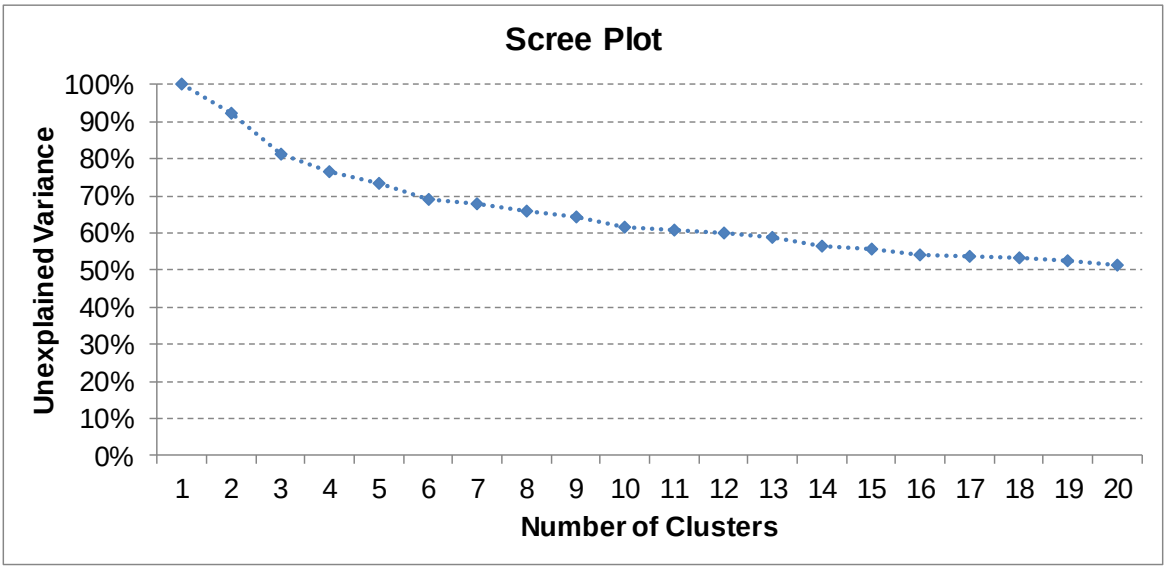


Figure 15: Scree plot

Output:

The k-means cluster analysis does not show a clear break-point, but there is an indication that there could be six clusters

One-way Kruskal-Wallis tests were completed for each of the six clusters to determine if there were differences at a utility level (e.g. brand). The mean utility levels were compared to determine if there were meaningful differences between the clusters. The tests revealed that there are no significant differences between the attribute rankings of the clusters, and the ***proposition is therefore rejected.*** These test results are shown in APPENDIX K.

At face value, the attribute preferences indicate that there could be different segments based on Price, Fit and Brand. Further research should be conducted to validate the indicative segments and the discriminants used. The indicative clusters are described in APPENDIX J.

This study shows little differentiation between clusters using product attribute preferences. An alternative segmentation technique could be used to identify distinct consumer segments. The implication for marketers is that the female market can be treated as a homogenous group based on the product attribute preferences.

Finding:

Cluster analysis based on the product attribute preferences indicates the market to be relatively homogeneous on most attributes. By implication, marketers can use a universal messaging hierarchy when advertising sports bras, i.e. brand, followed by the fit and then price.

4.6. Results pertaining to Proposition 5

Proposition 5: Physical stores are the most preferred channel for purchasing sports bras. Younger age cohorts have a higher preference for online shopping relative to older age cohorts.

The purpose of this section was to provide the marketer with insight on the most effective shopping channels to reach female sports bra users.

Respondents were asked to rate several channels on the likelihood of purchasing a sports bra using a five-point Likert scale from '1' to '5', where '1' means extremely likely and '5' extremely unlikely.

The points on the scale were:

- 1: Extremely likely
- 2: Somewhat likely
- 3: Neutral: neither likely nor unlikely
- 4: Somewhat unlikely
- 5: Extremely unlikely

As described in section 3.6, the channel preference was determined using a distribution-fitting algorithmic approach (Stacey, 2005).

4.6.1. Channel preference of the total sample

The standard deviations, as derived from the rescaled verbal scale values, were ranked to determine relative channel preference. The results are significant (chi-test p-value 0.0818< significance level of 5%) and the null hypothesis of "*no differentiation in channel preferenc*e" is rejected.

The analysis results are illustrated in Table 12. Refer to APPENDIX F for the detailed Gaussian distribution-fit analysis report which includes a table of the rescaled values.

Table 12: Preferred purchase channel using the distribution-fitting method (total sample)

Channel	Rank	Standard deviation: μ
Specialty store (for example, Nike store, Sportsman's warehouse)	1	1.14
Department store (for example, Pick 'n Pay)	2	0.05
Wholesaler (for example, Makro)	3	-0.13
Discount outlet (for example, Jam clothing)	4	-0,26
Online store (for example, Takealot, Zando)	5	-0.32
Social media (for example, Instagram, Facebook)	6	-0.49

Chi-test p-value = 0.0818< than significance level of 0.05

A ranking of the standard deviations of the channels shows that females prefer speciality sports stores for purchasing sports bras (μ=1.14), followed by department stores (μ=0.05). Compared to speciality and department stores, consumers would not choose to purchase sports bras at wholesalers, discount outlets, online stores or using social media.

The results are congruent with previous research that states that unlike other apparel categories, bra consumers prefer specialist retail stores offering a depth of range, size availability, and specialist fitting advice (Dewsnap & Hart, 2004).

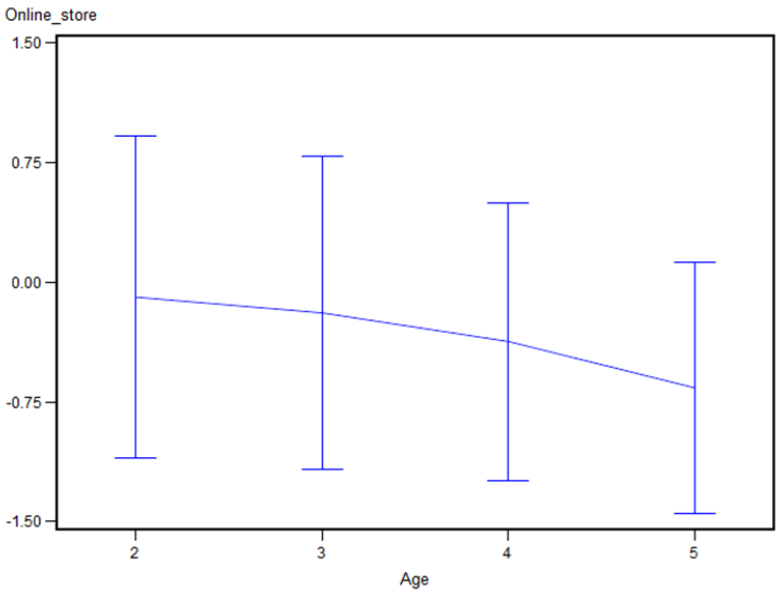
4.6.2. *Channel preferences across age segments*

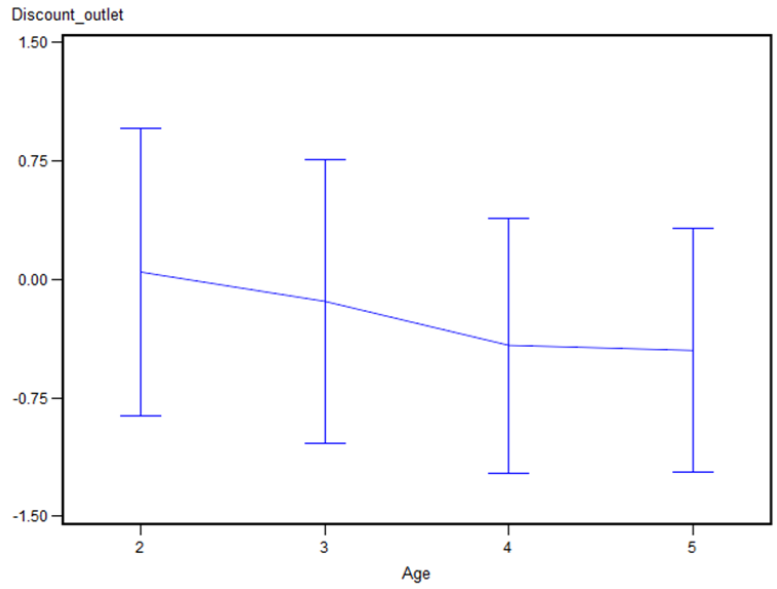
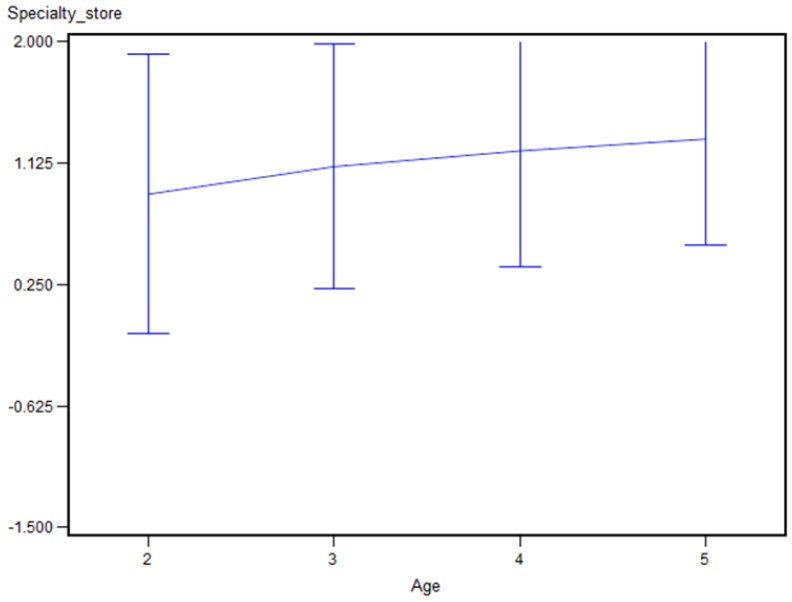
ANOVA tests were used to compare the channel responses across the age segments. Once significant differences were found using the ANOVA tests, the Bonferroni (Dunn) t-tests were completed to determine the significance of preferences between the age segments for a specific channel. This was done by conducting a post hoc analysis using pairwise age segment comparisons. This test was chosen as it does not require the overall ANOVA to be significant. The analysis was completed at a 5% significance level and is displayed in APPENDIX G.

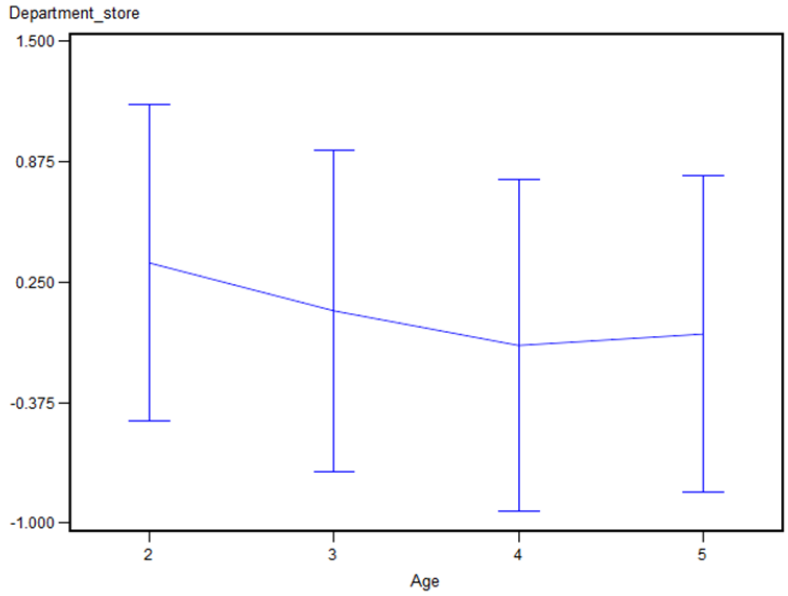
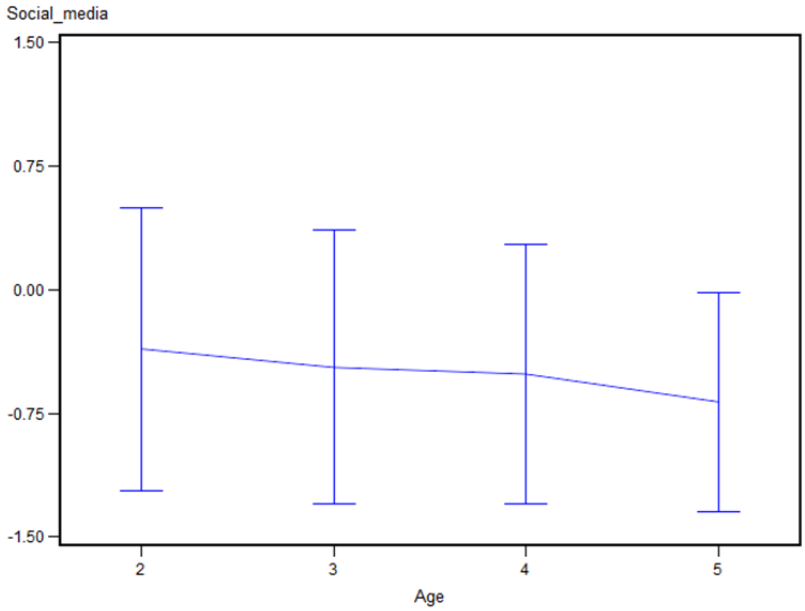
The female age segments are represented by numbers in Table 13:

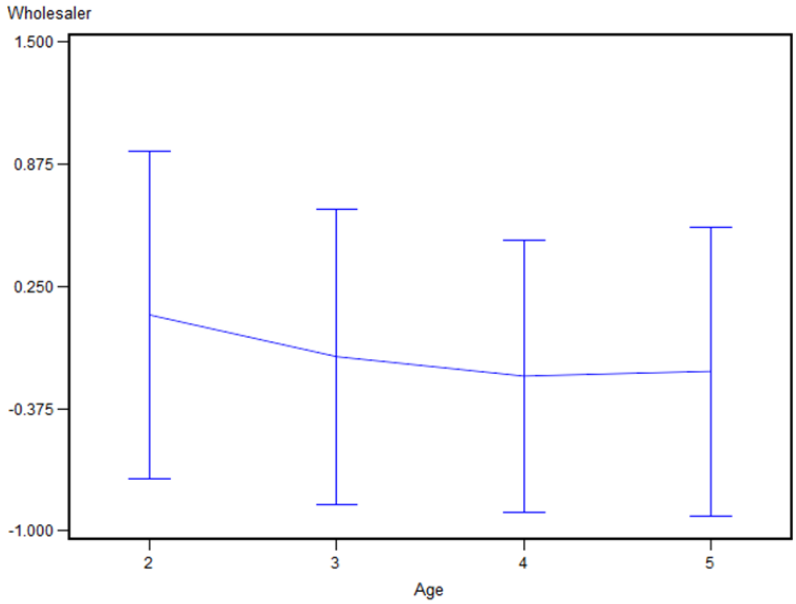
- 2 represents consumers aged 18-34 years old;
- 3 represents consumers aged 35-44 years old;
- 4 represents consumers aged 45-54 years old; and
- 5 represents consumers aged 55 years and older.

Table 13: Channel preferences

Online store: variance in means per age group  **p=0.0087<0.05, H_0 rejected, indicating significant variances between age groups**	Younger females (aged 18-34 and 35-44 yrs) are less negative about online stores than the older age cohorts (45 yrs and older). The older the female, the less likely they are to purchase sports bras from online stores.

Discount outlets  **p=0.0048<0.05, H_0 rejected, indicating significant variances between age groups**	Younger females are less negative about discount stores than older females. The older the female, the less likely they are to use discount stores to purchase sports bras.
Speciality stores  **p=0.1337 > 0.05, H_0 accepted, indicating there are no significant variances between age groups**	The Bonferroni t-test shows that we do not have enough evidence to conclude that there is a difference in the purchasing behaviour of sports bras across the different age cohorts in speciality stores.

Department stores  **p=0.0482<0.05, H_0 rejected, indicating significant variances between age groups**	The 18-34 age cohort shows a greater preference for department stores to the age groups 35 years and older
Social media  **p=0.2776>0.05, H_0 accepted, indicating there are no significant variances between age groups**	The t-test shows no significant differences between age cohorts for social media.

Wholesalers  **p=0.1572>0.05, H_0 accepted, indicating there are no significant variances between age groups**	The t-test shows no significant differences between age cohorts for wholesalers. .

Younger females (18-34 yrs and 35-44 yrs) are less negative about online and discount stores than older females (45 yrs and older). Younger females have a greater preference for department stores (e.g. Pick 'n Pay) than older females, and there are no significant age differences between speciality stores, wholesalers and social media channels.

Finding:

Shopping channel preferences differ by age groups. Younger females (aged 18-44 years) are less negative about online and discount stores than older females (ages 45 years and older) Physical stores, specifically, speciality and department stores, are the most preferred channels across all the respondents. This is consistent with the findings from Hart and Dewsnap (2001) who found that bra consumers preferred physical stores for specialist advice.

CHAPTER 5. CONCLUSION AND RECOMMENDATIONS

This study aimed to understand the consumer purchasing behaviour of sports bras. This chapter provides the main research findings, recommendations and research limitations.

5.1. Conclusions to research propositions

5.1.1. Relative importance of product attributes

Proposition 1: South African females rank the following product attributes as most important when purchasing sports bras: fit, followed by design/style, function, price and brand (Casselman-Dickson & Damhorst, 1993; Fowler, 1999).

The results show that South African females ranked Brand as the most important attribute, followed by Fit, then Price, Function and Design/Style. The results from the conjoint analysis therefore ***effectively reject*** the proposition.

Compared to studies done in other countries, South African females have a different ranking as determined by the research. Table 14 provides a comparison between the findings of this study and previous research.

Table 14: A comparison of the attribute rankings between this research and other authors

This research: *Sports bras*	**Research by Oladele and Ogundipe (2016): *Fashion clothing***	**Research by Fowler (1999) & Casselman-Dickson (1993): *Sportswear***	**Research by Pillai (2014): *Sportswear***
Brand Fit Price Function Design/Style	Fit Design/style Price Colour Brand	Fit Design/style Price Brand	Quality (composite variable of product characteristics) Price Brand name Brand sponsorship Country of manufacture

5.1.2. Relative importance of product attributes by age cohorts

Proposition 2: The relative importance of product attributes differ by age cohorts.

The rank correlation coefficients of Spearman's rho indicate a weak correlation between the product attribute ranking and the individual age groups. This implies that the importance attached to the different attributes do not differ significantly by age, which ***partially supports*** the proposition***.***

Specific instances of significant variances within the attribute levels were identified for brand, price, design/style and fit:

- **Brand:** Older females have a greater preference for the Triumph brand to Adidas and Cotton On. Triumph has historically attracted an older consumer (35 years and older), relative to Adidas and Cotton On which are focusing on attracting Millennials through sports performance and affordable fashion (Cotton On Group, 2015; Hollensen & Opresnik, 2015).
- **Price**: Older females are less price sensitive and are willing to pay higher prices for sports bras. The greater the age, the lower the importance of price (Rahulan et al., 2015).
- **Fit**: Older females have a greater preference for sports bras that provide breast support and upliftment to overcome breast sag (Risius et al., 2012).
- **Design/style**: An increase in age is significantly related to the need for high-performance sports bras.

5.1.3. Relative importance of product attributes by sports involvement

Proposition 3: South African females with high involvement in sport, rank functional attributes as more important than those that participate less frequently in sport.

Sports involvement was tested using two items: self-reported level of engagement (social or competitive sports participation) and physical activity level (the number of days participating in a sport per week) (Leksrisompong, 2010).

The results indicate that the level of sports involvement does not impact the ranking of the product attributes, i.e. females remain consistent with the ranking of brand, fit, price, function and design/style. There is, however, significant differences in the mean scores of certain product attribute levels. This implies that there is ***partial support*** for the proposition.

The significant differences include:

- Females who competitively engage in sports place greater importance on anti-chaffing fabric relative to women who practice sport socially.
- Females who exercise more than five days a week, display a greater preference for the female-only international fitness brands, durability and full coverage to limit breast movement during exercise.
- Females who exercise less than five days a week, display a greater preference for the lifestyle sports brands, such as Puma, and fabric with anti-odour qualities (First, 2009).

5.1.4. Consumer Segmentation

Proposition 4: Distinct consumer segments can be identified based on the ranking of product.

The cluster analysis showed limited differentiation between the respondent groups and the proposition is ***rejected***. The results indicate that the South African sports bra market appears to be relatively homogenous, based on the ranking of product attributes.

The relative variances in the mean scores of the attributes indicate potential segments. However, this requires further research into the discriminants of the study. Alternative segmentation techniques could also be considered in future studies.

5.1.5. Channel Preference

Proposition 5: Physical stores are the most preferred channel for purchasing sports bras. Younger age cohorts have a higher preference for online shopping relative to older age cohorts.

The ANOVA tests show that speciality sports stores are the most preferred channel, which ***supports*** the proposition. According to Hart and Dewsnap (2001), sports bra consumers show store loyalty and seek speciality advice.

Similar to older women, younger females prefer physical stores but display a higher incidence and preference for online shopping than older consumers (O'Sullivan et al., 2017).

5.2. Recommendations to organisations

The identification of the relative importance placed on product attributes will assist manufacturers to enhance their marketing strategies and new product development efforts. Recommendations are as follow:

Build brand trust to lower purchase risk

Brand plays a crucial role in high-involvement products such as sports bras, which are often purchased for their symbolic meaning, image reinforcement or physical reflection of aspirations and affiliations (Radder & Huang, 2008). Sports bras are regarded as high-risk purchases and need a trusted brand association to alleviate the pressure presented in the decision-making process (Tsarenko & Lo, 2017).

Marketers should, therefore, concentrate resources on building the emotive meaning of brands. If females can identify and build a connection with the brand, they are more likely to purchase the product (Wickramasinghe & Liyanage, 2009).

Adidas, for example, is championing the concept of the "versatile female athlete" by creating and communicating high-performance products, which can easily integrate into the female's lifestyle through versatile design and style (Mellery-Pratt, 2015). The

brand is building an image reflecting the social life and aspirations of its target audience. This strategy has paid off for the brand which, according to Forbes (2018), is the second largest sportswear company globally

The Triumph brand is another example. The brand is associated with fashionable lingerie, with low awareness of its sports bra range. The brand embarked on a marketing programme to educate consumers on lingerie designed for different purposes, such as sports (Wickramasinghe & Liyanage, 2009).

Fit as an obstacle to brand loyalty

Although the brand is important, marketers should not neglect the other product attributes, especially fit and price.

Product fit lowers the purchase risk to female consumers (Tsarenko & Lo, 2017). Sanad (2016) suggests that females' perception of "fit" is correlated to how the brand makes them feel. Therefore, emotive-driven product attribute communication, follows brand, but precedes product price in the messaging hierarchy for sportswear (Chi & Kilduff, 2011).

The product messaging should have a positive impact on how females feel, provide pleasure or social currency, and brands need to understand local market sizing and cut requirements to ensure relevancy with consumers (Tsarenko & Lo, 2017).

Price as an indicator of perceived value

Sportswear falls into the categories of budget and bridge pricing (Oladele & Ogundipe, 2016). This study revealed that to some degree, South African females are sensitive towards the price, as indicated by their preference for budget prices. It is therefore essential that brands build value that is greater than the cost at which consumers will purchase the product (Lau et al., 2006).

Physical stores

Marketers should consider the speciality store format as an extension of the brand to offer specialist advice. Jack Morton (2012) recommends creating in-person brand experiences to show females how the brand could fit into their lives.

O’Sullivan et al. (2017) further suggest a hierarchy of criteria that can be used in a physical store format to differentiate the consumer experience. It includes sales assistance, in-store promotions, brand availability, store accessibility (location and operating hours), store appeal (in-store displays and exterior design) and store atmosphere (store decorations, lighting, and temperature).

Nike and Under Armour have understood the value of having a positive, supportive network of speciality retailers. These brands have created female-friendly store environments that offer in-store advice and fitting services (Danziger, 2017).

Online shopping

The research results show that female consumers are not likely to purchase sports bras from online stores. Younger females (aged 18-24 and 35-44 yrs) are less negative about online stores than the older age cohorts (45 yrs and older).

Even though Generation Y consumers prefer physical stores, online shopping has a higher incidence of usage and should not be neglected as a channel for price-comparison and research (O’Sullivan et al., 2017).

Integrated sales channels

Marketers of sportswear should consider the types of physical and leisure activities that women pursue when defining channel strategies. Given that females prefer physical stores, marketers can create experiential events where the consumer can fit and purchase the brand in a socially relevant context. This experience can reflect the current and future contexts in which women will wear their garments (O’Sullivan et al., 2017).

Marketers also need to consider that women use online channels to research and spread word-of-mouth about products (Jack Morton, 2012). It can, therefore, be concluded that brands should be represented on these channels to educate consumers about the products.

5.3. Suggestions for future studies

- **Larger sample**: Future studies could include larger samples with a broader age and ethnic representation, using random sampling or non-convenience sampling to improve the inferences.
- **South African adoption of global trends**: Contradictory to the increased focus on fashion globally, this study showed that South Africans shop considering functional criteria (e.g. fit). Future research should understand the adoption of the athleisure trend in South Africa, using a longitudinal study.
- **Alternative segmentation approaches**: Explore alternative segmentation approaches to understand the differences in sports bra shoppers.
- **Explore alternative influencers of buying behaviour**: In addition to brand, price and style, consumers are also influenced by sales promotions, store atmospherics, and in-store stimuli (Bui, 2013; Lim & Aprianingsih, 2015). Future studies could explore the alternative factors influencing purchasing decisions, such as industry trends, channel, place, and promotion.
- **Understand geographical nuances**: Conduct a comparison of consumer behaviour in different areas of South Africa or an emerging market like South Africa.
- **Validate target market profile:** Validate the sample composition against the consumer profile of sports brands such as Nike and Adidas.
- **Explore other steps in the consumer purchase decision-making process:** Investigate other influencers of product preference and purchase, for example, search for information.

5.4. Limitations

The following possible limitations were identified:

- A newly designed measurement instrument was used.
- A convenience sample was used, which could have limited the sample size of specific age groups. The survey population is over-indexed versus the South African employed female population in the age category 25–54 years and under-indexed in the age categories 18-24 years and 55 years and older (Figure 16).

Although the survey respondents do not reflect the South African population distribution, it may represent the sports bra target market.

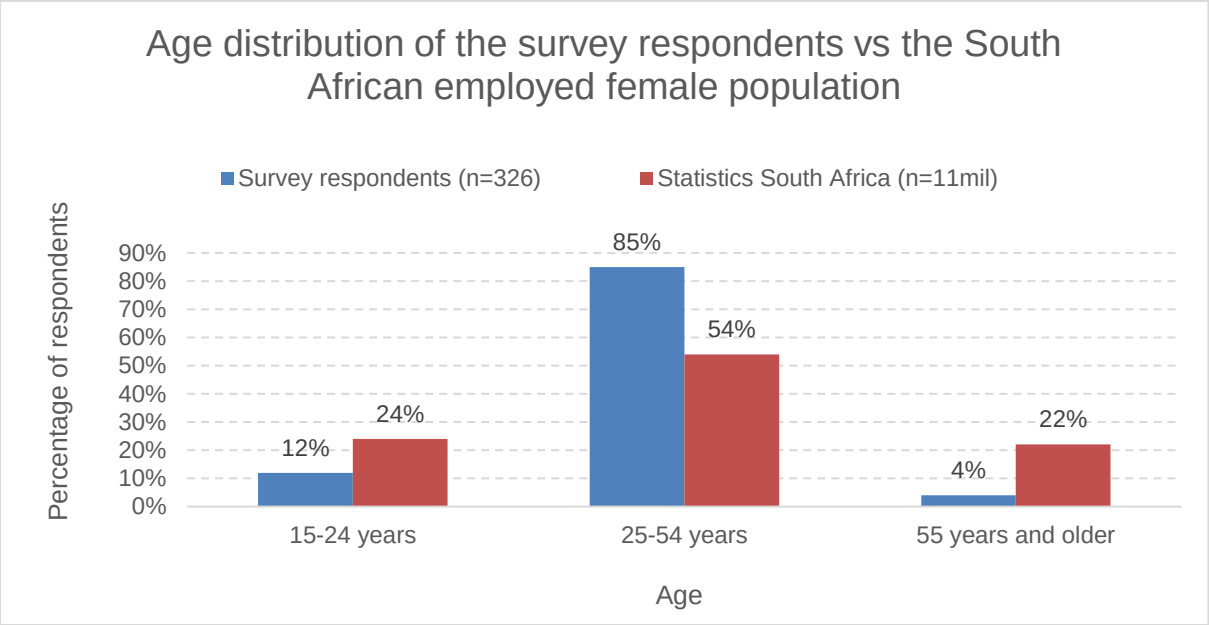


Figure 16: Survey respondents compared to South African population estimates

- The racial distribution of the sample may not be reflective of the South African ethnic composition, but may represent the sports bra target market.
- The sampling was predominantly performed online (95%), which may have lowered the response rate (persons without internet access excluded).
- Only one product category was tested (sports bras).
- The cluster analysis highlighted the potential for six segments. A deep-dive into the clusters showed a potential for a price-seeking cluster (price ranked as the most preferred attribute) and a fit-focused cluster (this cluster contains the greatest proportion of females with a size D+ bra cup and who rank fit as the most important attribute). A larger sample size may provide greater clarity on whether these distinctive clusters do exist.

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APPENDIX A. Questionnaire

Ranking of Sports bra product attributes

This is to confirm that Mrs Michelle Hutcheon is undertaking a bona fida academic project in partial fulfilment of the requirements of the Master of Business Administration (MBA) degree at the Graduate School of Business Administration, University of Witwatersrand, Johannesburg (Wits Business School).

Wits Business School MBA students are required to carry out an Applied Research Project on a topic of their choice, which typically requires data collection and analysis grounded in academic literature.

This survey is being distributed to collect data concerning the sports bra purchase behaviours of survey participants. The survey responses will be kept securely until the dissertation has been submitted and marked by Wits Business School, whereafter they will be destroyed.

Participation in the research is voluntary. Please note that all responses will remain confidential and will only be used for this research study. Should you have any questions, please contact 594915@students.wits.ac.za.

Ethical clearance

1) Please state below whether you consent to participate in the study	Select one
I have read and understood the above-mentioned, and I consent to take part in this study voluntarily	☐
I have read and understood the above-mentioned, and I do not consent to take part in this study	☐

If the participant does not consent, stop questionnaire.

Demographics

2) Please select your gender	Select one
Male	☐
Female	☐

If male, stop questionnaire.

Thank you for your participation. This survey targets females who purchase or intend to purchase sports bras.

Questionnaire continues if female…

3) Have you purchased a sports bra in the past 24-months or do you intend to buy one in the next 12-months?	Select one
Yes	☐
No	☐

If No, stop questionnaire.

Thank you for your participation. This survey targets females who purchase or intend to purchase sports bras.

Questionnaire continues if Yes…

4) Please select your age (years)	Select one
Younger than 18	☐
18-24	☐
25-34	☐
35-44	☐
45-54	☐
55 and older	☐

5) Please identify your ethnicity	Select one
Asian	☐
Black	☐
Caucasian	☐
Coloured	☐
Indian	☐
Other	☐

6) Please select your sports bra size	Select one							
	28	30	32	34	36	38	40	42+
AA-A	☐	☐	☐	☐	☐	☐	☐	☐
B-C	☐	☐	☐	☐	☐	☐	☐	☐
D-DD	☐	☐	☐	☐	☐	☐	☐	☐
E-F	☐	☐	☐	☐	☐	☐	☐	☐
FF+	☐	☐	☐	☐	☐	☐	☐	☐

A. Behavioural

7) Please select your involvement in sports activities	Select one
7.1. **No engagement:** I do not participate in sport or fitness activities	☐
7.2. **Social engagement:** I participate in sport and fitness activities, but do not compete	☐
7.3. **Competitive engagement:** I actively participate and compete in sport and fitness activities	☐

Only display this question if the respondent chose 7.2 or 7.3

8) How often do you participate in sport or fitness activities?	Select one
8.1. **1-2 days a week**	☒
8.2. **3-4 days a week**	☐
8.3. **5-7 days a week**	☐

9) Select your sports Impact level. This should be sports that you practice at least 1- 3 times a week	Select multiple
9.1. **Low impact,** e.g. Yoga, Pilates, Walking, Hiking, swimming	☐
9.2. **Medium impact,** e.g. spinning, cycling, boxing, mountain biking	☐
9.3. **High Impact,** e.g. running, jogging, HIIT, CrossFit, gymnastics, netball	☐

10) How do you use your Sports bra?	Select one
10.1. Use sports bras exclusively for sports/fitness	☐
10.2. Use sports bras only for casual wear	☐
10.3. Use sports bras for sports and casual wear	☐

B. Channel Preference

a) *Which of the following channels do you use when shopping for your favourite sports bra brand? Please rate EACH using a 5-point scale, using any number from 1 to 5; where '1' means extremely likely and '5' extremely unlikely.*

11) Where do you do most of your shopping for sports bras?	Extremely likely	Somewhat likely	Neither likely nor unlikely	Somewhat unlikely	Extremely unlikely
11.1. **Online store** (e.g. Zando, Takealot and Wish).	1	2	3	4	5
11.2. **Discount outlet** (e.g. Jam clothing)	1	2	3	4	5
11.3. **Speciality store** (e.g. Nike store, Adidas store, Ducathlon, Sportsman's warehouse and Totalsports)	1	2	3	4	5
11.4. **Department store** (e.g. Pick 'n Pay).	1	2	3	4	5
11.5. **Social media** (e.g. Instagram + WhatsApp, Facebook + WhatsApp)	1	2	3	4	5
11.6. **Wholesaler** (e.g. Makro)	1	2	3	4	5

C. Product attributes influencing shopping decisions for sports bras:

For each of the following pairs of sports bras, please choose the one that you prefer.

Rate your preference from '1' to '9' where:

- '1' indicates that you strongly prefer the bundle on the left,
- '5' indicates that you do not have a preference and
- '9' indicates that you strongly prefer the bundle on the right.

1.

NIKE R 250 Designed for performance Anti-chaffing fabric Compression: minimise breast movement				*or*	adidas R 500 Designed for comfort Anti-odour fabric Adjustable straps/bands/cups			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

2.

R 250 Durable: wash multiple times Anti-bacterial fabric Full coverage: limits breast spillage	*or*	R 750 Designed for performance Moisture-wicking fabric Uplifting: push-up

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

3.

R 250 Durable: wash multiple times Anti-odour fabric Uplifting: push-up	*or*	R 500 Designed for comfort Anti-chaffing fabric Compression: minimise breast movement

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

4.

R 500 Designed for comfort Moisture-wicking fabric Uplifting: push-up	*or*	R 950 Durable: wash multiple times Anti-bacterial fabric Shaping: creates attractive silhouette

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

5.

R 950 Durable: wash multiple times Moisture-wicking fabric Uplifting: push-up	*or*	R 750 Fashionable: latest colour/style Anti-odour fabric Adjustable straps/bands/cups

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

6.

LORNA JANE	*or*	adidas
R 500 Designed for comfort Moisture-wicking fabric Shaping: creates attractive silhouette		R 250 Fashionable: latest colour/style Anti-chaffing fabric Compression: minimise breast movement

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

7.

adidas	*or*	BOOST GYMWEAR
R 950 Durable: wash multiple times Anti-odour fabric Uplifting: push-up		R 250 Designed for comfort Moisture-wicking fabric Full Coverage: limits breast spillage

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

8.

	or	adidas
R 500 Fashionable: latest colour/style Anti-chaffing fabric Adjustable straps/bands/cups		R 750 Designed for performance Moisture-wicking fabric Shaping: creates attractive silhouette

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

9.

adidas	*or*	
R 500 Fashionable: latest colour/style Anti-bacterial Shaping: creates attractive silhouette		R 950 Designed for performance Anti-chaffing fabric Full coverage: limits breast spillage

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

10.

Triumph	*or*	LORNA JANE
R 500 Designed for comfort Anti-bacterial fabric Shaping: creates attractive silhouette		R 950 Fashionable: latest colour/style Anti-odour fabric Adjustable straps/bands/cups

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

11.

	*or*	LORNA JANE
R 950 Designed for comfort Moisture-wicking fabric Compression: minimise breast movement		R 500 Designed for performance Anti-odour fabric Uplifting: push-up

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

12.

BOOST GYMWEAR	*or*	NIKE
R 500 Durable: wash multiple times Anti-chaffing fabric Shaping: creates attractive silhouette		R 750 Designed for performance Anti-bacterial fabric Adjustable straps/bands/cups

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

13.

COTTON:ON	*or*	BOOST GYMWEAR
R 250 Designed for comfort Anti-chaffing fabric Full coverage: limits breast spillage		R 500 Fashionable: latest colour/style Anti-bacterial fabric Adjustable straps/bands/cups

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

14.

Triumph	*or*	PUMA
R 950 Fashionable: latest colour/style Anti-chaffing fabric Full coverage: limits breast spillage		R 250 Designed for performance Anti-odour fabric Compression: minimise breast movement

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

15.

LORNA JANE	*or*	NIKE
R 750 Durable: wash multiple times Anti-bacterial Compression: minimise breast movement		R 950 Fashionable: latest colour/style Moisture-wicking fabric Shaping: creates attractive silhouette

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

16.

COTTON:ON	*or*	BOOST GYMWEAR
R 500 Designed for performance Anti-chaffing fabric Adjustable straps/bands/cups		R 250 Designed for comfort Anti-odour fabric Full coverage: limits breast spillage

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

17.

PUMA	*or*	COTTON:ON
R 500 Fashionable: latest colour/style Moisture-wicking fabric Full coverage: limits breast spillage		R 250 Designed for comfort Anti-bacterial fabric Uplifting: push-up

1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

18.

COTTON:ON	*or*	NIKE
R 250 Durable: wash multiple times Moisture-wicking fabric Adjustable straps/bands/cups		R 950 Designed for performance Anti-bacterial Uplifting: push-up

1	2	3	4	5	6	7	8	9

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

19.

LORNA JANE R 950 Designed for comfort Anti-odour fabric Shaping: creates attractive silhouette				or	Triumph R 500 Durable: wash multiple times Moisture-wicking fabric Uplifting: push-up			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

20.

NIKE R 750 Durable: wash multiple times Anti-bacterial fabric Adjustable straps/bands/cups				*or*	Triumph R 250 Fashionable: latest colour/cut Anti-odour fabric Compression: minimise breast movement			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

21.

COTTON:ON R 500 Fashionable: latest colour/style Anti-odour fabric Full coverage: limits breast spillage				*or*	Triumph R 250 Designed for comfort Anti-chaffing fabric Adjustable straps/bands/cups			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

22.

adidas R 250 Designed for performance Anti-bacterial fabric Full coverage: limits breast spillage				*or*	NIKE R 750 Durable: wash multiple times Anti-odour fabric Compression: minimise breast movement			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

23.

LORNA JANE R 750 Fashionable design: latest colour/cut Anti-bacterial fabric Uplifting: push-up				*or*	BOOST GYMWEAR R 500 Designed for performance Anti-chaffing fabric Full Coverage: limits breast spillage			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

24.

Triumph R 950 Designed for performance Moisture-wicking fabric Compression: minimise breast movement				or	 R 750 Fashionable: latest colour /style Anti-chaffing fabric Shaping: creates attractive silhouette			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

25.

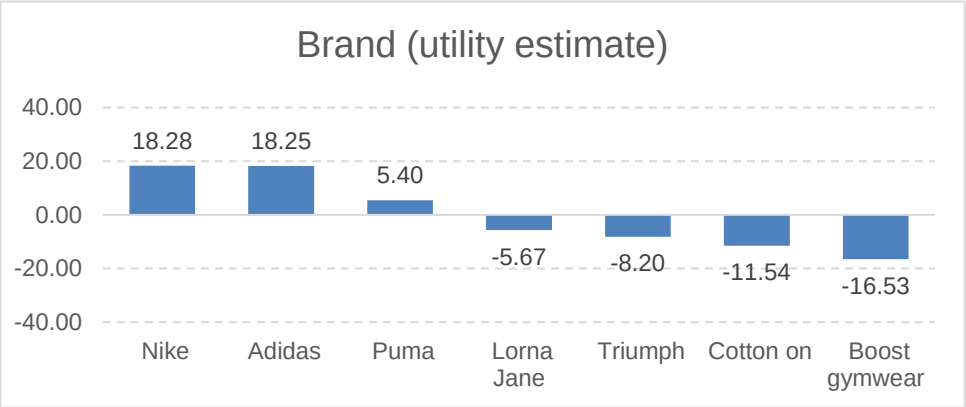
adidas R 750 Durable: wash multiple times Anti-chaffing fabric Compression: minimise breast movement				or	COTTON:ON R 250 Designed for performance Moisture-wicking fabric Shaping: creates attractive silhouette			
1	2	3	4	5	6	7	8	9
Strongly Prefer Left		Somewhat Prefer Left		Indifferent		Somewhat Prefer Right		Strongly Prefer Right

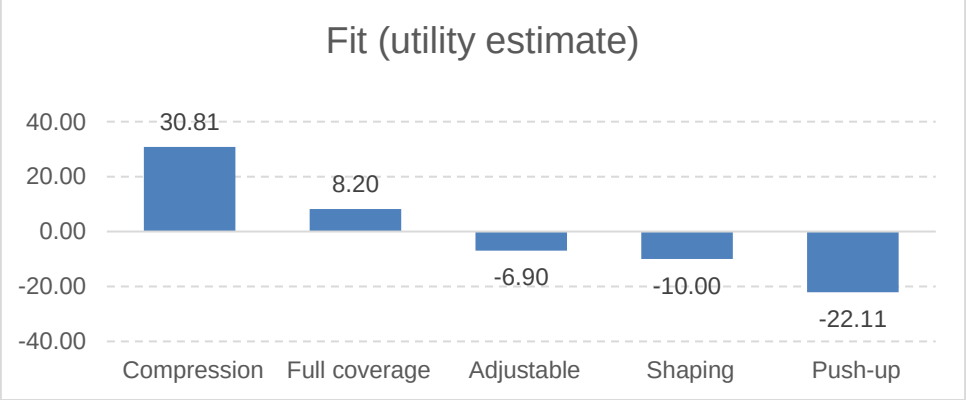
APPENDIX B. Comparison of the conjoint utilities

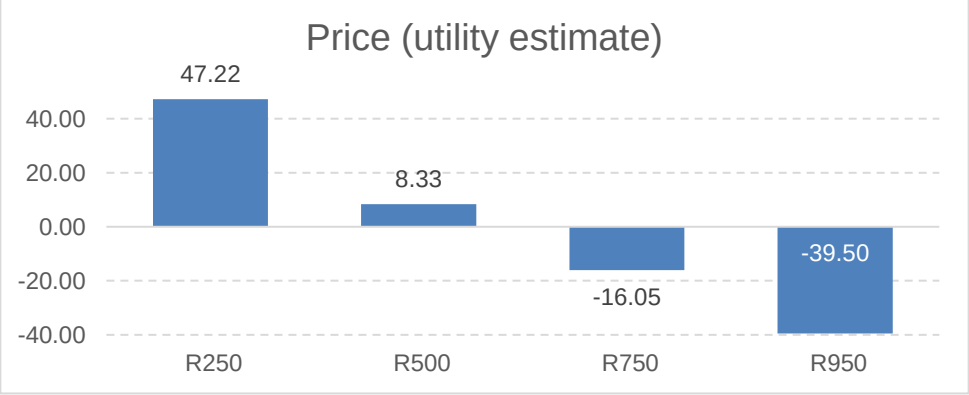
The charts show the differences in the attribute levels of an attribute. For example, Brand is an attribute. The attribute levels of Brand are, for example, Nike, Adidas and Puma.

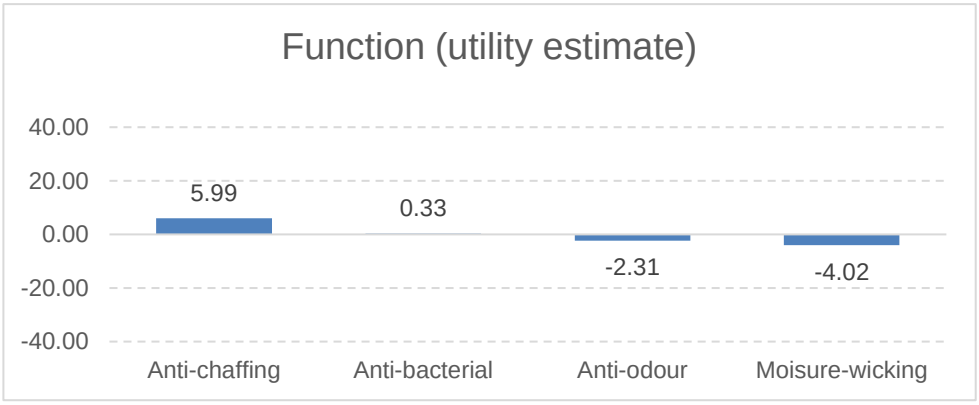
The product attribute level with the highest score is the most preferred item within the attribute. For example, Compression is the most preferred attribute level in the product attribute Fit.

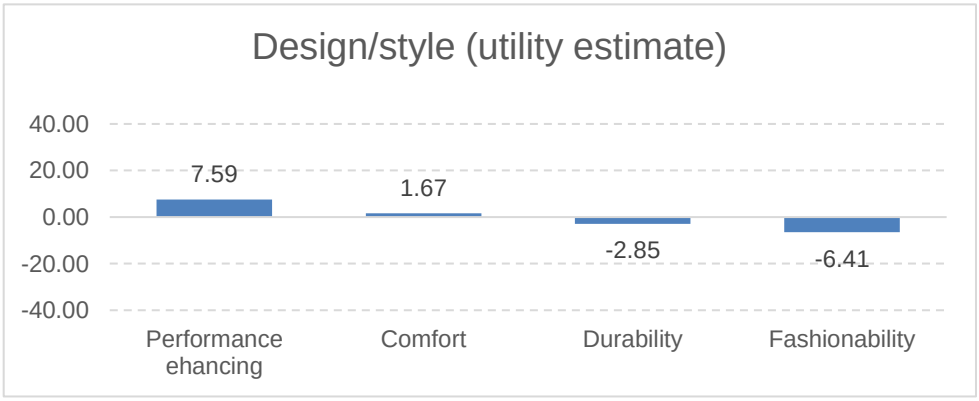
Table B.1 Utility levels per attribute level for the total sample











Note:
The mean per attribute is equal to zero. Therefore, the positive values indicate that the utility levels are above average, and the negative values indicate that the utility levels are below average.

APPENDIX C. Detailed analysis results for Proposition 1

Proposition 1: South African females rank the following product attributes as most important when purchasing sports bras: fit is most important, followed by design/style, function, price and then brand (Casselman-Dickson & Damhorst, 1993; Fowler, 1999).

R-Studio, an integrated development environment for R, was used to analyse the utility data from the conjoint analysis, which was performed in SPSS (Mooi & Sarstedt, 2011).

The following hypothesis was tested at a 5% level of significance:

- H_o: there is no difference between the means of the utilities, and
- H_1: at least one sample mean is different to the others.

Below are side-by-side boxplots of each utility. The bold line shows the medium of each utility. One can observe that Price, Design/Style and Function are similar, whereas Brand and Fit shows variation.

Since the p<2.2e-16 (2.2e-16 = 0.00000000000000022) is less than the significant level of 0.05, the null hypothesis (H_0) is rejected. Therefore, ***there is a significant difference in the means.***

The conjoint analysis produced attribute importance values. The higher the value of the importance, the more important the attribute to the consumers. The importance values were ranked from the most important to the least important attribute in Table 15.

Table 15: Descriptive statistics for the conjoint importance of the bra attributes

Position	Attribute	N	Minimum	Maximum	Mean	Std. Deviation
1	Brand	326	.00	98.76	31.75	15.004
2	Fit	326	.00	66.25	23.84	13.999
3	Price	326	.31	100.00	17.34	18.553
4	Function	326	.00	53.20	13.61	7.385
5	Design/Style	326	.00	46.85	13.47	7.421

Table 16 shows pairwise comparisons between the attributes. From the 'p-adj' column it can be seen that 'Function-Design/Style' shows that there is no significant difference between them.

Table 16: ANOVA t-test results on pair-wise attribute comparison

Tukey multiple comparisons of means: 95% family-wise confidence level				
	Diff	Lwr	Upr	p-adj
Price-Brand	-13.9326027	-16.934210	-10.930996	0.0000000
Design/Style-Brand	-18.2147260	-21.216333	-15.213119	0.0000000
Function-Brand	-18.1806849	-21.182292	-15.179078	0.0000000
Fit-Brand	-7.7274315	-10.729038	-4.725825	0.0000000
Design/Style-Price	-4.2821233	-7.283730	-1.280516	0.0009672
Function-Price	-4.2480822	-7.249689	-1.246475	0.0010945
Fit-Price	6.2051712	3.203564	9.206778	0.0000002
Function-Design/Style	0.0340411	-2.967566	3.035648	0.9999998
Fit-Design/Style	10.4872945	7.485688	13.488901	0.0000000
Fit-Function	10.4532534	7.451646	13.454860	0.0000000

There is a significant difference between the utilities, therefore by calculating the averages, it can be concluded that South African women are most influenced (in order) by Brand, Fit, Price, Function, and then Design/Style (with the latter two showing no significant differences between the two attributes).

Proposition 1 - Part 2: test the attribute levels

The attribute or utility levels were ranked to determine the importance. Within each attribute or utility level, the ranking is relative to each other. Therefore, by calculating the mean of each utility, the relative significance of each utility is determined.

For the brand utilities, the ranking is as follows: Adidas, Nike (no significant difference between these brands), Puma, Lorna Jane, Triumph, Cotton On and Boost Gymwear.

Table 17: Importance of the brand attribute levels

Pair-wise brand comparisons	diff	lwr	upr	Adjusted p-value
Puma-Nike	-11.2984621	-25.329350	2.732426	0.2090329
Adidas-Nike	0.6674352	-13.363453	14.698323	0.9999994
Boost Gymwear-Nike	-34.0234907	-48.054379	-19.992602	0.0000000
Cotton On-Nike	-30.2011880	-44.232076	-16.170300	0.0000000
Triumph- Nike	-26.5904398	-40.621328	-12.559552	0.0000005
Lorna Jane-Nike	-22.7276972	-36.758585	-8.696809	0.0000385
Adidas-Puma	11.9658973	-2.064991	25.996785	0.1536381
Boost Gymwear-Puma	-22.7250286	-36.755917	-8.694140	0.0000386
Cotton On-Puma	-18.9027259	-32.933614	-4.871838	0.0014111
Triumph-Puma	-15.2919777	-29.322866	-1.261090	0.0223530
Lorna Jane-Puma	-11.4292351	-25.460123	2.601653	0.1972269
Boost Gymwear-Adidas	-34.6909258	-48.721814	-20.660038	0.0000000
Cotton on-Adidas	-30.8686232	-44.899511	-16.837735	0.0000000
Triumph-Adidas	-27.2578750	-41.288763	-13.226987	0.0000002
Lorna Jane-Adidas	-23.3951323	-37.426021	-9.364244	0.0000192
Cotton On-Boost Gymwear	3.8223026	-10.208586	17.853191	0.9846238
Triumph-Boost Gymwear	7.4330508	-6.597837	21.463939	0.7057820
Lorna Jane-Boost Gymwear	11.2957935	-2.735095	25.326682	0.2092787
Triumph-Cotton on	3.6107482	-10.420140	17.641636	0.9885934
Lorna Jane-Cotton On	7.4734909	-6.557397	21.504379	0.7003856
Lorna Jane-Triumph	3.8627427	-10.168146	17.893631	0.9837597

*** padj<=0.05 is statistically significant*

Brand: In the pairwise comparison above, it shows us that Adidas and Nike are not significantly different from one another (since the p-value is equal to 0.9999994).

Price: For the price utilities, the ranking is as follows: R250, R500, R750, followed by R950.

Design/Style: For the design/style utilities, the ranking is as follows: Performance, Comfort, Durability and then Fashion.

Function: The ranking is as follows: Anti-chaffing, Anti-bacterial, Anti-odour and Moisture-wicking.

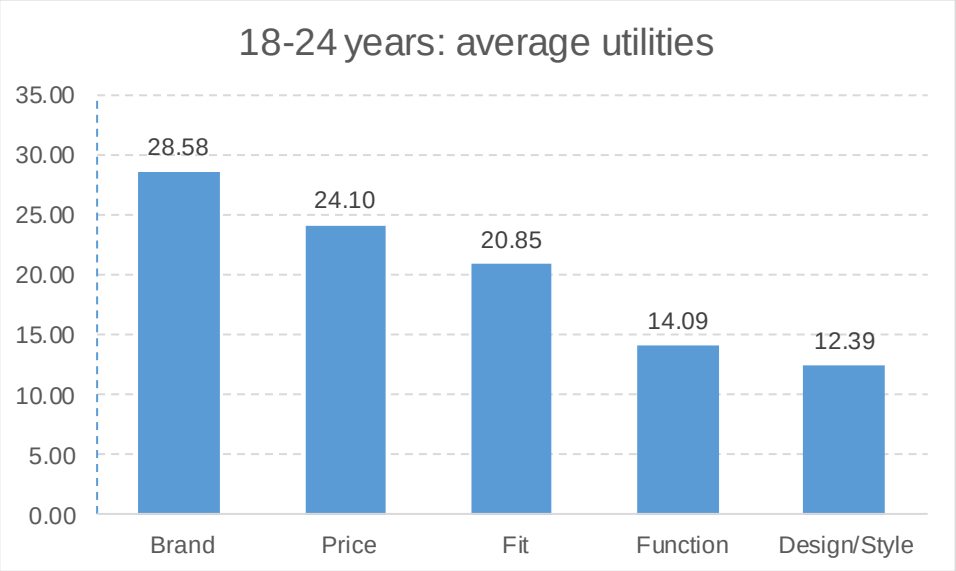
Fit: For the fit utilities, the ranking is as follows: Compression, Coverage, Adjustable, Shaping, Uplifting.

APPENDIX D. Detailed analysis results for Proposition 2

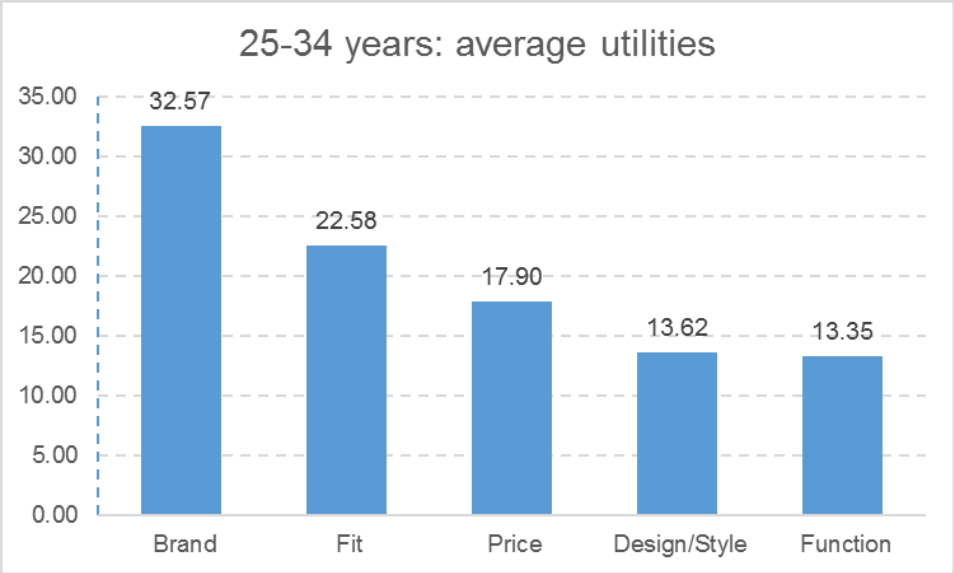
Proposition 2: The relative importance of product attributes identified in proposition 1 differ by age cohorts.

RStudio, an integrated development environment for R, was used to analyse the utility data post the conjoint analysis.

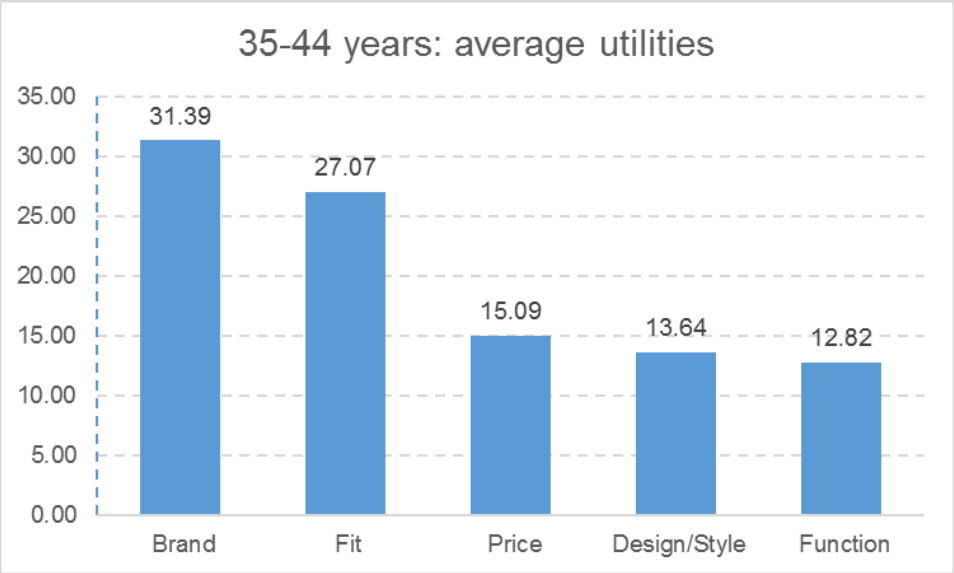
The 18-24 age group (n=37) are most influenced by Brand, Price, Fit, Function and Design/Style. This age group places a higher ranking on price which is consistent with findings from O'Sullivan et al. (2017) and Rahulan et al. (2015) indicating that generation Y consumers are more price-sensitive than the older age cohorts.



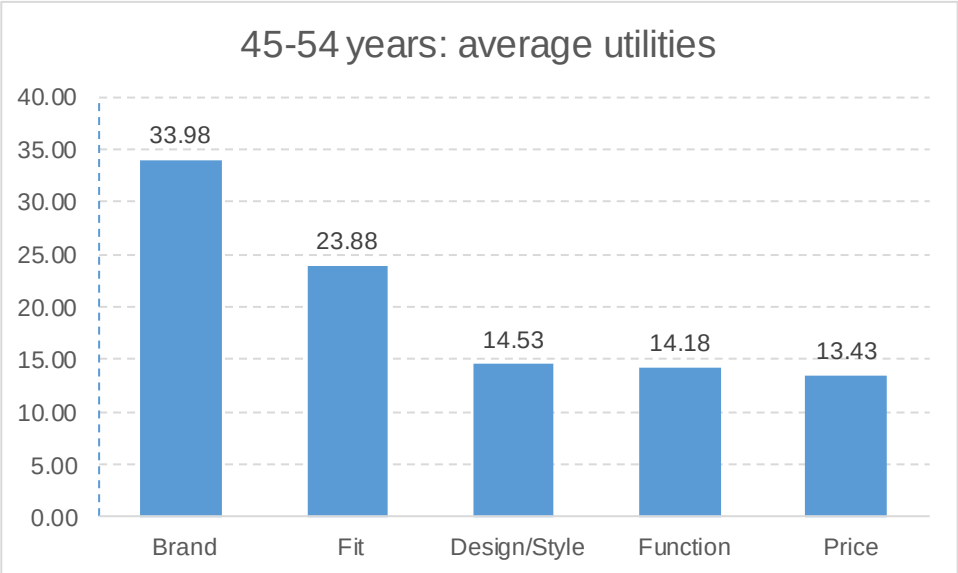
The 25-34 age group (n=122), are influenced by Brand, Fit, Price, Design/Style and Function.



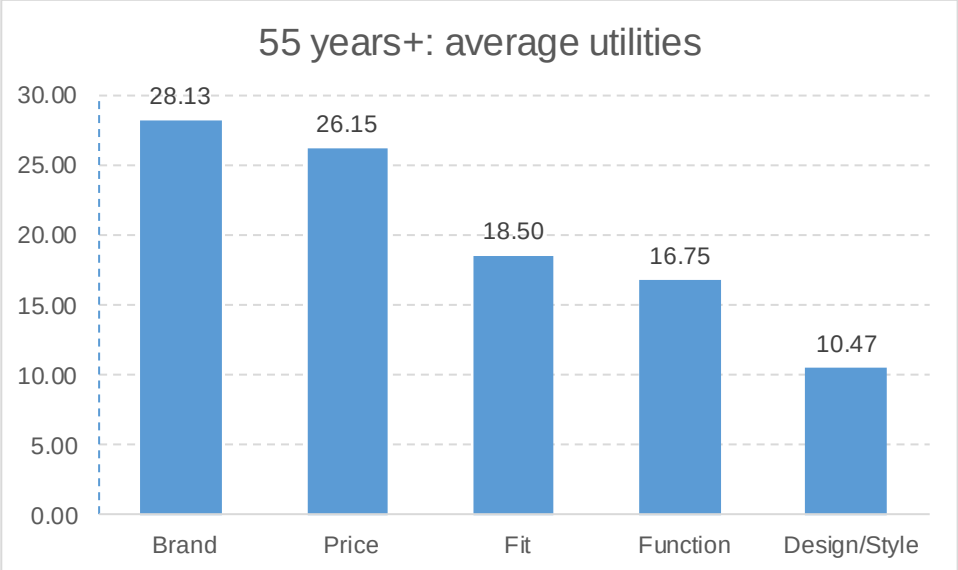
The 35-44 age group (n=110), are influenced by Brand, Fit, Price, Design/Style and Function.



The 45-54 age group (n=44), prefer Brand, Fit, Design/Style, Function and Price. This group is the least price-sensitive.



The age 55 and older age group (n=12), are influenced by Brand, Price, Fit, Function and Design/Style.



APPENDIX E. Detailed analysis results for Proposition 3

Proposition 3: South African females with high involvement in sport, rank functional attributes as more important product attributes than those that participate less frequently in sport.

To assess this proposition, One Way Analysis of variance was conducted with performance utility as the dependent variable and frequency of sport as the independent variable. The results are shown below;

Table 18: ANOVA and descriptive statistics - sporting days versus performance utility

Descriptives					
Performance					
	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
1-2 days a week	56	1.27	33.147	-7.609	10.145
3-4 days a week	133	9.97	29.365	4.935	15.009
5-7 days a week	128	8.13	30.865	2.735	13.532
Total	317	7.69	30.723	4.297	11.087

ANOVA					
Performance					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3027.464	2	1513.732	1.610	.202
Within Groups	295236.658	314	940.244		
Total	**298264.123**	**316**			

The results show that the highest utility for performance was among the women who participated in sport for 3–4 days a week (mean=9.97) followed by those who participated in sport for 5-7 days a week. The lowest utility for performance was among the women who participated in sport for 1-2 days a week (mean=1.27). The differences in the performance utilities by participation in sport were not significant at 5% significance level since the p-value (0.202) was greater than 0.05.

APPENDIX F. Gaussian distribution-fit algorithm results

	Online store	Discount outlet	Specialty store	Department store	Social media	Wholesaler	Overall
Observed frequencies							
5	152	142	17	106	177	120	**714**
4	50	52	12	33	50	56	**253**
3	16	28	10	26	31	36	**147**
2	54	49	75	91	26	61	**356**
1	33	33	197	49	18	31	**361**
n =	305	304	311	305	302	304	**1831**
Distribution parameters							
μ =	**-0.32**	**-0.26**	**1.14**	**0.05**	**-0.49**	**-0.13**	
σ^2 =	**0.86**	**0.75**	**0.76**	**0.71**	**0.64**	**0.56**	
Expected frequencies							
5	151.8	143.1	14.5	100.2	175.9	120.7	
4	43.4	46.8	16.2	47.0	46.4	54.5	
3	24.6	26.7	15.1	30.1	23.6	32.2	
2	52.9	56.6	68.3	74.4	41.6	67.2	
1	32.3	30.8	196.9	53.3	14.5	29.4	
χ^2 contributions							
5	0.0002	0.0088	0.4187	0.3387	0.0066	0.0046	
4	1.0046	0.5725	1.0695	4.1931	0.2866	0.0416	
3	2.9970	0.0619	1.7405	0.5619	2.3001	0.4456	
2	0.0236	1.0118	0.6665	3.7066	5.8407	0.5646	
1	0.0152	0.1607	0.0000	0.3426	0.8380	0.0881	
29.3110	4.0405	1.8158	3.8952	9.1429	9.2721	1.1446	

Chi-test *p*-value: 0.0818

"Solver" parameters	T_1	T_2	T_3	T_4		
Thresholds	-0.32	0.02	0.23	0.84		
Means	-0.1660	-0.1355	0.5966	0.0277	-0.2560	-0.0668
Variances	0.2366	0.2049	0.2082	0.1954	0.1756	0.1527

Sample size, n = | To prevent division by zero: 0

Hypothesis tests						
t-value	**-5.96**	**-5.22**	**23.06**	**1.09**	**-10.61**	**-2.98**
p-value	**0.0000**	**0.0000**	**0.0000**	**0.2749**	**0.0000**	**0.0031**

Rescaling of values						
"Expected value" within category:						
5	-1.0612	-0.9890	-0.6821	-0.8759	-1.0249	-0.8519
4	-0.1547	-0.1542	-0.1368	-0.1502	-0.1579	-0.1525
3	0.1194	0.1194	0.1262	0.1209	0.1178	0.1196
2	0.5039	0.5017	0.5592	0.5135	0.4857	0.4980
1	1.2876	1.2528	1.6571	1.2968	1.1749	1.1935
Squared differences from the mean:						
5	0.5539	0.5334	3.3170	0.8626	0.2875	0.5245
4	0.0263	0.0109	1.6281	0.0412	0.1095	0.0006
3	0.1904	0.1430	1.0261	0.0046	0.3678	0.0611
2	0.6738	0.5782	0.3363	0.2122	0.9494	0.3914
1	2.5747	2.2848	0.2683	1.5475	2.7677	1.7452
Variance with Discretisation Error:						
	0.6843	0.6042	0.5332	0.6122	0.4768	0.4701

Rescaled values	Online store	Discount outlet	Specialty store	Department store	Social media	Wholesaler
5	**-1.15**	**-1.07**	**-1.03**	**-0.95**	**-1.11**	**-0.92**
4	**-0.13**	**-0.14**	**-0.38**	**-0.17**	**-0.11**	**-0.15**
3	**0.17**	**0.16**	**-0.07**	**0.13**	**0.21**	**0.14**
2	**0.60**	**0.59**	**0.45**	**0.55**	**0.64**	**0.55**
1	**1.48**	**1.42**	**1.76**	**1.39**	**1.44**	**1.31**

Note: 5 = extremely unlikely; 4 = somewhat likely; 3 = Neither likely nor unlikely; 4 = somewhat likely; 1 = extremely likely

APPENDIX G. ANOVA reports for channel preferences

One-Way Analysis of Variance

The ANOVA Procedure

Dependent Variable: Online store

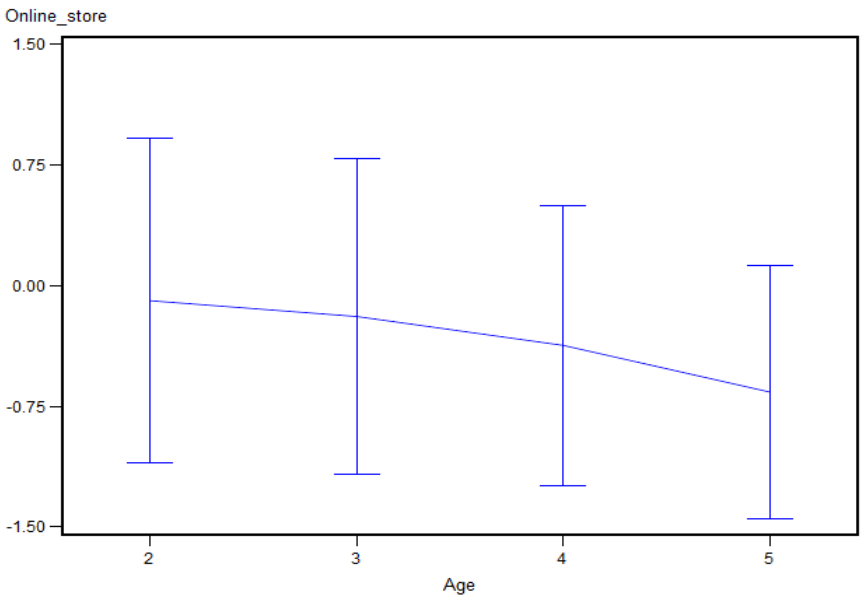
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	10.0259970	3.3419990	3.95	0.0087
Error	301	254.5497595	0.8456803		
Corrected Total	304	264.5757565			

Significant if less than 0.05 (95% confidence)

Bonferroni (Dunn) t-tests for Online store

Comparisons significant at the 0.05 level are indicated by *.**

Age Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
2 - 3	0.0981	-0.3604	0.5567	
2 - 4	0.2778	-0.1851	0.7408	
2 - 5	0.5683	0.0449	1.0917	***
3 - 2	-0.0981	-0.5567	0.3604	
3 - 4	0.1797	-0.1529	0.5123	
3 - 5	0.4701	0.0576	0.8827	***
4 - 2	-0.2778	-0.7408	0.1851	
4 - 3	-0.1797	-0.5123	0.1529	
4 - 5	0.2905	-0.1271	0.7080	
5 - 2	-0.5683	-1.0917	-0.0449	***
5 - 3	-0.4701	-0.8827	-0.0576	***
5 - 4	-0.2905	-0.7080	0.1271	



One-Way Analysis of Variance

The ANOVA Procedure

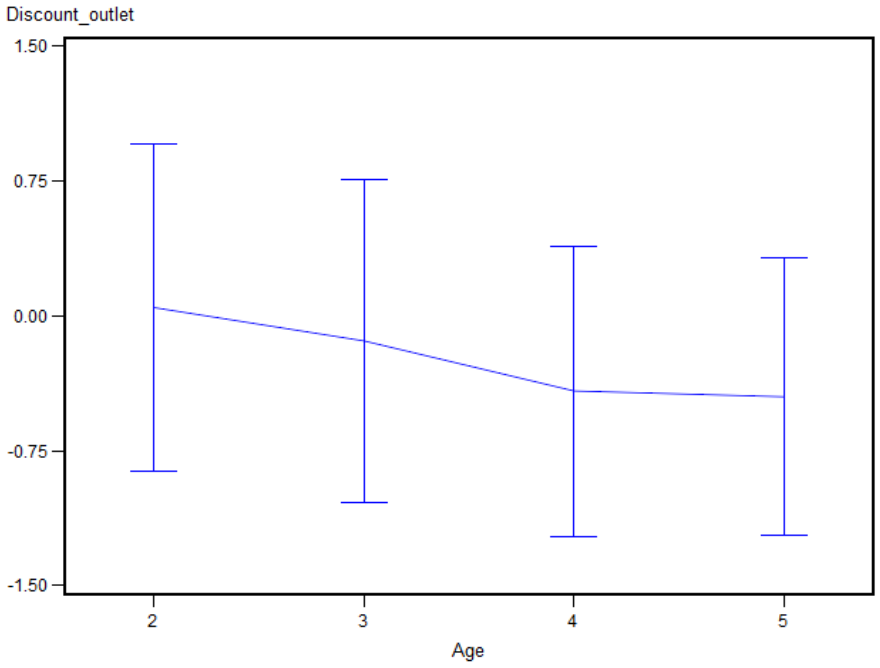
Dependent Variable: Discount outlet

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	9.5695560	3.1898520	4.39	0.0048
Error	300	217.8815446	0.7262718		
Corrected Total	303	227.4511006			

Bonferroni (Dunn) t-tests for Discount outlet

Comparisons significant at the 0.05 level are indicated by ***.

Age Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
2 - 3	0.1854	-0.2386	0.6093	
2 - 4	0.4639	0.0337	0.8940	***
2 - 5	0.4963	0.0092	0.9834	***
3 - 2	-0.1854	-0.6093	0.2386	
3 - 4	0.2785	-0.0300	0.5870	
3 - 5	0.3109	-0.0730	0.6948	
4 - 2	-0.4639	-0.8940	-0.0337	***
4 - 3	-0.2785	-0.5870	0.0300	
4 - 5	0.0324	-0.3584	0.4231	
5 - 2	-0.4963	-0.9834	-0.0092	***
5 - 3	-0.3109	-0.6948	0.0730	
5 - 4	-0.0324	-0.4231	0.3584	



One-Way Analysis of Variance

The ANOVA Procedure

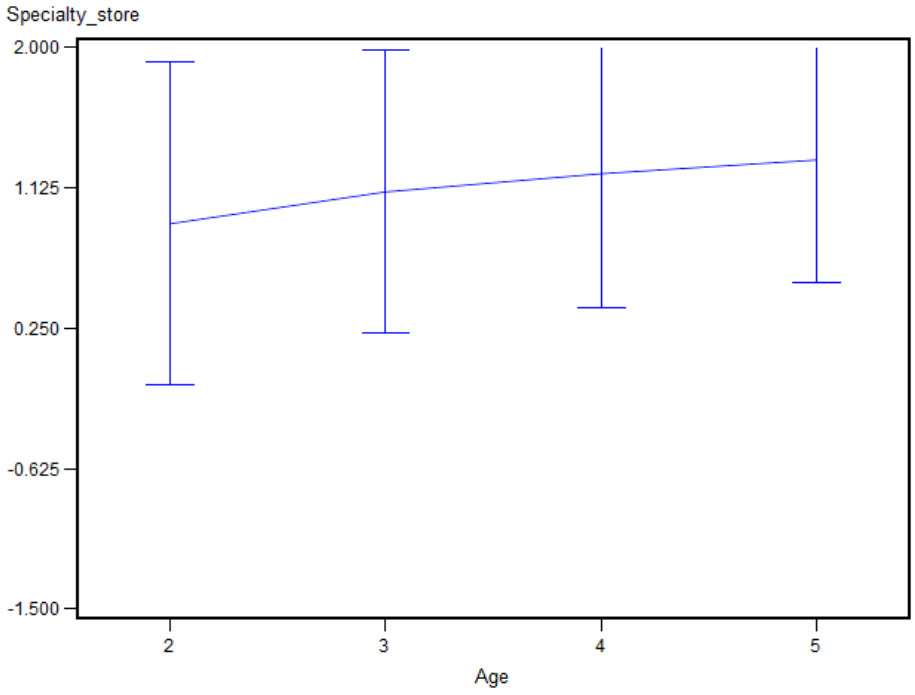
Dependent Variable: Specialty store

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	4.2065018	1.4021673	1.88	0.1337
Error	307	229.5315337	0.7476597		
Corrected Total	310	233.7380355			

Bonferroni (Dunn) t-tests for Specialty store

Comparisons significant at the 0.05 level are indicated by ***.

Age Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
5 - 4	0.0856	-0.3038	0.4749
5 - 3	0.1988	-0.1844	0.5820
5 - 2	0.3973	-0.0927	0.8874
4 - 5	-0.0856	-0.4749	0.3038
4 - 3	0.1133	-0.1960	0.4226
4 - 2	0.3118	-0.1229	0.7465
3 - 5	-0.1988	-0.5820	0.1844
3 - 4	-0.1133	-0.4226	0.1960
3 - 2	0.1985	-0.2307	0.6277
2 - 5	-0.3973	-0.8874	0.0927
2 - 4	-0.3118	-0.7465	0.1229
2 - 3	-0.1985	-0.6277	0.2307



One-Way Analysis of Variance

The ANOVA Procedure

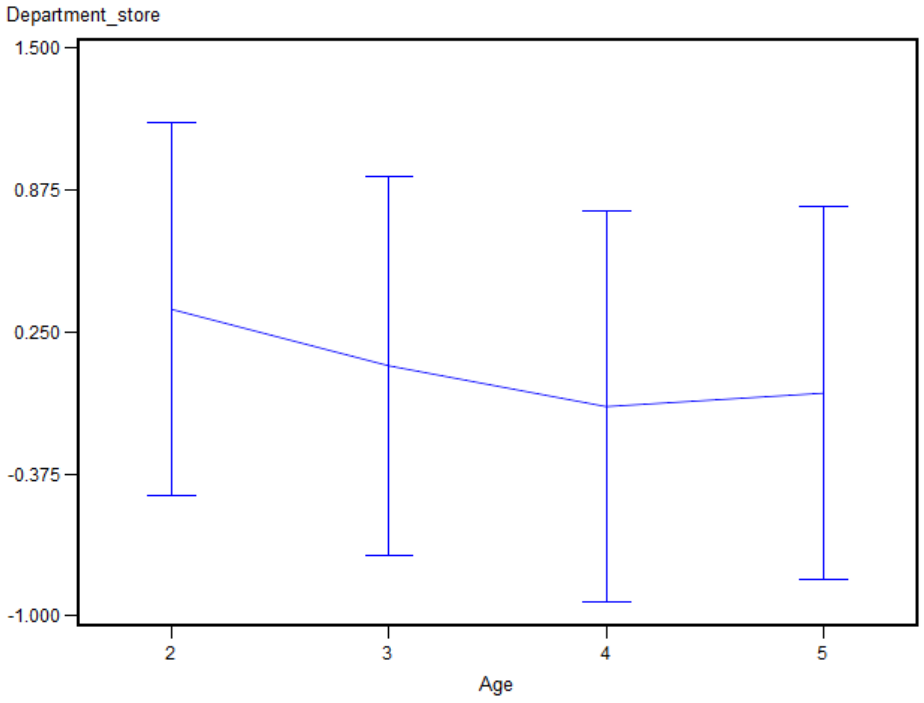
Dependent Variable: Department store

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	5.6541366	1.8847122	2.66	0.0482
Error	301	213.1294448	0.7080712		
Corrected Total	304	218.7835814			

Bonferroni (Dunn) t-tests for Department store

Comparisons significant at the 0.05 level are indicated by *.**

Age Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
2 - 3	0.2487	-0.1704	0.6677	
2 - 5	0.3692	-0.1097	0.8481	
2 - 4	0.4282	0.0041	0.8524	***
3 - 2	-0.2487	-0.6677	0.1704	
3 - 5	0.1205	-0.2565	0.4975	
3 - 4	0.1795	-0.1249	0.4840	
5 - 2	-0.3692	-0.8481	0.1097	
5 - 3	-0.1205	-0.4975	0.2565	
5 - 4	0.0591	-0.3236	0.4417	
4 - 2	-0.4282	-0.8524	-0.0041	***
4 - 3	-0.1795	-0.4840	0.1249	
4 - 5	-0.0591	-0.4417	0.3236	



One-Way Analysis of Variance

The ANOVA Procedure

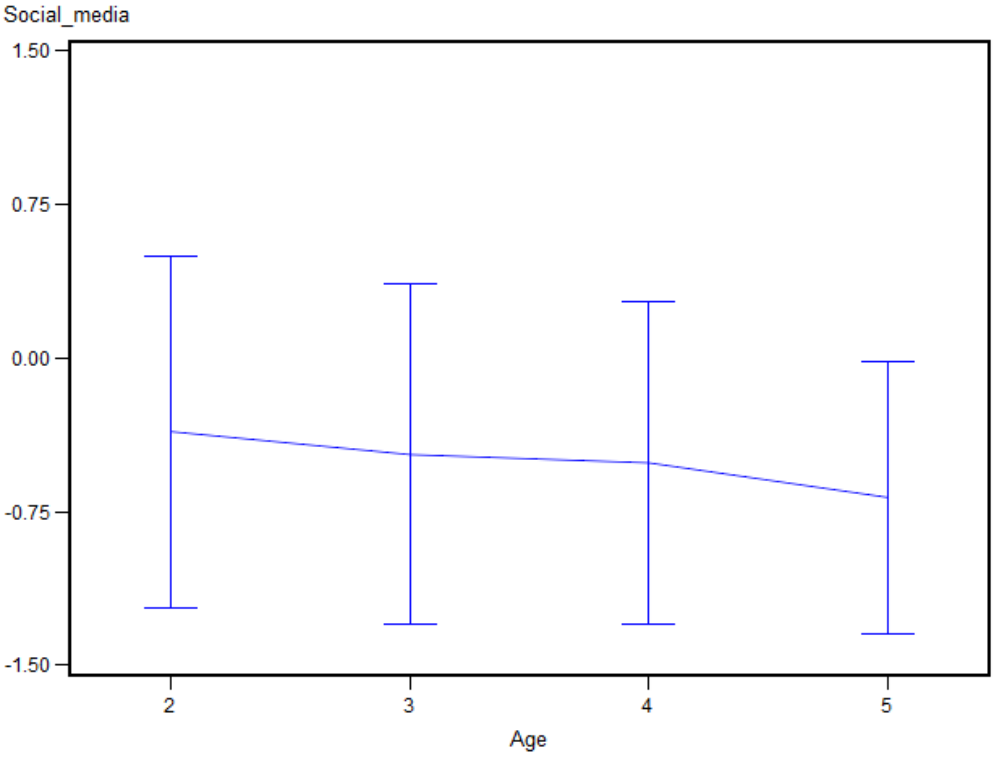
Dependent Variable: Social media

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	2.4499755	0.8166585	1.29	0.2776
Error	298	188.4940411	0.6325303		
Corrected Total	301	190.9440166			

Bonferroni (Dunn) t-tests for Social media

Comparisons significant at the 0.05 level are indicated by ***.

Age Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
2 - 3	0.1120	-0.2841	0.5082
2 - 4	0.1524	-0.2490	0.5539
2 - 5	0.3213	-0.1353	0.7779
3 - 2	-0.1120	-0.5082	0.2841
3 - 4	0.0404	-0.2481	0.3289
3 - 5	0.2092	-0.1521	0.5706
4 - 2	-0.1524	-0.5539	0.2490
4 - 3	-0.0404	-0.3289	0.2481
4 - 5	0.1689	-0.1983	0.5360
5 - 2	-0.3213	-0.7779	0.1353
5 - 3	-0.2092	-0.5706	0.1521
5 - 4	-0.1689	-0.5360	0.1983



One-Way Analysis of Variance

The ANOVA Procedure

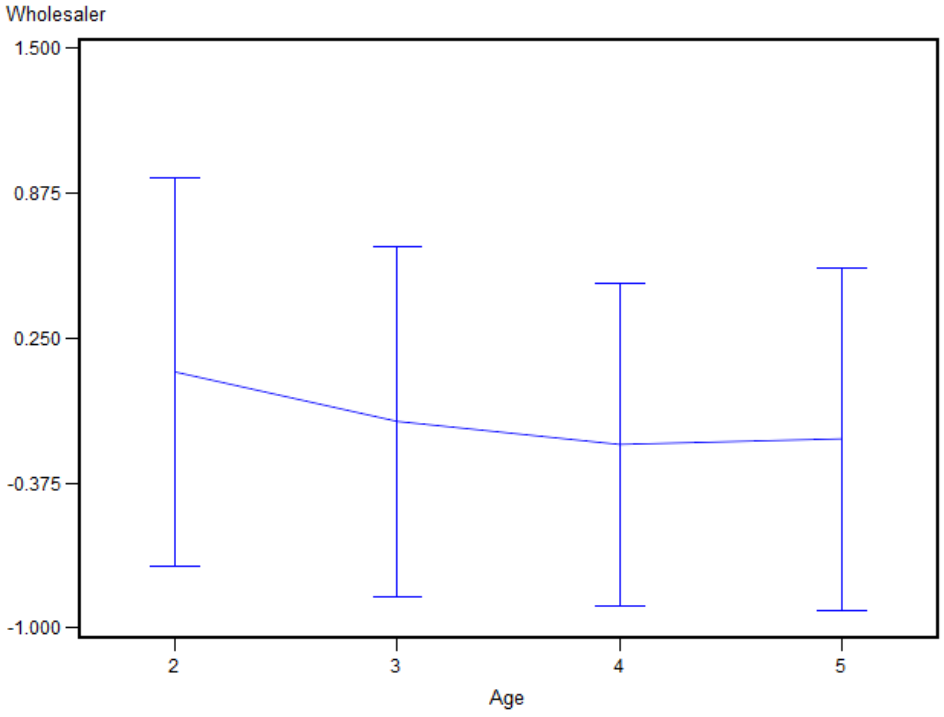
Dependent Variable: Wholesaler

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	2.9114264	0.9704755	1.75	0.1572
Error	300	166.5449633	0.5551499		
Corrected Total	303	169.4563897			

Bonferroni (Dunn) t-tests for Wholesaler

Comparisons significant at the 0.05 level are indicated by ***.

Age Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
2 - 3	0.21333	-0.15775	0.58441
2 - 5	0.28835	-0.13571	0.71241
2 - 4	0.31274	-0.06335	0.68882
3 - 2	-0.21333	-0.58441	0.15775
3 - 5	0.07502	-0.25880	0.40884
3 - 4	0.09941	-0.17085	0.36968
5 - 2	-0.28835	-0.71241	0.13571
5 - 3	-0.07502	-0.40884	0.25880
5 - 4	0.02439	-0.31498	0.36376
4 - 2	-0.31274	-0.68882	0.06335
4 - 3	-0.09941	-0.36968	0.17085
4 - 5	-0.02439	-0.36376	0.31498



APPENDIX H. Chi-square tests to determine channel preference

As the five-point scale is ordinal (Boone & Boone, 2012; Jamieson, 2004), the chi-squared test was used to determine the significance of the differences between the age cohorts.

Chi-square tests show that the 18-24-year-old age cohort only shows a significant difference in channel purchase behaviour in discount outlets and wholesalers versus the other age cohorts (Table 19).

The chi-square test shows that there is not enough evidence to conclude that there is a difference in the purchasing behaviour of sports bras across the different age cohorts on online channels. See Table 19.

Table 19: Chi-square test between age cohorts across channels

Chi-square test						
Sports bra purchases via channels						
Age category	**Online channel**	**Discount outlet**	**Speciality store**	**Department store**	**Social media**	**Wholesaler**
18-24yrs	0.401	0.002	0.293	0.163	0.291	0.046
25-34yrs	0.404	0.439	0.611	0.698	0.605	0.794
35-44yrs	0.735	0.176	0.485	0.361	0.780	0.647
45yrs+	0.092	0.540	0.804	0.486	0.729	0.927
Total	**0.114**	**0.002**	**0.390**	**0.168**	**0.488**	**0.255**

Key	
	No significant differences between age cohorts
	Significant differences between age cohorts

The channel data was analysed using Excel formulae by calculating the frequency and converting it to a percentile for each channel type (variables). The analysis is shown in Table 20 and Table 21.

The analysis shows that 18-24-year-old females are more likely than the total sample to purchase sports bras from wholesalers and discount outlets. 26% of 18-24-year olds cite that they are extremely unlikely to purchase sports bras from wholesalers versus the total sample responses of 39%, and 26% of 18-24-year-

olds indicating that they are unlikely to shop at discount outlets versus the total sample of 46%.

Table 20: Distribution of the number of respondents

The distribution of the number of respondents: Total Sample							
Channel	**Number of respondents**	**Extremely likely**	**Somewhat likely**	**Neither likely nor unlikely**	**Somewhat unlikely**	**Extremely unlikely**	**Total**
Online store	330	12%	17%	5%	17%	49%	100%
Discount outlet	327	11%	17%	9%	17%	46%	100%
Speciality store	335	63%	24%	3%	4%	5%	100%
Department store	329	15%	30%	9%	12%	35%	100%
Social media	326	6%	9%	11%	17%	57%	100%
Wholesaler	328	10%	20%	12%	18%	39%	100%
Total		20%	19%	8%	14%	38%	100%

The distribution of the number of respondents: 18-24 year olds							
Channel	**Number of respondents**	**Extremely likely**	**Somewhat likely**	**Neither likely nor unlikely**	**Somewhat unlikely**	**Extremely unlikely**	**Total**
Online store	38	18%	16%	3%	24%	39%	100%
Discount outlet	38	21%	13%	11%	29%	26%	100%
Speciality store	38	50%	29%	3%	8%	11%	100%
Department store	38	26%	32%	8%	16%	18%	100%
Social media	38	8%	16%	5%	24%	47%	100%
Wholesaler	38	24%	13%	13%	24%	26%	100%
18-24yr olds		25%	20%	7%	21%	28%	100%

Table 21: Mean channel preferences

Channel	**Rank**	**Mean: Total sample**	**Mean 18-24 yrs.**
Specialty store	1	1.64	2.00
Department store	2	3.21	2.68
Wholesaler	3	3.55	3.16**
Discount outlet	4	3.69	3.26**
Online store	5	3.75	3.50
Social media	6	4.11	3.87

***Significant difference to total sample (p<=0.05)*

APPENDIX I. T-test results on the level of sports involvement

Table 22: T-test results on the level of sports engagement: social versus competitive

Variable		Group Means		Equality of Variances		Equal Variances			Unequal Variances				*Significance on p:*		
		Social	Competitive	F Value	Pr > F	DF	t Value	Pr > |t|	DF	t Value	Pr > |t|		Group means	Unequal variances	Equal varriances
Importances	Brand	31.643	31.866	1.06	0.7125	322	-0.13	0.8938	318.35	-0.13	0.8936		FALSE	FALSE	FALSE
	Price	17.158	17.556	1.27	0.1316	322	-0.19	0.8478	302.54	-0.19	0.8490		FALSE	FALSE	FALSE
	Design/Style	13.773	13.114	1.13	0.4422	322	0.80	0.4261	320.18	0.80	0.4242		FALSE	FALSE	FALSE
	Function	13.319	13.935	1.40	0.0329	322	-0.75	0.4541	295.25	-0.74	0.4592		Significant	FALSE	FALSE
	Fit	24.107	23.529	1.00	0.9753	322	0.37	0.7114	315.92	0.37	0.7115		FALSE	FALSE	FALSE
Brand	Nike	12.184	25.272	1.16	0.3462	322	-1.97	0.0501	308.40	-1.96	0.0512		FALSE	FALSE	FALSE
	Puma	7.063	3.501	1.12	0.4824	322	0.62	0.5339	310.62	0.62	0.5355		FALSE	FALSE	FALSE
	Adidas	14.105	23.000	1.32	0.0782	322	-1.43	0.1545	299.68	-1.41	0.1584		FALSE	FALSE	FALSE
	Boost Gymwear	-21.923	-10.345	1.13	0.4497	322	-1.86	0.0633	320.14	-1.87	0.0622		FALSE	FALSE	FALSE
	Cotton On	-4.422	-19.690	1.06	0.6992	322	2.25	0.0252	313.30	2.24	0.0256	**	FALSE	Significant	Significant
	Triumph	-6.106	-10.603	1.04	0.8039	322	0.66	0.5112	317.68	0.66	0.5106		FALSE	FALSE	FALSE
	Lorna Jane	-0.901	-11.137	1.56	0.0052	322	1.61	0.1086	319.63	1.63	0.1034		Significant	FALSE	FALSE
Price	R250	45.395	49.305	1.55	0.0053	322	-0.60	0.5494	286.93	-0.59	0.5553		Significant	FALSE	FALSE
	R500	10.369	5.997	1.54	0.0065	322	1.78	0.0767	287.84	1.75	0.0811		Significant	FALSE	FALSE
	R750	-15.367	-16.826	1.20	0.2459	322	0.54	0.5889	306.23	0.54	0.5912		FALSE	FALSE	FALSE
	R950	-40.397	-38.476	1.05	0.7460	322	-0.45	0.6531	318.11	-0.45	0.6525		FALSE	FALSE	FALSE
Design/Style	Comfortable	3.5866	-0.5220	1.30	0.1039	322	1.28	0.1999	321.98	1.30	0.1960		FALSE	FALSE	FALSE
	Durable	-3.4554	-2.1566	1.21	0.2406	322	-0.38	0.7008	321.40	-0.39	0.6990		FALSE	FALSE	FALSE
	Fashionable	-4.6553	-8.4205	1.11	0.5002	322	1.21	0.2280	319.81	1.21	0.2263		FALSE	FALSE	FALSE
	Performance	4.5242	11.0990	1.13	0.4287	322	-1.94	0.0535	320.27	-1.95	0.0525		FALSE	FALSE	FALSE
Function	Moisture_wicking	-3.465	-4.645	1.17	0.3254	322	0.38	0.7037	320.91	0.38	0.7022		FALSE	FALSE	FALSE
	Anti-odour	0.850	-5.926	1.00	0.9936	322	2.04	0.0425	316.18	2.04	0.0425	**	FALSE	Significant	Significant
	Anti-chaffing	0.948	11.768	1.45	0.0192	322	-2.97	0.0032	292.68	-2.94	0.0036	**	Significant	Significant	Significant
	Anti-bacterial	1.668	-1.197	1.17	0.3092	322	0.95	0.3451	307.67	0.94	0.3477		FALSE	FALSE	FALSE
Fit	Adjustable	-7.5873	-6.1221	1.05	0.7475	322	-0.29	0.7725	318.10	-0.29	0.7721		FALSE	FALSE	FALSE
	Uplifting	-22.4146	-21.7527	1.29	0.1089	322	-0.11	0.9089	321.98	-0.12	0.9081		FALSE	FALSE	FALSE
	Shaping	-8.1683	-12.1048	1.09	0.5916	322	0.84	0.4023	319.19	0.84	0.4010		FALSE	FALSE	FALSE
	Compression	27.0024	35.1736	1.08	0.6109	322	-1.30	0.1956	319.06	-1.30	0.1944		FALSE	FALSE	FALSE
	Coverage	11.1678	4.8060	1.12	0.4601	322	1.48	0.1393	310.30	1.48	0.1409		FALSE	FALSE	FALSE

** *Significant difference in mean scores between two groups*

A t-test analysis (significance level 5%) of the social vs competitive sports engagement group, shows no differences in the attribute levels of brand and price. See Figure 17 and Figure 18.

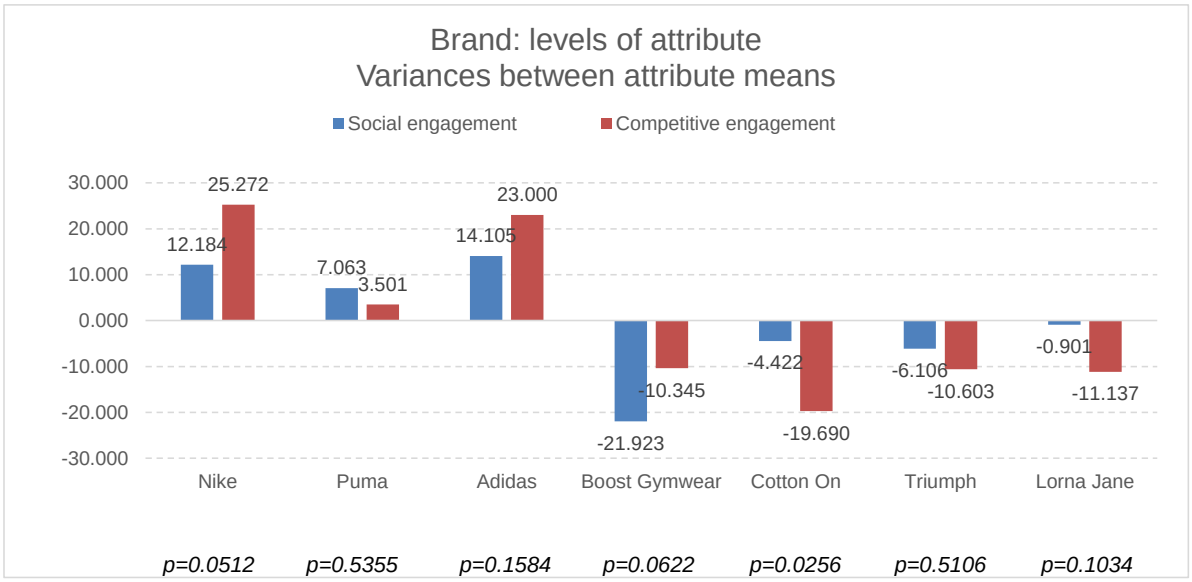


Figure 17: Brand attribute levels: variances between the attribute means

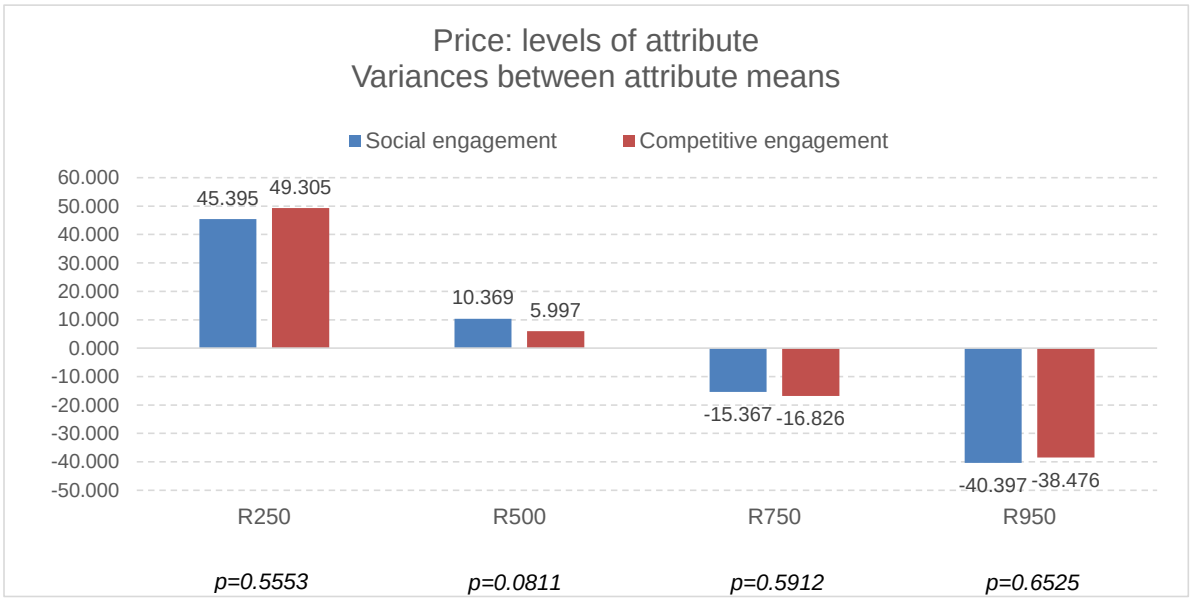


Figure 18: Price attribute levels: variances between the attribute means

Table 23: T-test results on the activity frequency: 1-4 days versus 5-7 days per week

Variable		Group Means		Equality of Variances		Equal Variances			Unequal Variances				*Significance on p (alpha is 5%):*		
		1-4 per week	5-7 per week	F Value	Pr > F	DF	t Value	Pr > |t|	DF	t Value	Pr > |t|		Group means	Equal variances	Unequal variances
Importances	Brand	32.477	30.628	1.13	0.4567	322	1.08	0.2789	283.21	1.10	0.2728		FALSE	FALSE	FALSE
	Price	18.099	16.188	1.17	0.3323	322	0.91	0.3656	286.56	0.92	0.3577		FALSE	FALSE	FALSE
	Practicality	13.248	13.801	1.03	0.8613	322	-0.66	0.5126	274.49	-0.66	0.5113		FALSE	FALSE	FALSE
	Function	13.409	13.908	1.04	0.7996	322	-0.59	0.5526	267.81	-0.59	0.5543		FALSE	FALSE	FALSE
	Fit	22.769	25.475	1.25	0.1610	322	-1.71	0.0889	249.95	-1.67	0.0968		FALSE	FALSE	FALSE
Brand	Nike	14.445	24.162	1.16	0.3610	322	-1.43	0.1546	285.73	-1.45	0.1483		FALSE	FALSE	FALSE
	Puma	10.229	-1.988	1.28	0.1221	322	2.11	0.0359	247.74	2.05	0.0411	**	FALSE	Significant	Significant
	Adidas	19.322	16.609	1.27	0.1469	322	0.43	0.6709	293.47	0.44	0.6631		FALSE	FALSE	FALSE
	Boost_gymware	-18.465	-13.560	1.49	0.0155	322	-0.77	0.4417	305.86	-0.80	0.4226		Significant	FALSE	FALSE
	Cotton_on	-13.316	-8.815	1.09	0.6063	322	-0.64	0.5195	279.74	-0.65	0.5158		FALSE	FALSE	FALSE
	Triumph	-1.216	-18.899	1.78	0.0005	322	2.56	0.0110	315.83	2.71	0.0070	**	Significant	Significant	Significant
	Lorna_Jane	-11.001	2.490	1.06	0.7081	322	-2.08	0.0380	265.93	-2.07	0.0393	**	FALSE	Significant	Significant
Price	R250	49.539	43.661	1.15	0.3930	322	0.88	0.3776	284.85	0.90	0.3706		FALSE	FALSE	FALSE
	R500	7.562	9.511	1.09	0.6107	322	-0.77	0.4402	279.64	-0.78	0.4362		FALSE	FALSE	FALSE
	R750	-16.148	-15.892	1.18	0.3214	322	-0.09	0.9259	286.89	-0.09	0.9246		FALSE	FALSE	FALSE
	R950	-40.952	-37.280	1.23	0.2076	322	-0.84	0.3996	290.78	-0.86	0.3894		FALSE	FALSE	FALSE
Practicality	Comfortable	2.4515	0.4779	1.25	0.1743	322	0.60	0.5467	292.18	0.62	0.5373		FALSE	FALSE	FALSE
	Durable	-5.5731	1.3195	1.13	0.4406	322	-2.01	0.0450	259.72	-1.99	0.0480	**	FALSE	Significant	Significant
	Fashionable	-4.1108	-9.9308	1.18	0.2888	322	1.84	0.0674	255.21	1.80	0.0726		FALSE	FALSE	FALSE
	Performance	7.2324	8.1334	1.02	0.8723	322	-0.26	0.7960	269.27	-0.26	0.7965		FALSE	FALSE	FALSE
Function	Moisture_wicking	-6.098	-0.826	1.02	0.9052	322	-1.67	0.0951	269.92	-1.67	0.0959		FALSE	FALSE	FALSE
	Anti-odour	1.330	-7.878	1.08	0.6227	322	2.73	0.0068	279.38	2.75	0.0064	**	FALSE	Significant	Significant
	Anti-chaffing	4.703	7.962	1.29	0.1114	322	-0.87	0.3868	247.05	-0.84	0.3995		FALSE	FALSE	FALSE
	Anti-bacterial	0.066	0.742	1.12	0.5042	322	-0.22	0.8272	282.05	-0.22	0.8253		FALSE	FALSE	FALSE
Fit	Adjustable	-7.4489	-6.0708	1.05	0.7559	322	-0.27	0.7899	276.60	-0.27	0.7888		FALSE	FALSE	FALSE
	Uplifting	-17.3529	-29.3845	1.06	0.6968	322	2.05	0.0408	265.69	2.04	0.0423	**	FALSE	Significant	Significant
	Shaping	-6.6507	-15.1359	1.11	0.5009	322	1.78	0.0763	261.25	1.76	0.0799		FALSE	FALSE	FALSE
	Compression	23.9878	41.2580	1.14	0.4230	322	-2.71	0.0071	259.25	-2.67	0.0080	**	FALSE	Significant	Significant
	Coverage	7.4647	9.3332	1.60	0.0031	322	-0.43	0.6709	227.21	-0.41	0.6858		Significant	FALSE	FALSE

** *Significant difference in mean scores between two groups*

APPENDIX J. Proposition 4: Cluster analysis output

Six potential clusters were identified based on the variances between the attribute level mean scores.

Table 24: Cluster means for attribute importance and utilities

Heat map	Cluster					
Importances	**1**	**2**	**3**	**4**	**5**	**6**
	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**Cluster 5**	**Cluster 6**
	Affordable fashion	**Pragmatic**	**Feminine yuppies**	**Price seekers**	**Branded babes**	**Functional fit**
Brand	**38.3**	**34.8**	**43.8**	**18.6**	**48.0**	**25.1**
Nike	10.9	42.8	17.2	6.1	73.7	-8.7
Puma	-2.5	2.9	-29.0	-5.7	43.5	16.9
Adidas	19.9	9.4	3.1	8.7	91.4	5.0
Boost Gymwear	-39.4	-55.2	-31.3	7.1	-22.0	10.1
Cotton On	90.5	-33.0	-25.2	-6.6	-66.5	-10.9
Triumph	-51.1	44.9	-46.3	1.5	-75.2	-4.5
Lorna Jane	-28.3	-11.9	111.6	-11.1	-45.0	-7.9
Price	**12.0**	**13.9**	**10.5**	**47.5**	**8.2**	**6.5**
R 250	28.3	35.0	25.5	139.9	17.9	16.5
R 500	13.4	12.7	13.3	4.4	6.7	5.3
R 750	-10.1	-13.3	-12.0	-46.8	-1.5	-5.8
R 950	-31.5	-34.4	-26.8	-97.5	-23.0	-16.0
Design/ Style	**13.9**	**14.5**	**13.4**	**9.2**	**15.6**	**15.0**
Comfortable	11.2	0.4	-7.0	7.3	-11.2	2.5
Durable	-13.1	9.7	2.7	-7.4	0.4	-7.8
Fashionable	2.1	-10.7	-6.6	-0.6	1.8	-14.1
Performance	-0.2	0.6	10.9	0.7	9.0	19.4
Function	**14.0**	**14.0**	**15.6**	**11.5**	**13.1**	**14.5**
Moisture-wicking	-7.9	-2.6	14.2	-15.3	4.0	-4.3
Anti-odour	-17.0	11.2	-18.2	1.3	-11.3	-0.6
Anti-chaffing	16.5	-8.0	0.6	21.8	3.0	4.0
Anti-bacterial	8.4	-0.6	3.5	-7.8	4.3	0.9
Fit	**21.8**	**22.8**	**16.8**	**13.2**	**15.1**	**38.8**
Adjustable	-1.7	-14.5	3.8	-9.2	-5.7	-5.7
Uplifting	-16.1	-0.8	-15.7	13.4	-13.8	-71.1
Shaping	-20.6	14.1	2.7	-1.0	8.6	-40.6
Compression	28.2	2.3	1.0	-2.3	11.4	93.3
Coverage	10.2	-1.0	8.3	-0.9	-0.5	24.1

Note: the heatmap portrays the mean utility level scores of the attribute levels, relative to each other and the entire population. Green translates to the highest utility scores, and Red translates to the lowest utility scores.

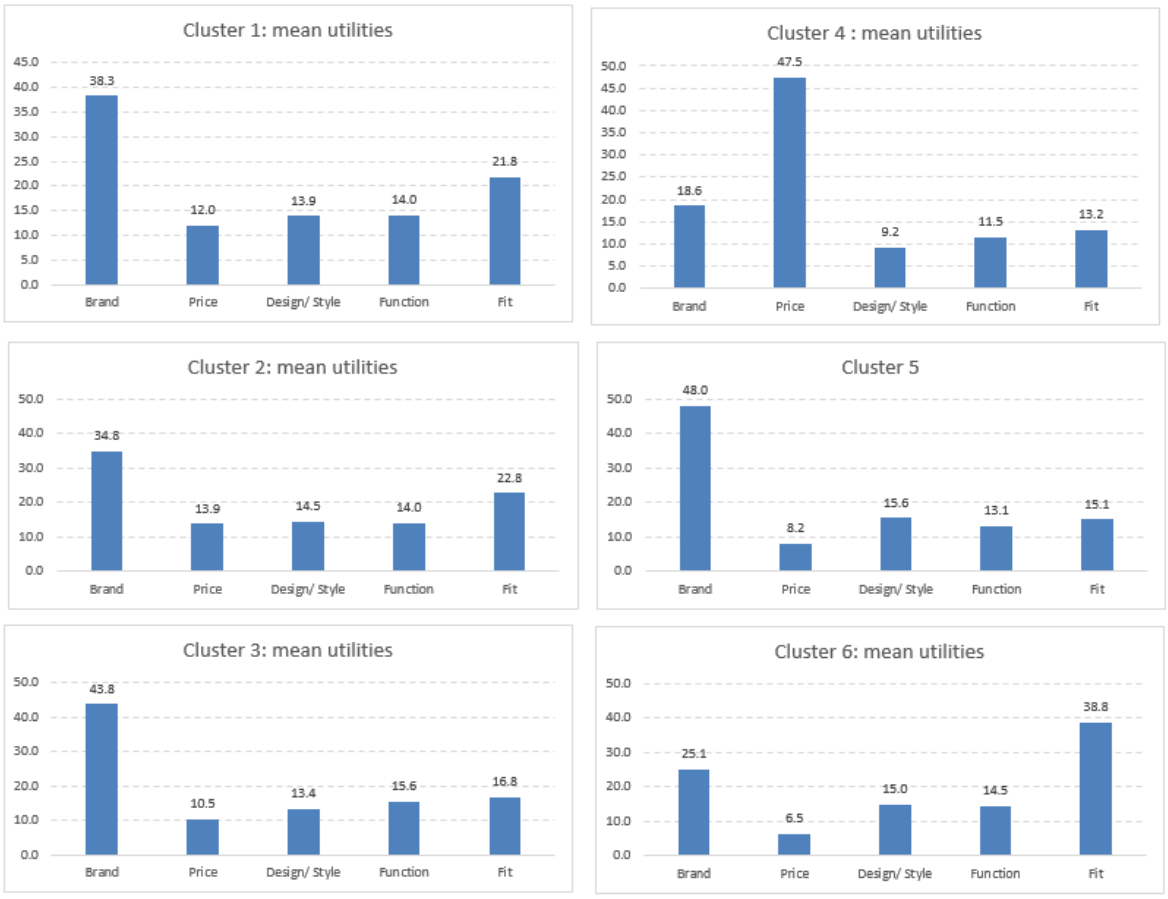


Figure 19: Mean utilities per cluster

APPENDIX K. Proposition 4: Kruskal-Wallis tests

Summary statistics:

Variable	Observations	Obs. with missing data	Obs. without missing data	Minimum	Maximum	Mean	Std. deviation
Cluster 1	5	0	5	11.971	38.261	20.000	10.883
Cluster 2	5	0	5	13.876	34.838	20.000	9.115
Cluster 3	5	0	5	10.469	43.790	20.000	13.515
Cluster 4	5	0	5	9.248	47.490	20.000	15.751
Cluster 5	5	0	5	8.181	48.040	20.000	15.945
Cluster 6	5	0	5	6.514	38.848	20.000	12.429

Kruskal-Wallis test / Two-tailed test:

K (Observed value)	0.577
K (Critical value)	11.070
DF	5
p-value (one-tailed)	0.989
alpha	0.05

An approximation has been used to compute the p-value.

Test interpretation:
H0: The samples come from the same population.
Ha: The samples do not come from the same population.
As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.
The risk to reject the null hypothesis H0 while it is true is 98.90%.

Multiple pairwise comparisons using Dunn's procedure / Two-tailed test:

Sample	Frequency	Sum of ranks	Mean of ranks	Groups
Cluster 2	5	84.000	16.800	A
Cluster 6	5	83.000	16.600	A
Cluster 3	5	80.000	16.000	A
Cluster 1	5	78.000	15.600	A
Cluster 5	5	74.000	14.800	A
Cluster 4	5	66.000	13.200	A

Pairwise comparisons:

Differences:

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Cluster 1	0	-1.200	-0.400	2.400	0.800	-1.000
Cluster 2	1.200	0	0.800	3.600	2.000	0.200
Cluster 3	0.400	-0.800	0	2.800	1.200	-0.600
Cluster 4	-2.400	-3.600	-2.800	0	-1.600	-3.400
Cluster 5	-0.800	-2.000	-1.200	1.600	0	-1.800
Cluster 6	1.000	-0.200	0.600	3.400	1.800	0

p-values:

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Cluster 1	1	0.829	0.943	0.666	0.886	0.857
Cluster 2	0.829	1	0.886	0.518	0.719	0.971
Cluster 3	0.943	0.886	1	0.615	0.829	0.914
Cluster 4	0.666	0.518	0.615	1	0.774	0.541
Cluster 5	0.886	0.719	0.829	0.774	1	0.746
Cluster 6	0.857	0.971	0.914	0.541	0.746	1

Bonferroni corrected significance level: 0.0033

Significant differences:

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Cluster 1	No	No	No	No	No	No
Cluster 2	No	No	No	No	No	No
Cluster 3	No	No	No	No	No	No
Cluster 4	No	No	No	No	No	No
Cluster 5	No	No	No	No	No	No
Cluster 6	No	No	No	No	No	No

APPENDIX L. Clusters described

The differences in the mean scores of the clusters indicate that there could be meaningful consumer segments. Further research is required into the discriminants used for this study. This study's cluster analysis was based on a sample of South African females of 326. A larger sample size may provide greater distinction between the clusters.

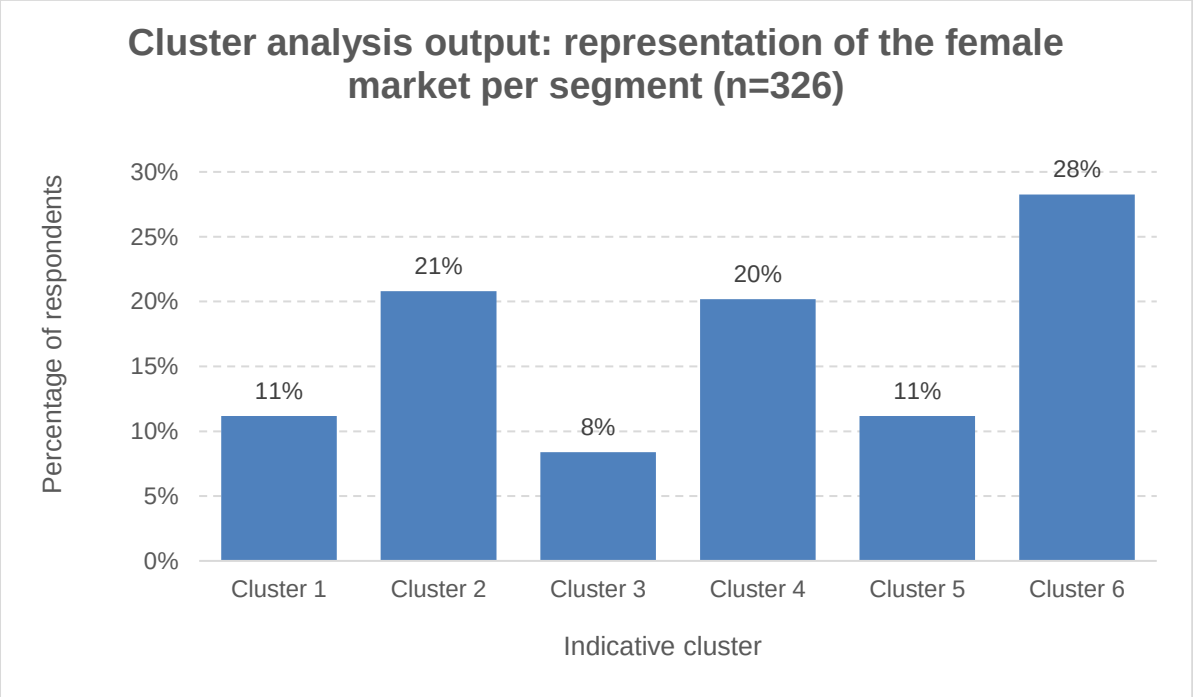


Figure 20: Cluster analysis population distribution

Chi-square tests were performed on the following study data fields to determine significant differences between the clusters: age group, race, sports bra cup size, sports involvement (social vs competitive participation, frequency of activity), sports bra usage (sports only, sports and casual use) and activity intensity level (low, medium, high or a combination).

The variables sports bra cup size ($p<0.05$) and activity intensity level ($p<0.05$) shows significant differences between the clusters.

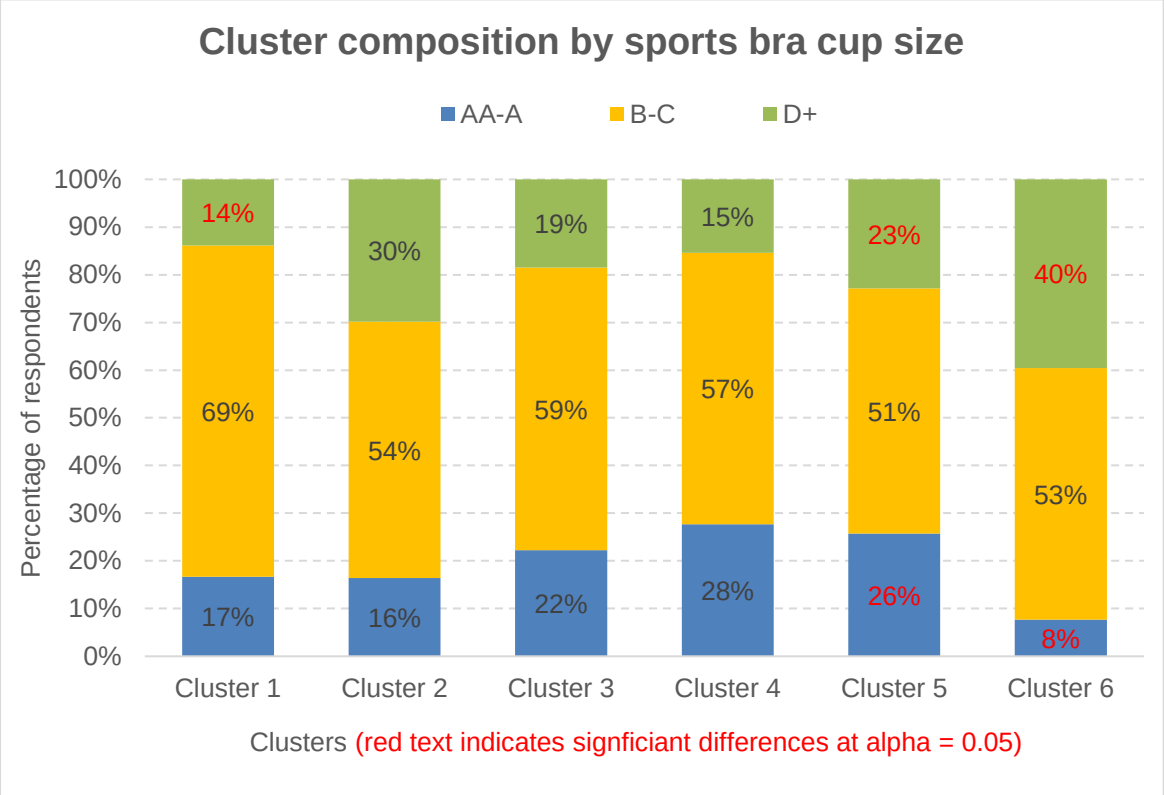


Figure 21: Consumer clusters by sports bra cup size

Sports bra cup size: Significance by cell (Fisher's exact test):

	AA-A	B-C	D+
Cluster 1	<	>	**<**
Cluster 2	<	<	>
Cluster 3	>	>	<
Cluster 4	**>**	>	**<**
Cluster 5	>	<	<
Cluster 6	**<**	<	**>**

Values displayed in red are significant at the level alpha=0.05

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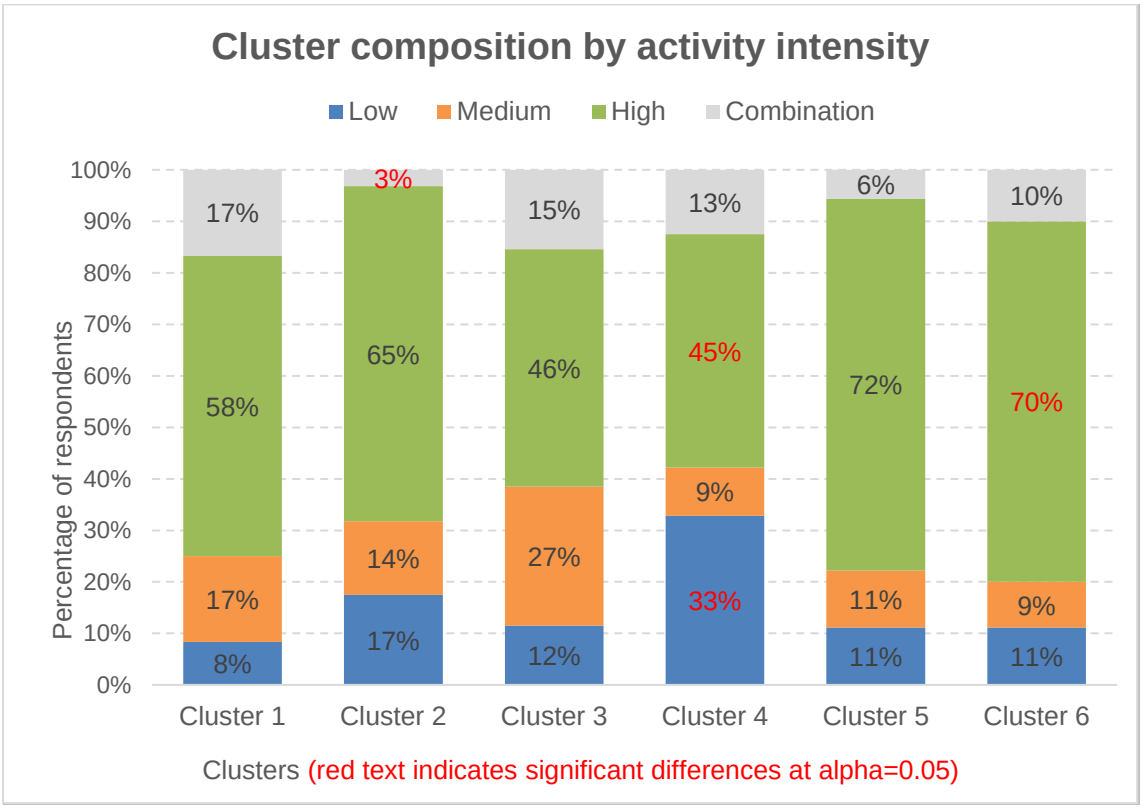


Figure 22: Consumer clusters by activity intensity level

Significance by cell (Fisher's exact test):

	Low	Medium	High	Combination
Cluster 1	<	>	<	>
Cluster 2	>	>	>	**<**
Cluster 3	<	>	<	>
Cluster 4	**>**	<	**<**	>
Cluster 5	<	<	>	<
Cluster 6	<	<	**>**	>

Values displayed in red are significant at the level alpha=0.05

A high-level description of the potential clusters is provided for future research

Cluster 1: Affordable fashion

- Prefer cheaper and fashionable brands. Cotton On is most preferred, and the brand describes itself as “fast fashion”.
- This segment has the highest need for comfort
- This segment participates in a combination of low, medium and high impact sport.

Cluster 2: Pragmatic shopper

- This segment has a balance between brand and price, which shows a pragmatic shopper.
- The segment has the highest preference for durability and anti-odour fabric
- This segment mostly participates in high impact sport, e.g. running and CrossFit

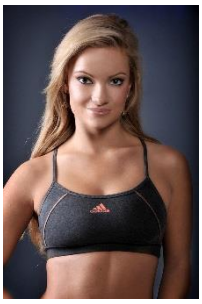
Cluster 3: Feminine yuppies

- This segment is the least price-sensitive segment and have an affinity for female only fashion sportswear brands
- This segment has the highest preference for moisture - wicking fabric
- This segment mostly participates in medium impact sport, e.g. spinning at gym

Cluster 4: Price seekers

- This segment is highly priced sensitive
- This segment has the highest preference for anti-chaffing fabric
- This segment participates in low impact sport, e.g. yoga, and Pilates (validated by chi-square results)

Cluster 5: Branded babes



- This segment is all about unisex, sports brand.
- This segment mostly participates in high impact sport, e.g. running and CrossFit

Cluster 6: Fit and Fab

- This segment has the highest preference for fit, compression and performance orientation.
- This segment has the largest bra cup sizes (D+ validated by chi-square results).
- The purchasing risk for women with larger breast sizes are higher as they rely on functional support to a greater extent than brand (Tsarenko & Lo, 2017)
- This segment mostly participates in high impact sport, e.g. running and CrossFit

APPENDIX M. Tables and figures

Table 25: Number of respondents according to age group and bra size categories

Age *(n=326)*	AA-A	B-C	D-DD	E-F	FF+	Total
18-24	2%	8%	1%	0%	0%	12%
25-34	9%	20%	8%	1%	1%	38%
35-44	5%	18%	9%	1%	1%	33%
45-54	2%	8%	4%	1%	0%	14%
55 and older	1%	2%	1%	0%	0%	4%
Total	**19%**	**56%**	**22%**	**2%**	**1%**	**100%**

Table 26: Respondent distribution based on channel preference

The distribution of the number of respondents: total sample							
Channel	**Number of respondents**	**Extremely likely**	**Somewhat likely**	**Neither likely nor unlikely**	**Somewhat unlikely**	**Extremely unlikely**	**Total**
Online store	*330*	12%	17%	5%	17%	49%	100%
Discount outlet	*327*	11%	17%	9%	17%	46%	100%
Specialty store	*335*	63%	24%	3%	4%	5%	100%
Department store	*329*	15%	30%	9%	12%	35%	100%
Social media	*326*	6%	9%	11%	17%	57%	100%
Wholesaler	*328*	10%	20%	12%	18%	39%	100%
Total		20%	19%	8%	14%	38%	100%