Comparative analysis of sizing in children's wear between the UK and Korea

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The candidate confirms that the work submitted is her own except where work which has formed part of jointly-authored publications has been included. The contribution of the candidate and other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

Chapters 4 and 5 include the publication content, and contributions of the candidate were conducting research data collection and analysis. The other authors assisted the manuscript review with a proof-reading and advisory opinion.

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Abstract

The body shapes and sizes of children are distinctive and continually developing into adults' shapes. The sizing system for children's garments is not standardised between clothing companies and countries because to follow the national standard sizing system and to use the data of a national sizing survey is not compulsory for clothing companies. These factors bring about difficulties for garment makers for manufacturing appropriate sizes of clothing as well as for consumers while choosing the size of clothes in the global fashion market.

For these reasons, a better understanding of body size and shape of children including their current sizing system and size charts is required. This research is based on in-depth empirical research comparing selected cases which are the UK and Korea. The aim was to provide a systematic technical guideline for garment makers by gaining a knowledge of current children's body sizes and shapes and consequently providing an alternative set of data for the UK and Korea.

Firstly, the main body shapes and sizes characteristics of infants and children including their growth rate, age classification, and gender differences were considered. Next, data of national sizing surveys and national sizing standards including the current brand size charts of infants and children's clothing brands in the UK and Korea were compared and analysed by mixed methods. Also, consumer surveys were conducted and analysed to be aware of the difficulties in choosing sizes and purchasing tendencies of consumers.

It was found that national sizing surveys and national sizing systems in the UK and Korea did not correspond significantly and it was referred that understanding of this contrasting designation and body measurement methods should be considered to explore each countries' market. The different size chart constructing methods and body measurements between the two countries' brand size charts also should be reflected for developing new size charts. It was also found that the considerably different consumer behaviour in the two countries should be recognised by garment manufacturers.

Table of Contents

List of Tables

List of Figures

Chapter 1 Introduction

This chapter presents the background and the problem under investigation with a general summary of the structure of the thesis. The problem address by research is that there is a lack of detailed analysis of differences between sizing system of clothing used in the UK and Korea. This can be a major problem for clothing companies either countries entering each other's market as globalisation increase. In order to address the matter under systematic investigation, an overview of the children's clothing market has been presented. This has motivated the researcher to consider the deeper investigation of the current status in children's wear to be adapted to the industry.

1.1 Background to the research

Human body shapes are different according to gender, age, and ethnic and environmental background (Kim, 2009). Body types are also different between races, and the body sizes and proportions of each are different (Lee et al., 2007). Therefore, products which human beings use should be made in consideration of the various body shapes even though each individual's satisfaction parameters may be subjective. Especially, clothing is one of the universal and essential products, and it is required the proper understanding of body shapes based on the practical and aesthetic point of views. (Kim, 2009; Hwang and Kim, 2013).

Infants and children have a wider variety of body types and shapes (Kim, 2014). IAAF (2009) addressed that the increase in body size and proportion of human being is changing from birth to adults. As for growth pattern, children grow in size with a fast rate especially in infancy and early childhood. However, growth rate becomes slow and steady in middle childhood, but it increases rapidly during puberty until adult height is reached. Moreover, the physical body proportion changes differently at different ages, and some body parts grow more than other parts during developments (IAAF, 2009).

Children's wear developers should be aware of the body shapes and proportion changes according to a particular children's growth stage to develop well-designed and well-fitted clothing (Aldrich, 2009a). Government

health and education initiatives produce body dimensions and physical information of children. However, the size charts of retailers of children's wear still use their own independent trial-and-error systems which focus on the only majority number of children without updating the children's growth trend (Lee et al., 2007). The mass production system of clothing manufacturing is concerned with only particular target groups' consumers even though the needs of customers are getting diverse (Aldrich, 2009b; Kim, 2009). Body dimension surveys provide the practical information as benchmarks for clothing production and give a consistent guide to measure body dimension (Aldrich, 2009a; Roebuck, 1995). Moreover, sizing standards have been introduced to describe the body measurement data of the actual population for the domestic and globalised clothing markets, but this data is also modified when it is adapted because the regulation of the sizing standards is voluntary (Petrova and Ashdown, 2012).

In general, the UK have the highest expenditure on clothing and textile (19.8 %) among the European countries with a consistently increasing rate (KOFTI, 2014; KOFTI, 2016). The UK National Statistics expected the population of the UK children would continue to grow between 2015 and 2019 with a total 4.4% growth rate. In accordance with this growth rate, there was a 5.0 % growth of children's wear expenses in the UK from 2015 to 2016 while Korea had a 2.6 % growth rate in the same period (Kang, 2016; Key Note, 2016). Children's wear markets in Korea also were expected to grow even though the birth rate of Korea is not growing considerably (from 1.19 in 2013 to 1.23 in 2015) (Kang, 2016; KOSIS, 2016). It was inferred that Korean parents give more financial support to the fewer children than the past (Kang, 2016). Key Note (2016) also predicted that a consistent demanding of children's wear would be shown in the UK market. They also addressed that the UK parents are strongly willing to spend a considerable amount of money for new, fashionable, high quality, and luxury clothes and children have more interests in fashion (Key Note, 2016).

However, the dissatisfactory rate of clothing purchase has been existed due to the use of outdated pattern blocks and sizing system in clothing manufacturing companies (Kim, 2009). It is worthy to consider two consumer market targets which are children and parents; children who wear clothing and adults who are responsible for purchasing clothing. Otieno (2000) and Key Note (2016) mentioned that children's clothing fit is distinctive from other customer satisfaction measurements. Thus, consideration of both parents and children are required. The highly claimed aspects in children's wear are

dissatisfied fit, irregular sizes, and sizing system (Kang et al., 2001; Otieno, 2000). The major factors which are influencing on fit and satisfaction with clothing are body type and shape, and it is crucial to understand each characteristic among different races and countries in the globalised market (Lee et al., 2007).

Therefore, body size and shape comparison including measurement methods and systems between countries allow the opportunity to develop improved sizing systems and well-fitted clothing. Moreover, a deeper understanding of the children's wear market in the UK and Korea is valuable because there is a potential of spending increase in both countries for a variety of international consumers and clothing retailers.

1.2 Research aim and objectives

The overall aim of this research is to compare the body and garment size of infants' and children's wear in the UK and Korea in order to provide a body of knowledge to the use of, benefit to, children's wear designers, manufacturers, constructors, and academics.

In order to achieve this aim, the research objectives of this research are as follows:

1. To provide understanding infants' and children's garment
   (a) To critically review the literature one sizing and fit issues
   (b) To better understand the physical characteristics of infants and children
   (c) To define the main features of children's body shapes and sizes

2. To investigate the body and clothing sizes children's clothing of the UK and Korea
   (a) To examine the latest children's national sizing surveys
   (b) To determine the differences children's clothing national sizing systems
   (c) To investigate recent children's clothing brand size charts
   (d) To establish current children's clothing purchase parameters

3. To undertake accurate data analysis of infants' and children's clothing
   (a) To provide reliable technical information for the garment designers
   (b) To present efficient and informative size guidelines for the garment makers
   (c) To identify differences by comparing the targeted countries
   (d) To suggest improvements to the analysis results for future studies

1.3 Thesis structure overview

This thesis is structured with eight chapters to approach these different objectives. This first chapter addressed the research background with the problem statement which there has not been significant analysis between the UK and Korea including motivation of this research as well as the research aim and objectives.

Chapter 2 is an overview of literature dealing with the important aspect of size and fit including discussion on anthropometry study, sizing surveys, size standards, sizing systems, and size charts and labelling. Furthermore, the literature review includes physical characteristics of infants and children for a better understanding of their garments.

Chapter 3 describes the methodological choice of this research. This includes theoretical perspectives on research which have research paradigms, philosophy, approach, and purpose of the research. Next, the chosen comparative and mixed methods were discussed with research design and specific techniques.

Chapter 4 investigates the national sizing survey which is focused on infants' and children's clothing. Data of the Shape GB and the 6th Size Korea were selected to investigate the specific information such as sampling, methods and data collection with analysis methods. Next, the critical comparison between two countries' sizing survey data was conducted.

Chapter 5 presents an investigation and comparison data of national sizing standards in the UK and Korea. Provided details of both countries such as construction methods and body measurement data were examined separately, and an analytical comparison between data was followed.

Chapter 6 is focused on the examination of the current clothing size charts. Infants and children's targeted brands were collected from both the UK and Korea, and the distinct features were determined. Also, the critical comparison between two data sets was conducted at the end of the chapter.

Chapter 7 contains the results of the customer survey in the UK and Korea. Four parts of survey results were analysed by statistical analysis method, and the comparison data between two countries was analysed.

To conclude, Chapter 8 summarises the main conclusion of this research which brings together the previous chapters. This outlines how the aim and objectives were achieved and concludes by determining the contributions. The limitations of the study are also discussed at the end of this chapter as well as recommendations for future work.

Chapter 2 Literature review

The relevant literature about the size and fit consideration including detailed understanding how clothing and body size are applied in the clothing industry (Section 2.1), and how these are influencing clothing fit (Section 2.2 and 2.3) were reviewed in this chapter. Next, general information of infants and children's physical characteristics and children's wear were followed.

2.1 Size and fit in clothing manufacturing process

It is essential to find out the main activities involved in clothing development and manufacturing process to understand the relation between a target market, sizing systems and clothing fit issues (Bougourd, 2007).

Clothing manufacturing consists of a number of processes which start with the order receiving to the final clothing shipment and clothing manufacturing processes are classified into three stages as below (Sarkar, 2013a).

- Pre-Production Processes: sampling, sourcing of raw materials, production approvals, production planning meeting, etc.
- Production processes: cutting, sewing, etc.
- Post production processes: thread trimming, pressing, checking, folding and packing, shipment inspection, etc.

Sarkar (2011) mentioned that pre-production processes are significant to build efficiency of garment production, and pattern making, pattern modification, pattern grading are at this stage. Pattern cutters develop the first fit pattern and modify the pattern according to the opinion of the clients; then grading is conducted on the approved fit pattern for the size set samples. Once the final order is ready for mass-production, the final pattern is graded into the whole size range (Sarkar, 2011).

May-Plumlee and Little (1998) stated the specified six-stage 'No-interval coherently phased product-development model (NICPPD)' for the functional apparel development (see Table 2.1).

The primary activities of three main teams (marketing, merchandising, and product development) of clothing companies are described in the NICPPD model. The product development team is considerably involved across the whole clothing manufacturing process; 3. Design development and style

selection, 4. Marketing the line, and 5. Pre-production. The consideration of target market's body size and shape is essential for the decision of sampling, and final fabric yardage, approval of pattern making and fit. Wear testing in design development, and style selection stage and the development product specs in marketing the line stage are also related to the clothing size and fit. It is crucial to consider the size and fit at the production planning and control division for grading, market making, planning, and material sourcing in the NICPPD model.

Table 2.1 No-interval coherently phased product-development model (NICPPD) for apparel development

(Reproduced from May-Plumlee and Little, 1998)

<table>
<tr><th>Phase</th><th>Marketing</th><th>Merchandising</th><th>Product development</th></tr>
<tr><td>Phase 1:
Line planning and research</td><td colspan="2">- Market and target research
- Marketing plan based on previous sales data</td><td>- Fabric and trim research
- Colour research
- Trend research</td></tr>
<tr><td rowspan="2">Phase 2:
Design/
Concept development</td><td>- Concept testing</td><td colspan="2">-</td></tr>
<tr><td colspan="3">- Decisions of colour and concept, approval of Fabric, design, trim, and colour, style and design specification</td></tr>
<tr><td rowspan="2">Phase 3:
Design development and style selection</td><td>-</td><td>- Identification of assortment
- Volume decisions
- Pricing and gross margins establishment</td><td>- Raw material development, testing, and approval
- Colour testing and approval
- Acquisition of sample yardage, pattern-making and fit approval
- Style evaluation
- Wear testing
- Finalising sample specifications</td></tr>
<tr><td colspan="3">- Review samples to make decisions on final line adoption.</td></tr>
<tr><td rowspan="2">Phase 4:
Marketing the line</td><td>- Sales samples line presentation to retail channels</td><td>-</td><td rowspan="2">- Raw materials order for more duplicates
- Production planning and control division
- Decision of detailed costing
- Development product specs</td></tr>
<tr><td colspan="2">- Review of promotional materials for sales
- Review retail orders comparison with sales forecast</td></tr>
</table>

	- Adjustment of styles, colours, and sizes for the final modified line.		
Phase 5: Pre-production	-	- Engineering specifications - Production planning and control division.	- Finalisation of quality, production and process standards - **Production planning and control division for grading, marker making, planning, and material sourcing** - Finalisation of quality and material
Phase 6: Line optimisation	-	- Review the final line - Style number adjustments	-

Bougourd (2007) added the stages of communication and consumption in the clothing development and production process (see Table 2.2). She emphasised the importance of the apparel evaluation process according to various sizes of the company, and the characteristic of clothing including an appropriate target market identification. She also mentioned that the monitoring and analysis of customers' responses, preference, and needs are essential (Bougourd, 2007). Considerable understanding of clothing size and fit are required at the prototype and production stages from preparation to the approval of production samples. As to preparation stage, the key consideration for clothing developments are listed as; shape profile, sizing shape system, body measurement, sizing system, size chart, block pattern, and dress form. In the realisation and evaluation stage, generation of pattern, apparel production in appropriate sample size, and the evaluation of a design sample on a dress form were found as significant factors for size consideration. Clothing size consideration is also required for the preparation and approval or graded sizes with the fitting evaluation of samples in the production stage (Bougourd, 2007).

Table 2.2 An outline of apparel development and production process
(Reproduced from Bougourd, 2007, p.110)

Stage	Activity	Detail
Problem exploration	Monitoring	- Anthropometric data
	Analysis	- Target market and customer profile
	Selection	- New techniques - Fashion trends - Materials - Sole usage system
Generation of solutions	Primary creation	- Experimental design - Creation of new designs - Selection
Prototype	**Preparation**	**- Shape profile, sizing shape system, size chart** **- Body measurement, sizing system, size chart** **- Block pattern** **- Dress form**
	Realisation and evaluation	- **Generation of pattern** - Assembly specification - **Apparel product in relevant sample size** - Initial material and manufacturing costs - **Evaluation of design sample on dress form** (white seal)
	Production of further pre-production sample	- **For fit approval** (red seal[1])
Production	**Preparation and approval of graded sizes**	- **Graded patterns** and costings - **Evaluation of graded samples on fit models and wear test if appropriate** (blue seal) - Material markers; labour and material costings - **Specifications for** materials, **size,** manufacture, labelling and packaging, **specific fitting instructions, size** and colour **apportionments planning and scheduling**
	Approval of production samples	- **Evaluation of production samples on fit model** (gold seal)

[1] "Red seal: a sample with red tag is an identification of a sample that buyer had approved and sealed that particular sample for production. A sealed sample means approved garment construction, approved trims attached to the garment" (Sarkar, 2013b, no page)

Communication	Promoting the product	- Fashion show - National advertising - In store or online catalogues
	Consumer product information	- Label, swing ticket, hanger or package (size, shape, colour, material and aftercare)
Consumption	Monitoring, analysis and evaluation	- Sales - Consumer feedback - Returns - Repeat sales

Regarding clothing fit, the final clothing patterns are created to fit a standard size in the target market of the specific retail company, and a sample garment made from the final pattern is tested using a fitting model that can represent the average size of the target market (Pandarum and Yu, 2015). Approval of clothing fit is required to produce different sizes based on the grading interval which was derived from the retailer's size chart. Finally, the range of clothing within the various clothing sizes can be created to fit a target market (Ashdown et al., 2007).

Kennedy (2015) addressed the importance of understanding the body and measurement data for pattern construction. He mentioned that significant knowledge of the body dimension points is equivalent to the final garment measurement points. In addition, he mentioned that the pattern making design is a combination of a creative design and technical manufacturing, and stated that clothing fit determines the success of the pattern block.

Senanayake (2015) emphasised the importance of fit evaluation understanding for pattern makers to develop clothing patterns and the technical designers to develop a technical package (tech-pack). As can be seen in Figure 2.2, the technical package defines design and product specification and comprises standards and specification to manufacture each style of clothing. The design specification is a summary of clothing style which is included fashion and style details considering aesthetic features, and it has design number, season, front and back flat sketches and so on. The product specification includes fabric information, the standard branding and packaging information, fit specifications and garment assembling instructions. As to fit specification, specific size range with description is given such as retailer's size chart information including tolerance level of each measurement for flexible manufacturing and fit quality evaluation. Senanayake (2015) also mentioned that tech-packs are various in different companies according to the product, company size,

sourcing place, producer profiles, but well-developed specific tech-packs help to improve the product quality as well as a financial trading tool.

Fit specifications									Cal Poly Pomona
Style #:	AM21401	Description:	Open back scoop neck T		Status:	In progress			
Design/proto #:	#3	Group:	Knit		Current stage:	PD			
Division:	Womens	Season:	Fall 2014		Approved date:	Pending			
Brand:	AM2	Base size:	S		Date created:	01/21/14			
Product class:	Tops	Size range:	XS. S. M. L		Date revised:	05/10/14			
Approval status			Sizes				Fit		
POM	Description		XS	S	M	L	Fit spec. (L)	Delta (+/-)	Revised spec.	Pom comments—flats with measurements
1	Back bottom panel length center back to bottom hem		18 1/2	18 3/4	19	19 1/4	19	3/8		
2	Center back neck to shoulder		7 1/2	7 3/4	8 1/4	8 1/2	8	1/4		
3	Center back neck to yoke hem		12 1/2	12 3/4	13	13 1/4	13	3/8		
4	Center front neck to hem		21 1/4	21 3/4	22 1/4	22 3/4	22 1/4	1/2		
5	Front neck width		18	18 1/2	19	19 1/2	20	3/8		
6	Neck drop		5 1/2	5 1/2	5 1/2	5 1/2	6 3/4	1/4		
7	Sideseam		18	18 1/4	18 1/2	18 3/4	18	1/2		
8	Sleeve length top		9 1/2	9 3/4	10	10 1/4	9 1/2	1/4		
9	Sleeve opening		11 1/4	12	12 3/4	13 1/2	12 1/2	1/4		
10	Sweep		38	40	42	44	43	1/2		
	Comments									
1)										
2)										
3)										
4)										
CB: Centre back										

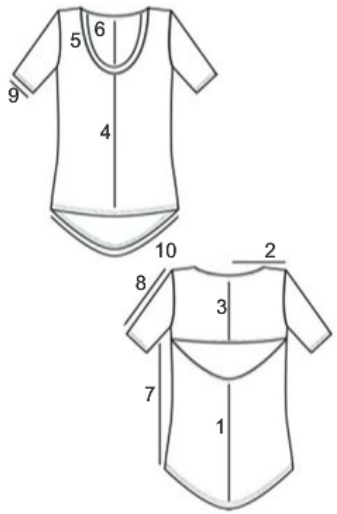


Figure 2.1 Figure Teck-pack: fit specification
(Reproduced from Senanayake, 2015, p.39)

Keist (2015) addressed quality control and quality assurance is related to the size and fit consideration in the clothing manufacturing process, and the quality assurance is inspected in the stages of pre-production, during production, and the final inspection. Firstly, pre-production quality control deal fabric, comfort, colour fastness, and durability including other accessories and design element inspection. Quality control during production is conducted to find out the defects of spreading and cutting, assembling, pressing and finishing, and improper size can occur due to incorrect patterns, erroneous marking or cutting, shrinkage or stretch, and so on. The final garment is tested at the final inspection stage for the overall appearance, performance requirements, and sizing and fit. Clothing size is measured to fit intended sizing or is also visually tested by dress forms or fitting models. Keist (2015) also mentioned that user-production interactions[1] should be concerned for the final finished garments, and the variables of inspection are design, function, appearance, size or dimension, fit, construction, and packaging.

2.2 Size and fit

2.2.1 Anthropometric study

The word “anthropometry” originated from the Greek word “anthropo” which means “human” and “-metron” which means “the process of measuring”. Anthropometry is “the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue” (CDC, 2007, p.1). Anthropometric data usually presents the body measurement data using tables and annotations of human figures, and this data is used in ergonomic applications to enable designs and standards to become practical (LibGuides, no date). Relevant anthropometric data is essential to develop effective sizing for the garment practitioners to provide appropriate fit (Otieno, 2008).

Kennedy (2015) mentioned that appropriate body measurement data is a guide to developing a pattern, and determining the size profiles for sizes from manual measurement or 3D body scanning, and it is essential because of the relevant market definition. Also, anthropometric data is the foundation

[1] “User-production interaction: an examination of the ways in which product and user interact and influence consumer satisfaction with the product” (Kadolph, 2007, p. 555)

to determine the size range which is the smallest to largest and variety of different proportion (Otieno, 2008). Otieno (2008, p.74) presented the three main issues of the anthropometric data as the basis of clothing as follow:

- How to measure the body adequately
- How to analyse the vast data into efficient size charts
- How to use the size charts in marketing in order to create customer satisfaction with clothing

Chan (2014) mentioned that an anthropometric study is to acquire the accurate body dimensions of a population and the selected sample from the population should reflect the variety of that population. The purpose of anthropometrics are as below, and the processes of measuring anthropometric data with relevant analysis and reliable understanding into size charts are the first stage to achieve these aims (Otieno, 2008, pp.74-75).

- To facilitate the improvement of standards of manufactured clothing (e.g. fit, sizing, and performance)
- To improve the process of making clothes (e.g. lay planning, styling)
- To facilitate the development of size charts based on scientific evidence (e.g. grading)
- To develop a better understanding of human factors involved in the development of clothes, especially, high-performance wear, clothes for a particular group of people such as children, older people and disabled people and specialised wear (sportswear, wedding outfits, stage wear, etc.).
- To enhance consumer satisfaction by developing clothes that fit well, through understanding underlying factors such as maturity, ageing and posture
- To develop a greater understanding of the processes of data management and analysis that lead to the development of patterns

Chan (2014) mentioned that the variables which influence the sample selection are gender, ethnic group, age group, occupation, geographical location and other social-demographic requirements in the anthropometric study. Accurate and cost-efficient clothing can be produced with the

availability of the anthropometric data, and the anthropometric data helps to develop an appropriate size distribution for generating accurate pattern and satisfactory fit (Chan, 2014).

2.2.2 Sizing survey

Many of anthropometric data can be obtained from national census offices and affiliated governmental organisations; then this data can be used help to select the sample depending on purposes (Chan, 2014; Reed, 2013). Some sources of anthropometric data which open to the public are the World Health Organisation (WHO) Child growth standard, National Health and Nutrition Examination Survey (NHANES) in the United States, and Health Survey for England in the UK, but these data only contain few body dimensions mainly height and weight. The National Centre for Health Statistics has published a series of surveys since the 1960s, and the data has been released in two years from 1999 in the United States (Reed, 2013). In the UK, Health Survey for England has provided data of blood pressure, body measurements, and analysis of blood and saliva samples since 1991 (CDC, 2007).

Manual measurements in the sizing survey are required as a trained measuring technique because some body parts such as crotch length are difficult to measure accurately. Current 3D body scanning technology is raised to overcome many defects of manual measurements having the accuracy and convenience. This technology helps to acquire usability and accessibility of body measurements in the clothing industry and brings immediate benefits such as minimising visual distraction between clothing and body (Ashdown et al., 2004; Otieno, 2008). Anthropometric data is a basis of development of new scanning technologies which can provide current body size and shape identifications for well-fitted clothing for consumers (Apeagyei and Otieno, 2007; Otieno, 2008). The first 3D body scanning technology was used for the UK national survey (SizeUK) in 2001. Also, a number of countries including the United States, France, Germany, Korea, Spain, and Thailand conducted the national sizing surveys which are named Size plus the country name using 3D scanning technology (e.g. SizeUS, SizeKorea, etc.) (Apeagyei and Otieno, 2007).

The information on human growth and measurements from national surveys provides substantial benefits, and the results of national survey become a guide to update the body size and shape data for the industry, analysis of

demographics, and improved size standards and new size chart developments (Otieno, 2008).

However, Otieno (2008) also mentioned that chosen samples of the population in national surveys should be represented for all population because it is impossible to measure every individual sample. Additionally, Otieno (2008) and Apeagyei (2010) cautioned that an anthropometric survey is costly and requires considerable time as well as specialised experts for the measurements. Otieno (2008) mentioned that the currently accessible data to the public are usually outdated, and Apeagyei (2010) also addressed that the accessibility of the anthropometric data is difficult to the public. Moreover, the public domain for the anthropometric data is not accessible to gain the detailed information such as the techniques of the measurement or the precise results of the data (Apeagyei, 2010).

The clothing industry adapts invalid and irrelevant anthropometric data, and this influences the production of unreliable size chart systems even though the anthropometric data is the valuable marketing tool for retailers and manufacturers to communicate with customers. Clothing companies use different procedures to measure the same variables, and it is difficult to compare data (Otieno, 2008).

With demands from retailers on data of children, some research only for children's anthropometrics was conducted. One of the current anthropometric surveys for children is the Shape GB sizing survey in the UK using the 3D body scanning technology supported by retailers (Apeagyei and Otieno, 2007). The European Committee for Standardization (CEN) also support some research groups to strengthen the anthropometric data of children; DIN German Institute for Standardization (Deutsches Institut für Normung e.v.) and the 'Anthropometry Research Group' in Instituto de Biomecánica (IBV, no date). SA/CEN2014-09 'Anthropometric Data for Children' is currently being executed, and this information will be published in CEN Technical Report(s) (IBV, no date).

The information on the anthropometric surveys will continue to provide the various basis of the size charts, pattern construction, and dress forms which improve usability and accessibility in the clothing industry (Otieno, 2008).

2.2.3 Size standards

Standard is defined as follows (Flynn and Foster, 2009 p. 551):

> "Commonly agreed on aid for commutation and trade; a set of characteristics of procedures that provide a basis for resource and production decision; a product that meets all specifications and company or product requirements."

ISO International Standards define a standard is (ISO, no date):

> "A document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose."

UK Fashion & Textile Association (UKFT) explains that a standard contains a technical specification to be used as a rule, guideline, or definition, and addressed that standards support a simple life, increasing reliability, and the efficiencies of the products and services of people (UKFT, 2012).

White (2011) mentioned that standards are agreements made by different groups in industries and countries and Flynn and Foster (2009, p. 551) defined standardisation as below;

> "The process of developing and applying rules for a consistent and uniform approach to a specific activity for the benefit and with the cooperation of all concerned."

International standards give economic benefits to the business, consumers, and governments to ensure the safety and quality of products and services, to facilitate international trade, and to improve the environment (see Table 2.3).

Table 2.3 Benefits of International Standards

(Reproduced from ISO, no date)

For business	For consumers	For government
- Cut costs - Increase customer satisfaction - Access new markets - Environmental impact reduction	- Confidence in safety, reliability, good quality of the product	- Getting expert opinion - Opening up world trade

As to the business, standards are a guide to help companies ensuring efficient business operation, increasing productivity, and helping to explore new markets. ISO international standards mentioned that the standards contribute to reducing the manufacturing cost by improved systems and processes, and it increases consumers' satisfaction through enhanced safety, quality, and processes. Additionally, a new market is accessible through compatibleness between products and services including the environmental impact minimisation. Moreover, customers also can confirm the products they consume are safe, reliable and of good quality through standards, and national governments also can use international standard by supporting public policies from the experts' opinion. Also, national regulation ensuring the requirements for import and export in the international standards can integrate the different policies between countries (ISO, no date).

With respect to clothing, standards often provide definitions of terminologies of body measurements and methods to prevent confusion. The data from standards are applied to the different group of samples according to their characteristics such as body shape, age, and gender (White, 2011). Kennedy (2015) mentioned that both the clothing industry and consumers expect standards to provide efficient mass-production, and Otieno (2008) also emphasised the local sizing strategies such as the European standards which have been used across Europe in the globalised clothing industry. However, Kennedy (2015) also stated that maintaining a standard size in mass-production is difficult because of a global fast fashion product which clothing industry focuses on less diverse body shaped consumers. In addition, international standards such as ISO standards are self-regulatory clothing sizing standards which allow privates or companies to consider adopting a standard voluntarily (Flynn and Foster, 2009; Kennedy, 2015).

2.2.4 Sizing system

A sizing system is "a set of pre-determined body sizes designated in a standard manner" according to "the body measurements which were taken on a cross section of the target population" (Kunick, 1967, p.1; Winks, 1997, p.24). Petrova (2007, p. 57) defined that a sizing system is "A table of numbers which presents the value of each of the body dimensions used to classify the bodies encountered in the population for each size group in the system." A sizing system is constructed according to the classification of the

population into groups having similar body dimensions which are used to divide as control dimensions or key dimensions (Petrova, 2007).

A sizing system development starts with an anthropometric survey with the focus on a particular target population (Winks, 1997, p.24). Apeagyei (2010) mentioned that a clothing sizing system is classified by the standardised and categorised body dimensions which aim to fit the largest number of a population with the smallest number of sizes. Ashdown (1998) also stated that sizing systems are based on the selected body dimensions from an anthropometric study of a population, and key body dimensions are chosen to classify the population into size groups. She also mentioned that the goal of any sizing system is to find the minimum size groups with a limited number of sizes to fit most of the population. The population is classified into different body types firstly according to body dimensions such as height or ratios between body measurements (Ashdown, 1998).

Additionally, it is addressed that the enhanced sizing system can construct restriction on the manufacturing system to help simplify the product development process and distribution of clothing (Ashdown, 1998). Petrova (2007) also mentioned that constructing a sizing system for manufacturers contributes to the increase in customer satisfaction even though it is a dilemma to decide a number of size groups and division of population. Pandarum and Yu (2015) stated that standardised clothing sizing gives customer satisfaction with fit in various clothing sizing systems that have been developed worldwide. Also, a globally standardised clothing system promotes growing market sector encouraging trade between countries.

Ashdown (1998) mentioned sizing systems developed by different countries are various in the selected body dimensions to classify the population, and Apeagyei and Otieno (2007) also stated that diverse and complex sizing systems in the clothing industry confuse customers. Pandarum and Yu (2015) addressed that the clothing industry does not adapt the standards for their manufacturing process promptly, and inappropriate data of a population is influenced to add considerable value towards the standard system.

However, the cost of restraining the sizing system needs to accommodate and to balance the requirement of providing proper sizes and a suitable structure (Ashdown, 1998). Moreover, Otieno (2008) mentioned that the incongruity of anthropometric data towards efficient sizing system development had been debated for many years, the utilisation of anthropometric data cannot solve all problems. There is a possibility that inaccurate determination and measurements in the system which is adapted

in the different industries may give improper and unreliable data. That is why the appropriate skills for the measurements and proper sampling process should be considered to provide the required outcome including accurate analysis and interpretation of data (Otieno, 2008).

Pandarum and Yu (2015) summarised the following factors which would determine the successful adoption of a standardised system:

- How consensus is reached by the different countries on the classification of garment types
- How realistic the key dimensions selected within and between manufacturers in a country will be
- Whether a new standardised system will be used and adopted by customers worldwide
- Whether customers will know and understand a garment sizing system using body measurements or even know their own body measurements at any given time

Finding out a relationship between body size and shapes which is considered appropriate clothing fit in the sizing system is required because the methods and financial implications for the collection of body measurement data are complex for the retailers and manufacturers (Apeagyei, 2010). Even though some challenges should be considered providing an appropriate and unified sizing system, the followed benefits from the standardised sizing system are not doubtable in the global clothing market.

2.2.5 Size charts and labelling

White (2011, p. 1) defined a size chart as below:

> "A table of data showing measurements either of the body or the clothing attached with a size label."

Similarly, Knight (2012) stated that "a size chart lists the average measurements of body sizes for a range of garment size." Apeagyei (2015, p.18) addressed a size chart as "an artificial driving of a range of measurements to designate size", and she also mentioned that size charts should be "concise, economical, consistent and simple to read." Otieno (2008, p.82) mentioned that size charts are substantial in the clothing industry and she described the uses of size charts as; "standardisation, labelling of garments, stock management, size identification by consumers,

providing proprietary information for retailers and manufacturers". Also, she stated that the factors in the size charts are related to "key dimensions, size codes, size ranges, grading increments, allowances and international standardisation".

As for clothing purposes, size charts classify the human physique to represent various body sizes and shapes to manufacture appropriate fit of clothes in a mass production system having various sizes (Otieno, 2008). Size charts are often organised in particular ways to facilitate practical use. Characteristics, order, and application drive the organisation of the chart components. Type of size charts is classified into size charts of body measurements and finished garments (Apeagyei, 2015). Body measurement charts consist of the size range of a represented customer group which are valuable for designers, pattern makers, and graders. Finished garment size charts include extra measurements such as ease allowances, and tolerance added to body measurements for movement and expansion depending on design and fabric. Finished garment size charts are usually used for quality control, garment inspection and specification (Apeagyei, 2015).

Otieno (2008) mentioned that size charts include a set of sizes which are developed from accepted assumptions due to the differentiated system and terminology. Pandarum and Yu (2015, p.193) explained the general components of clothing size charts with an example of women's trousers; (a) Type of clothing in header (e.g. Women's trousers), (b) Size label which represents a range of body measurements defining by the height or girth measurements (e.g. Size 10, 12, and 14), (c) The individual measurement part with measurement unit (e.g. waist and inseam) (see Figure 2.2). The header of size charts denote specific types of clothes in the target market, and labelling of the size and key measurements are followed (Apeagyei, 2015; White, 2011).

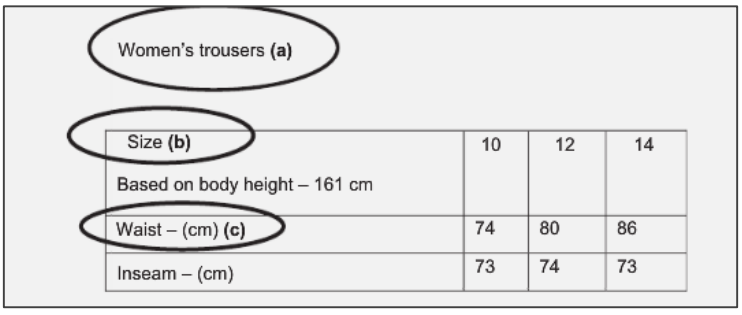


Figure 2.2 The general components of clothing size charts
(Reproduced from Pandarum and Yu, 2015, p.193)

Apeagyei (2015) defined size labelling as a communication of sizing with body measurements and letters or numbers according to the size charts. Clothing is labelled variously and sometimes inconsistently with different codes as below (Otieno, 2008, p.80):

- Numerical symbols – e.g. 12,14,16 or 1,2,3,4 or 34,36,38
- Control body measurement - e.g. to fit chest 32cm, hip 38cm, neck 38.5cm
- Finished garment measurement - e.g. Inside leg 31
- Height – e.g. to fit height 92 cm
- Figure type - consisting of XXS, XS, S, M, L, XL, XXL or Short, Medium, Tall
- Age and weight - e.g. Age 2 years or Age 2-3 years; 7 lb.

Numeric sizing may have any significance or correlation to specific body measurements such as a 34 chest to fit a body or 6, 8, 10 without similar measurement correlation (ASBCI, no date). Control body measurement[2] also called key dimensions are chosen based on the representative actual body measurements of size labels (Apeagyei, 2015; White, 2011). Finished garment measurements are chosen for indicating the final measurement size such as inside leg of jeans, and height is usually chosen for children's size label (Apeagyei, 2015; Otieno, 2008). Unit of key dimensions and finished garment measurements are used without rules; imperial units (inches, as in the United States) or metric units (centimetres, as the most of Europe or Asia) (ASBCI, no date).

Classification by figure type is called as letter coding (or alpha sizing), and it is usually comprised two to three numeric sizes with one or more letters such as XXS, XS, S, M, L, XL, XXL, XXXL or S (for Short), M (for Medium), T (for Tall) or S (for Small), M (for Medium), and L (for Large) (Otieno, 2008; White, 2011; Bubonia, 2014). Letter coding sizing is used for casual clothing which does not require precise fit having additional ease, and the size label order is organised from the minimum size on the left to maximum size on the right (Bubonia, 2014; White, 2011). Letter codes usually cover a target group with fewer sizes, and some brands combine the numeric and letter sizing

[2] Control dimensions are "the dimension of the body given on labels to enable consumers to buy clothes that fit". (Aldrich, 1991)

such as a label with size M (12-14) (ASBCI, no date). Height and age are parameters for children's clothing, but the weight is normally provided for the infant's size charts (Aldrich, 1991).

ASBCI (no date) added 'special' sizes for consumers who do not fit 'regular' sizing, and it generally has larger girth measurements called 'Plus' or 'Big' sizes. Additionally, women are have significantly shorter in height than average is called as 'Petite', and petite size clothing have shorter sleeve, inseam, and body lengths (ASBCI, no date)

Pandarum and Yu (2015) mentioned that the diversity of size charts by different codes bring about the consumer's confusion to acquire proper fit in the mass production market because this excessive number of types are not extensions of choice. It is impossible that all clothing with the same size label has the identified body measurements, but the clothing industry will improve this problem considerably even though the standard clothing size system will correct this situation. It is also emphasised that a clothing size label should indicate appropriately having simple, direct, and meaningful designations without uncertainty or possibility of confusion (Pandarum and Yu. 2015).

Otieno (2008) also addressed that variation of size charts and methods within and between clothing companies and different countries are adopted in developing size charts, and this causes difficulty for consumers. She also emphasised that clothing sizes should follow standardised dimensions with specific categories which consumers recognise the proper clothing with their intended fit. She concluded that size charts should be developed concisely and consistently with simple and economic numbers which aim to fit the convenient manufacturing process and consumers' satisfaction.

Zakaria (2016, pp.16-17) mentioned that size charts contain size roll, ranges, and intervals, and "a good sizing system is expected to have a high coverage rate and low aggregate loss".

A size chart is a communication tool with customers giving information by size labelling for retailers and manufacturers (Pandarum and Yu, 2015). Even though international standards for clothing sizing exist, it is apparent that efficient size charts are advantageous both for the industry and for customers because size charts influence the control of production numbers and to give appropriate information (Bubonia, 2014; Pandarum and Yu, 2015).

2.2.6 Clothing comfort and fit

Clothing generates wearing sensations depending on the combination of human activity variation (Hollies et al., 1979), and a number of factors influence clothing preferences to consumers such as comfort, aesthetics, and personal choice. Moreover, fashion trend, culture, age, gender, body shape, and lifestyle also influence personal fit preferences (Shan et al., 2012).

Flynn and Foster (2009, p.531) defined the comfort as

> "Positive interaction between the textile product and body; includes physical, physiological, and psychological factors".

Table 2.4 shows the diverse definitions of fit which can reflect the disagreement of responsible good fit in the clothing industry (Shan et al., 2012).

Table 2.4 Definition of fit
(Yu, 2004, cited in the list of researcher(s))

Researcher(s)	Definition
Cain (1950)	"Fit is directly related to the anatomy of the human body and most of the fitting problems are created by the bulges of the human body."
Chamber and Wiley (1967)	"Clothing that fits well, conforms to the human body and has adequate ease of movement, has no wrinkles and has been cut and manipulated in such a way that it appears to be part of the wearer."
Erwin and Kinchen (1969)	"Fit is defined as a combination of five factors; ease, line, grain, balance and set."
Efrat (1982)	"Clothing fit is a complex property which is affected by fashion, style, and many other factors."
Hackeler (1984)	"Clothing should fit the body smoothly with enough room to move easily and be free from wrinkles."
Shen and Huck (1993)	"Clothing which fits, provides a neat and smooth appearance and will allow maximum comfort and mobility for the wearer."

Shan et al. (2012, p.39) mentioned that "good fit is essential for clothing comfort, appearance, and consumer satisfaction." and they also addressed that fit is very subjective because each individual has a different assessment to describe a good fit of clothing on their bodies. Fit preference is defined by

how customers desire a particular clothing to match to their body shapes, and some factors for how customers choose their clothing are different for different cultural and ethnic groups (Manuel et al., 2010). Shan et al., (2012, p.40) mentioned that the factors which affect clothing fit are “physical and psychological comfort with appearance, and these are ease, body cathexis, fashion trends, and fabric property,”

Ease: Ease allowance is an extra measurement added to the body measurement for movement and expansion which are classified as wearer ease and design ease (Otieno, 2008; Shan et al., 2012, p.40).

Shan et al. (2012, p.40) divided apparel ease as;

- Wearing ease: the amount of extra fabric allowed over and above the body measurements to ensure comfort, mobility, and drape of a garment
- Design ease: additional amounts of fabric added to achieve certain design effects by changing the line and shape of the garment

Apeagyei (2015) defined wearing ease allowance is functional or end-use of the garment and type of fabric, and design ease depends on the style or fashion. Simplicity Pattern Co. Inc. (no date) described that wearing ease is based on individual preference and design ease is for a certain look such as a jacket which is designed slim (see Figure 2.3).

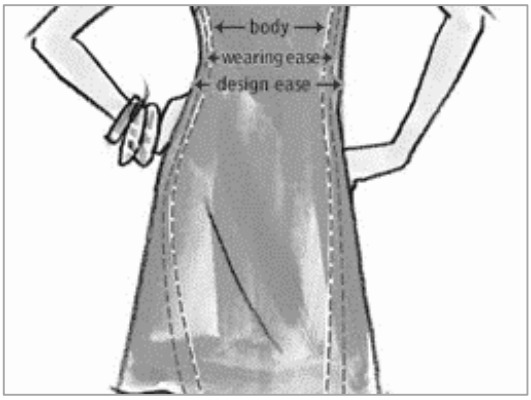


Figure 2.3 Wearing ease and design ease
(Reproduced from Simplicity Pattern Co. Inc., no date)

Shan et al. (2012, p.40) pointed out that the appropriate level of ease allowance is crucial for the high satisfaction of clothing fit, but the guidelines on this optimum ease range are limited. Moreover, they stated that “design

ease is not essential to the basic understanding of fit because it is subjective and style dependent."

Body cathexis: Body cathexis is defined as "positive and negative feeling towards one's body" (Shan et al., 2012, p.40) and "the degree of feeling about satisfaction or dissatisfaction with the various parts or processes of the body." (Second and Jourard, 1953, p.343). Body cathexis is also identified as a part of the self-concept, and an essential concept for body image from different ethnic groups with perceptual distortion of the body shape (Manuel et al., 2010).

Fashion trends: Fashion trends toward body influence into clothing fit. For example, less ease is included when the physical body ("body primary") is emphasised, but more ease is added when clothing ("clothing primary") is given more emphasis to hide the body (Shan et al., 2012 cited in Fiore and Kimle, 1997).

Fabric property: Type of fabric is also an influential factor for variations of allowance (Apeagyei, 2015). "Mechanical properties such as bending rigidity, the shear resistance, elongation of fabric-self-weight, and so on" are detailed factors to classify the type of fabric (Shan et al., 2012, p.40). Simplicity Pattern Co. Inc. (no date) gave some examples which classified the fabrics which require less or more ease (see Table 2.5).

Table 2.5 Fabric classification depending on ease requirement
(Reproduced from Simplicity Pattern Co. Inc., no date)

Less Ease	More Ease
Jersey Knits, Loose-Weave Linens, Crinkled Fabrics, Stretch Woven Fabrics	Tight-Weave Cottons and Linens, Denims, Wools, Satins

Flynn and Foster (2009, p.531) defined consumer satisfaction as "a measure of how well a product or service meets consumer expectations", and Hudson (1988, p.117) stated that "clothing can give satisfaction to the customers and should have aesthetic aspects and fit".

Alexander et al. (2005) mentioned that clothing with good-appearance is a considerable factor for customers, and dissatisfaction with fit is the one of the most generally described problem causes in the clothing industry. The problem of ill-fitted clothing still exists, and this is a major consideration for the industry and customers (DesMarteau, 2000). Otieno (2008) also pointed

out the assessment and achievement of clothing fit and sizing considerations are disregarded in the industry even though there has been considerable interest in customer satisfaction and dissatisfaction.

Clothing size and fit issues strongly affect the manufacturing and supply chain processes from body measurement to purchase (Otieno, 2008).

2.3 Reference to Infants and children

2.3.1 Definitions of infants and children

There are a number of terminologies in a clothing sizing system which describe infants, babies, toddlers, children, juniors, boys, girls and teenager which are defined differently in various dictionaries and academic sources.

Table 2.6 shows that various definitions which refer to the infant in different dictionaries. The age of the infant based on public health and medical dictionaries describes that a child between birth and under one year of age but, infants from the perspective of the legal view is indicated as being up to the age of seven years. However, the infant ages in the Oxford dictionary are between four and eight, and baby is defined as “a very young child” (Oxford Dictionary, 2016).

Table 2.6 Definitions of an infant

Oxford Dictionary of English (2016)	A Dictionary of Public Health (2007)	Concise Medical Dictionary (2010)
“A very young child or baby, (British) A schoolchild between the ages of about **four and eight**”	“A child **between birth and 1 year of age**. In common usage, the age range is more loosely defined, describing a child between birth and an age when an independent activity, such as walking, feeding, and washing, can be performed.”	“A child incapable of any form of independence from its mother: the term is usually used to refer to a child **under one year of age**, especially **a premature or newborn child**. In legal use the term denotes a child **up to the age of seven** years”

Oxford Dictionary (2016) defines a toddler as “A young child who is just **beginning to walk**” and Dictionary of Public Health (2007) defines a toddler as;

> “A descriptive term loosely age-related, describing a small child who is in the process of **learning to walk**, i.e., in the age range of about **9 to 18 months**. The popular media often describe children aged **1 to 2 years** as toddlers, and some paediatricians set a lower age range”.

As to the definition of a toddler from Oxford Dictionary (2016) is older than infants but a public health dictionary mentioned that toddler is “a variable and vague period of early childhood, and because of the variability the term is preferably avoided” (A Dictionary of Public Health, 2007).

The terms of the child, junior, and teenager are defined in Table 2.7. A child is described under the age of maturity in the Oxford Dictionary, and age range of junior and teenager are between age 7 and 11, and 13 and 19 respectively. Cooklin (1991) mentioned that the period of ‘teenage’ is used synonymously with adolescence from age 13 to 18. In addition, definitions of boy and girl are “a male child or youth” and “a female child” (Oxford Dictionary, 2016).

Table 2.7 Definition of child, junior, and teenager

Terminology	Child	Junior	Teenager
Definition	“A young human being below the **age of puberty** or below the legal age of majority”	“For denoting young or younger people: British for or denoting schoolchildren between the ages of about **7 and 11**”	“A person aged between **13 and 19** years”.

With respect to the international standards, ISO 3636 and 3637 (Size designation of clothes - Men's and boys' outerwear garments and Women's and girls' outerwear garments) state that boy and girl are “a male/ female person whose growth in height is not yet finished”. Also, British standards (BS EN 13402-1~3) and Korean standards (KS K 0042, KS K 9402~3) also define Infant boys and girls, and boys and girls, and the detail of standards are discussed in Chapter 5.

2.3.1.1 Size range

Cooklin (1991, p.3) defined the demarcation lines of children's growth according to age groups as follows:

- Baby: 2 months to 12 months
- Infant: 1 year to 3 years
- Children: 3 years to 6 years
- Juveniles: 6 years to 11 or 12 years
- Pre-pubertal: 10 years to 13 years
- Adolescence: 13 years to approximately 18 years

However, Hwang and Kim (2013) classified the age range as below, and they also mentioned that a toddler is referred from the child who is taking to the nursery school student.

- Newborn infant: 0 to 1 year
- Baby: 1 to 3 years
- Toddler: 3 years to 7 years
- Child: 7 to 13 years

Regarding the age group classification in Simplicity Pattern Co. Inc., which is a supplier of patterns and tools in the UK provide patterns divided into six ranged age group (see Table 2.8). With reference to baby, a specific age division is not found, and toddler is from 6 months to 4 years, child is from age 2 to 8, boys and teen boys are from age 7 to 20, girls are from age 7 to 16, and girls' plus are from age 8 1/2 to 16 1/2 (Simplicity Pattern Co. Inc., no date).

Table 2.8 The demarcation lines of children's growth
(Reproduced from Simplicity Pattern Co. Inc., no date)

Size group	Description
Baby	For infants who are not yet walking (XXS to L based on weight and approximate height)
Toddler	For figures that are taller than 'Babies' but shorter than 'Children'. Pants have a diaper allowance; dresses are shorter than children's sizes. (6 months to age 4)
Child	Age 2 to 8

Boys and Teen Boys	For growing boys and young men who have not yet reached full adult stature. (age 7 to 20)
Girls	For the growing girl who has not yet begun to mature (age 7 to 16)
Girls' plus	Designed for girls over the average weight for their age and height (age 8 1/2 to 16 1/2)

2.3.2 Growth and development of infants and children

Children's wear developers should aware of the children's body shape change as "it grows and the proportion of the change is different" (Aldrich, 1991, p.6). Cooklin (1991) also mentioned that understanding how a child body grows and develops between infancy and maturity is important because the growth rate of the each age in the group's body size are not increased equally.

Cooklin (1991) stated that body shape and proportions of children are continually changing, and each age group has different primary and secondary developments in each stage. He also mentioned that the progression for developmental achievement could be predicted accurately, but each child has its own growth way with many variations. Table 2.9 summarises the main physical characteristics of each age group (Cooklin, 1991, p.4-5).

Table 2.9 Physical characteristics based on age groups
(Reproduced from Cooklin, 1991, p.4-5)

Age group	Characteristics
Baby (2 to 12 months)	- Dominant length growth of body trunk with accumulation of subcutaneous fat - Body form is distinguished by a large head, heavy trunk and protuberant abdomen - Upper body part is longer than the lower body part relatively - Length of legs are approximately one-third of the total body length
Infant (1 to 3 years)	- Growth rate slows significantly, and height increase is lower than during infancy - Two and half year of weight is usually four times of the birth weight - Chest girth became larger than abdominal girth, and leaner appearance of lower extremities are shown after two years. - Body shape of infants is still protuberant.

Children (3 to 6 years)	- Physical growth slows down and begins to stabilise, - Increase of height is generally 6-7 cm per year with the greater development of the legs rather than the trunk. - Body proportion is not similar with the infant, and pre-school child is slender having an upright posture. - Differences of measurements and proportions are not much shown between boys and girls.
Juveniles (6 to 11 or 12 years)	- Growth and development are progressed steadily with an average 4 cm of height and 2 1/2 kg of weight per year. - There are minor size differences between boys and girls, but boys are slightly taller and heavier than girls at the beginning stage. - At the end of this phase, girls' growth rate of height and weight enhances the boys, and maturation between boys and girls start to be apparent. - The maturation difference is approximately two years between boys and girls, and girls' pubescence starts at the age 10 while boys are 12.
Pre-pubertal (10 to 13 years)	- General body types in this age group have a slimmer appearance having different body proportions due to fat diminish. - The body shape of girls is constructed with an uncertain bust line and a somewhat more defined waist line. - The body shape of boys shows a significant shoulder development and apparent beginning of a waist line. - Body characteristics are eventually accomplished as adults.
Adolescence (13 to 18 years)	- Growth and change are more significantly and visibly shown at this stage, and puberty is begin to boys for manhood and girls for womanhood. - The fast growing period of the final 20% to 25% of linear growth happens during at the early two to three year of this period - Growth amounts of the average boys are 20 cm in height and approximately 18 kg in weight while 12 cm in height and 7 kg in weight for the average girls.

Aldrich (2009) described the age group of children's basic growth features as having three stages: birth to age seven, age seven to puberty, and puberty. As to the stage of birth to age seven, the rapid increments in sizing is shown from birth to one having generally three-month intervals. In general, a child lose fat from the age of two until the age of eight, but boys are usually thinner than girls with a small difference (Aldrich, 2009). From age seven to puberty stage, the growth speed is decreased until the child reaches to the adolescent growth spurt, and little difference of growth rate is shown to boys and girls. However, there is a dramatic increase in height with maintaining

abdominal fat (Aldrich, 2009). IAAF (2009) mentioned that the peak of a growth spurt is age 14 for boys and age 12 for girls (see Figure 2.4).

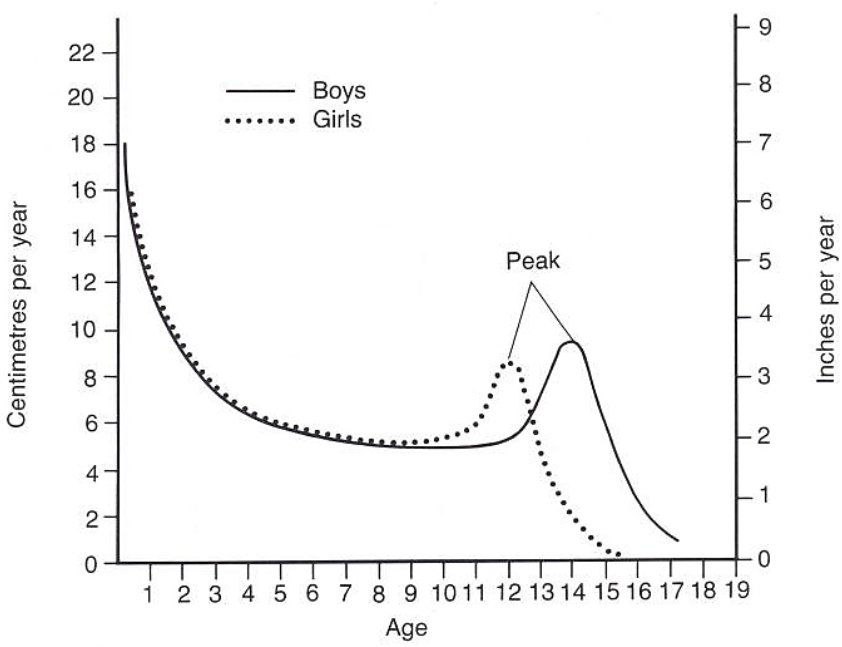


Figure 2.4 Different growth spurts of boys and girls
(Reproduced from IAAF, 2009)

Also, the distinctive body shape difference between boys and girls starts to show in this stage such as wider shoulders of boys and the smaller waist with the larger hip of girls. In puberty stage, the growth rate decrease varies from general 8 cm at the age of three to 5 cm (Aldrich, 2009). The average boys in puberty reach their growth spurt at the age of 13 and grow dramatically until the age of 15; then they grow up slowly until the age of 17. Boys in puberty start to gain muscle, and the trunk grows faster than the limbs with a maximum speed of shoulder growth. With respect to girls in puberty, they begin to grow significantly at the age of 11 or 12, but their growth spurt is shorter with a slower rate than boys due to their early start of puberty. During girls' growth spurt, they gain fat in the trunk area with a distinctive hip size increase rather than arms and legs (Aldrich, 2009).

Kunick (1967) mentioned that every normal child regardless of age will achieve and go through every specific size. Therefore, it is important to understand basic physical characteristics in each age group.

2.3.3 Clothing for infants and children

Zakaria (2016) pointed out that the children's clothing is expected to fit individual with affordable comfort, but she mentioned different factors such as diet, genetics, social and environmental factors, and so on, influence various growth rates for the same-aged group.

Aldrich (2009) classified basic requirements for manufacturing and sizing of infants and children's clothing according to the age groups. She mentioned that clothes for the stage from birth to the age of seven should be considered for designing clothing's opening for head to take on because the size of the head of a three-year-old child is one-fifth of its height.

Hwang and Kim (2013) mentioned that children's clothing is required to be produced based on their age and body type, and should have proper space to ensure comfort for children's comfortable movement. They also mentioned that the neck size of upper clothes should have appropriate space if the clothes with the large abdominal area do not have chest darts. Moreover, the depth of the armholes should have affordable depth with low sleeve cap. With respect to trousers, crotch length and width should have enough length for infants who wear diapers, and trousers with elastic bands also should be included in the extra amount around the waist (Hwang and Kim, 2013).

The growth rate and the body characteristics of each age group of children should be concerned for children's sizing and size charts development. At the stage from birth to age seven, weight measurement become the important description for clothing selection, but height becomes the demanding sizing division when a child starts to walk (Aldrich, 2009). In the case of early childhood, the gender difference was not significantly shown until the age four. Therefore, each gender's size chart is advisable, but the common size charts can be used for four years for boys and girls. However, considerable body size and shape differences start to show at the age of seven, and separate size charts for each gender is necessary by seven (Aldrich, 2009).

During puberty stage, the growth rate is decreased but height is increased 8 cm at age three and it is 5 cm at the age ten per year, then manufacturers decided to have 6 cm height intervals due to the average growth per year (Aldrich, 2009). However, she mentioned that the age of children is only a guide of the designation of expected stature, and other body measurements including height should be shown on the clothing label. As to puberty stage

of boys, age is not relevant on size charts because the growth spurt varies which usually starts at age 13 and finishes by age 17. Bust darts should be generated on the pattern blocks in the later girl's puberty stage, and specific size charts for this maturity stage which are different from women's. Puberty girls' stage has too various relationships between height and age; then it cannot be constructed with yearly increments like the puberty stage of boys (Aldrich, 2009).

2.4 Summary

In general, this chapter reviewed how size and fit issues are essential in clothing. Firstly, it was found that concerns about size and the fit are significantly required in many stages during the clothing manufacturing process from prototype development to the evaluation stage. Next, it is also found that size and fit consideration is fundamental in the anthropometry study, sizing survey, size standards, sizing system, size charts and labelling. Therefore, it is concluded that appropriate insights of size and fit are crucially considered for clothing to be comfortable and to fit. Finally, infants and children which are chosen as the targeted age group of this research were investigated from the physical characteristics to the background of the children's wear.

It is concluded that children have various body sizes and shapes, but it is important to determine appropriately how they vary and how many children will be accommodated or excluded with a specific set of design parameters (Lueder, 2007). Therefore, it is important to understand this variability of body size and shape, and the investigation of how it is adapted to the clothing market is necessary.

Chapter 3 Research Methodology

This chapter discusses the suitable methodology for achieving the research aim and objectives after clarifying the research topic. The most appropriate research strategy, data collection, and analysis methods are chosen in this chapter.

3.1 Overview of theoretical perspectives

Research is defined as “the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions (Oxford Dictionary, 2016). This research begins the investigation of current documents of children’s body and clothing size as well as clothing sizing system, then suggests knowledge and guides to clothing industry and researchers using social science methods.

An appropriate research methodology which is referred to the paradigm, philosophy or approach should be adopted for research design. Defining relevant research paradigm is critical to connect the methodology which is also connected to detailed data collection and analysis methods (Kim, 2016). In this research, six key elements (paradigm, philosophy, approach, purpose, type, and time horizon) were considered before research design (techniques of data collection and analysis). Table 3.1 summarises the research strategy in adopting various approaches in this research.

Table 3.1 Research strategy adopted for this research
(Dudovskiy, 2016; Lee and Jung, 2010; Saunders et al., 2016)

	Existing Research Strategies	**Adopted Research Strategies**
Research paradigm	• Axiology • Epistemology • Ontology • Phenomenology	• **Epistemology**
Research philosophy	• Positivism • Critical realism • Interpretivism • Postmodernism • Pragmatism	• **Positivism** • **Pragmatism**

Research approach	• Deduction • Induction • Abduction	• **Deduction** • **Induction**
Research purpose	• Exploratory • Conclusive - Explanatory - Descriptive	• **Exploratory** • **Descriptive**
Type	• Action research • Archival research • Case study • Documentary research • Experiment • Ethnography • Grounded theory • Narrative inquiry • Survey	• **Documentary research** • **Case study** • **Survey**
Time horizon	• Cross-sectional • Longitudinal - Trend study - Cohort study - Panel study	• **Cross-sectional**

Research paradigm and philosophy

Research paradigm which has four major dimensions: *axiology, epistemology, ontology,* and *phenomenology* is an all-embracing system of interconnecting practice and thinking which defines the nature of inquiry along these dimensions (Dudovskiy, 2016). Saunders et al. (2016) stated five major philosophies (*positivism, critical realism, interpretivism, postmodernism,* and *pragmatism*) based on three research paradigms (*axiology, epistemology,* and *ontology*).

In this research, epistemology was recognised among the four paradigms because authoritarian knowledge which relied on information from documents and empirical knowledge relied on objective facts from the survey were addressed (Dudovskiy, 2016). Regarding philosophy, pragmatism was applied because the practical meaning of knowledge in specific contexts from the governmental and official document as well as survey were studied focusing on problems, practices, and relevance having problem-solving contribution and insights (Saunders et al., 2016). Positivism also would be appropriate because this research's consumer survey was a

study of human phenomenon or behaviour scientifically and quantitatively (Flynn and Foster, 2009).

Research approach

The reason for research is divided into *deduction, induction*, and *abduction*, and this approach provides a different way to answer research questions (Saunders et al., 2016). Deductive approach concerns the “development of logical conclusions by proceeding from the general to applied concept of a single case,” and inductive approach refers to “using a certain case of circumstance to generalise to a large association” (Flynn and Foster, 2009, p.306). The abductive approach is a combination of deduction and induction, and it moves back and forth, from theory to data and also from data to theory.

The different type of research materials (national sizing survey, national sizing standard, brand size chart, and consumer perspective) were collected to find out the current circumstances, and these specific cases were driven to analyse the finding in this research. However, this research was premised on the assumption that the selected countries had physical differences and comparable consumer propensity. Therefore, an inductive approach was employed to the literature reviews, document research, and case study because data collection was for exploring phenomenon to identify patterns. A deductive approach was also applied to the survey because conducting the survey was an evaluation process to conclude the verification of the hypothesis.

Research purpose

Research is divided into *exploratory* and *conclusive* research, and conclusive research is subdivided into *explanatory* and *descriptive* research by purpose (Dudovskiy, 2016).

In this research, the exploratory design was adapted because a greater understanding of the problem in children’s clothing market in the UK and Korea are explored with a variable level of depth in the literature review, document research, and case study. A descriptive design was applied to the survey with aims to describe characteristics and behaviour of the sample population and to establish the awareness of children’s clothing in the both countries.

Research type

- Documentary research

Documentary research is described as the techniques for categorising, investigating, interpreting and identifying the written documents regardless of being in the private or public domain (Payne and Payne, 2004). Documentary research method is a confident application method to researchers having the subsequent scientific research process (Mogalakwe, 2006). Documentary analysis is differentiated from secondary data analysis which is defined as "any re-analysis of data collected by another researcher or organisation" (Robson, 2011 cited Hakim 2000, p.24). Documents are written text by individuals and groups to acquire their own particular practical necessities (e.g. government papers, diaries, and newspapers) (Mogalakwe, 2006; Scott, 1991).

The type of this research was documentary research because the research data (national sizing survey and national size standard) were written documents by government and organisation for providing the guide of children's body and garment size in the UK and Korea.

- Case study

A case study is intended to analyse specific issues within the ranges of a specific environment, situation or organisation (Dudovskiy, 2016; May, 2011). A case study aims to comprehend the entirety of the case to provide a specific written description of the case as an independent object (Blaxter et al., 2006). The purpose of a case study is "not to represent the world but to represent the case" and it does not provide theoretical development or generalisation (Blaxter et al., 2006 cited Stake, 2005, p.460).

In this research, brand size charts in children's wear in the UK and Korea were collected as cases to explain each country's sizing system including a comparison between two countries. Thus, a case study was applied to this research.

- Survey

A survey is a process to gather information for statistical analysis with a group of individuals, and the responses are combined to reach a conclusion (McKee, 2015). One of the advantages of survey research is flexibility due to

the access of a large amount of samples from a large number of population proportionately (Crouch and Pearce, 2012).

A survey was conducted in this research for understanding attitudes and opinions of participants who purchase children's wear, and it is designed by both open and closed questions (list question, category question, and Likert (five-point-scale question).

Time horizon

Research is defined by time dimension; *cross-sectional* research and *longitudinal* research. Cross-sectional research is conducted at the only one time which means an observation of samples or phenomena are made one point in time (Flynn and Foster, 2009; Babbie, 2013). Longitudinal research data collect over time or at a variety of specific points, and it is classified into *trend* study, *cohort* study, and *panel* study (Flynn and Foster, 2009).

This research is classified as cross-sectional research because the data in this research is collected at a specific point in time.

3.2 Research methods

The research design is a master plan how researchers answer the research questions with selected methods, and how the research is to be conducted describing the techniques for collecting data, approaches to select samples, and analysis methods (Blaikie, 2010; Gray, 2009; Saunders et al., 2016).

3.2.1 Data collection

Internet-based research

The internet-based research was conducted for collecting data in this research because of its convenience and reliability. The Internet helps cross-national research is feasible without travel expenses, and it also assists to provide a large sample of participants in surveys (Robson, 2011).

The data of the National sizing surveys, Shape GB in the UK and 6th SizeKorea in Korea published by authorised governmental and official organisations were collected on their official websites in October 2015, and these sources' URL are presented in Table 3.2. The access to the UK data was allowed with payment, but the Korea data was opened to the public

freely. The Shape GB summary report was provided by one of the retailers which support the Shape GB research.

Table 3.2 Data collection sources of national sizing survey

Country	Name	Website
UK	Shape GB	http://www.shapegb.org/
Korea	6th SizeKorea	http://sizekorea.kats.go.kr/

The national size standards, British Standards in the UK and Korean Standards in Korea are also provided by their official websites, and the UK and Korea data were accessed on October 2015. The UK data was accessible with payment, and it was possible to save the electronic file whereas the Korea data was freely accessed, but saving the original file or capturing the screen was not allowed. The international and European standards were also collected for the comparison, and the sources of each standard are listed in Table 3.3.

Table 3.3 Data collection sources of national sizing standard

Country	Name	Website
International	International Organization for Standardisation (ISO)	http://www.iso.org
	European Committee for Standardisation (CEN)	https://www.cen.eu/
UK	British Standards Institution (BSI)	www.bsigroup.com/
Korea	Korean Industrial Standards Association	https://www.ksa.or.kr/eng/
	Korean Agency for Technology and Standards (KATS)	www.kats.go.kr https://standard.go.kr/
	Korean Standards Service Network	www.kssn.net

The data of case study was collected at clothing retailer's online shopping web pages in the UK and Korea. Web pages of children's clothing brands in the two countries were accessed through the internet using the online web searching sites aiming to collect 100 brands on October 2015 (UK) and January 2016 (Korea).

Survey questionnaire in this research used the web-based survey tools to collect data through due to its effectiveness of time and the convenience of participants' recruitment. The questionnaire was designed to suit to internet environment using 'Survey Monkey' (https://surveymonkey.com/), then online survey service providers 'Prolific Academic' (UK) https://www.prolific.ac/, 'Macro mill Embrain' (Korea) http://www.embrain.com/) collected the responses on June 2016 (UK) and July 2016 (Korea).

3.2.2 Sampling methods

Sampling is about selecting a population, items or elements which researchers intend to collect data from, and this data are required to collect without bias and with precision (Mcgivern, 2006). Samples are generally people who mean everyone and researchers need to study such as households or organisations (Flynn and Foster, 2009; Mcgivern, 2006).

Purposive sampling

In this research, documentary research and case study are focused on an examination of the effectiveness of specific status (Crouch and Pearce, 2012). Therefore purposive sampling was found to be the most suitable sampling method because a sampling of documents (national sizing surveys and size standards) and cases (size charts) from the organisation and companies were specifically intended to study by the research's "handpicking supposedly typical or interesting cases" (Blaxter et al., 2006, p.163).

Stratified sampling

Sampling for the survey was performed by the stratified sampling method due to its benefit of population's representativeness which meant the selected samples were within groups of the population. The population of the survey was females who have children, and subgroups in the UK and Korea which had the same homogenous composition with the different point of views between the groups. The targeted samples of each subgroup were set (n=200) before conducting the survey. Therefore, the survey was followed by the disproportional stratified random sampling. Demographic qualification of the participants was examined using the customised filters such as age,

gender, the status of children, current country of residence, and nationality by online survey service providers which recruited the participants in their database. The only female participants who had children aged three to nine in the UK and Korea could conduct this survey.

A total number of the collected survey outcome were 214 in the UK, and approximately 95.3 % of the participants were Caucasian, and 89.7 % of participants were originally born in the UK (see Table 3.4). 213 Korean participants who were born in Korea participated in this research's survey, and all of them used the Korean language.

Table 3.4 Sample characteristics in the UK

Variable		n (%)
Ethnicity	Caucasian	199 (93.0)
	Other	15 (7.0)
Country of birth	UK	192 (89.7)
	Non-UK	22 (10.3)
Language	English	204 (95.3)
	Non-English	10 (4.7)

3.2.3 Analysis methods

The conducted documentary research, case study, and survey were analysed by a particular technique according to its suitability. Quantitative or qualitative methods or both were used in all conducted research.

The collected documents in this research were official documents mixed with written texts and numerical data. Therefore, both quantitative and qualitative methods were used.

Comparative documentary and content analysis

Comparative methods have been used in "cross-national studies to identify, analyse and explain similarities and differences across societies" (Hantrais, 1995, p.1). The purpose of the cross-national comparison is to examine particular matter or phenomena in two or more countries with the aim of comparing their status through the same research instruments with an aim to explain their similarities and differences (Hantrais, 1995). Kohn (1989) also mentioned that the development of cross-national research makes an

attempt to require global insights on social research, and it supports to overcome national, cultural, logistic and linguistic obstacles giving efforts to provide accurately comparative information on the human condition.

Documentary analysis begins with an analysis of common-sense, then surrounded factors on the situation are examined (May, 2011). Documents are also analysed by content analysis which can take both quantitative and qualitative forms and is focused on to considering specific phrases which take place in the text as a way of identifying its characteristics (May, 2011). Contents are analysed with a start of breaking the text into component parts deriving categories, then recurring similarities and illuminating differences are followed. This elicitation of the part in patterns of themes came from data in order to compare and to understand what the data offers (Flynn and Foster, 2009; May, 2011).

In this research, a cross-national comparison method was used to compare in the UK and Korea about different systems and phenomena (national sizing survey, national sizing standard, brand size chart, and consumer preference) to gain a better understanding of the different situation. The collected documents in this research were official documents mixed with written texts and numerical data. Therefore, both quantitative and qualitative methods were used. The significant meaning of the text was selected, then these were coded and summarised into a simplified version of patterns. Document summary provides a list of the main points and describes the purpose of documents (Saunders et al., 2016).

Mixed methods

Mixed methods have qualitative and quantitative methods in the same research; “a research design that clearly specifies the sequencing and priority that is given to the qualitative and quantitative elements of data collection and analysis” (Robson, 2011, p.164). Creswell (2013) stated that the convergent mixed methods approach would be probably the most familiar of mixed methods strategies and described the process; collecting and analysis of both quantitative and qualitative data separately - comparison or finding relation – interpretation of the results (see Figure 3.1).

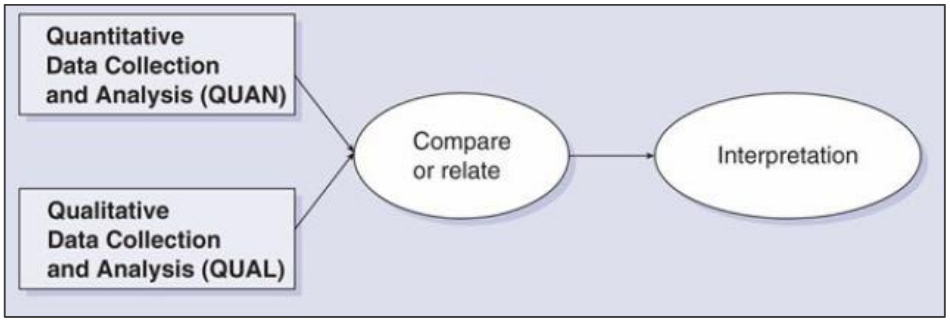


Figure 3.1 Convergent parallel mixed methods
(Reproduced from Creswell, 2013, no page)

In this research, both narrative (qualitative) and numeric data (quantitative) were collected, and these data were independently and sometimes conjointly analysed. Therefore, convergent parallel mixed methods were most suitable to compare different perspective drawn from quantitative and qualitative data.

As for qualitative data analysis, the qualitative data managing techniques by Blaxter et al. (2006); “Coding” – “Annotating” – “Labelling” – “Selection” – “Summary” is applied. Firstly, the data was simplified and reduced into a short phrase or numerical identity (Coding). Then, written materials is highlighted by consideration of more significant selection (Annotating). Significant texts are labelled (Labelling) and representative key items are chosen (Selection). Finally, the data which is linked to research findings and research aims and objectives is summarised (Summary).

Quantitative data in this research was analysed by IBM SPSS (Statistical Package for the Social Sciences) Statistics™ version of 23. To compare two countries’ data and variables, descriptive and inferential analysis (frequency analysis and Chi-square test) were adopted to find out the frequency counts of responses, preference and attitudes of consumers as well as a number of consumers. Multivariate analysis techniques (Correlation analysis, Factor analysis, and Cluster analysis) were also employed for the analysis. Spearman’s correlation analysis was applied to the rank order questions, and factor analysis (Principal Component Analysis) was adapted to reduce a list of variables, then to summarise influencing factors. Next, these factors lead to creating specific groups based on their similarities by cluster analysis. Finally, linear regression and discriminant analysis were used for data verification to determine the analyses of each variable were applied appropriately.

3.3 Ethical consideration

In this research, three issues of using the internet, involving human subjects, and storing collected data were considered.

Firstly, the only opened data of governmental, official, and industry documents which were accessible to all were downloaded and collected on online except the ShapeGB survey data which was purchased in October 2015. Also, collected data from online were only compared by qualitative and quantitative data analysis methods without modifying or changing the original detailed data.

Human subjects were involved in the consumer survey using internet-based survey tools. Basic ethical issues using human subjects are voluntary participation without pressure providing informed consent and researchers should not make unreasonable demands to participants keeping confidentiality and anonymity (Webster et al., 2013). In this research, the information sheet was provided to participants an overview of the research project and research procedures, and the survey system allowed only participants who checked all information could start the survey (see Appendix B.1). Also, a consent form to confirm the participants' voluntary willing was also set at the online survey system (see Appendix B.2). All personal information of participants were maintained anonymously while data analysis process.

Lastly, regarding storing data, all collected data were saved at the University of Leeds M drive without keeping personal devices.

Ethical considerations of this research were approved by Art and PVAC (PVAR) Faculty Research Ethics Committee in the University of Leeds (Ethics reference: PVAR 12-088).

3.4 Overview of research design

Table 3.5 provides a summary of the research process according to the research types. Detailed data collection and analysis method will be discussed in each research chapter.

Table 3.5 Overview of research design

Research activity	The source of data	Data collection technique	Sampling method	Analysis method	Chapter
National sizing survey analysis	Documentary sources	Web-based data collection	Purposive sampling	Qualitative and quantitative analysis	4
National size standard analysis					5
Brand size charts analysis					6
Customer survey	Primary sources	Online questionnaire	Stratified sampling		7

Chapter 4. National sizing survey in the UK and Korea

In this chapter, the literature draws attention towards the investigation of current children's body size and shapes which rapidly change. As to the start, the latest body size measurement data measured by the governmental and official organisation in the UK and Korea were collected including a written description of the data collection and methods (Section 4.1 and 4.2). Next section 4.3 details the background information and anthropometric data of a national sizing survey were investigated to find out the similarities and differences between the UK and Korea.

4.1 Sizing survey in the UK

It is recorded that the first UK national sizing survey was conducted in 1957 and the survey data was published by Kemsley. The data became a guide for sizing standards and labelling system in the UK, but the needs of recent sizing data were emphasised by clothing manufacturing companies and retailers (Bougourd et al., 2000).

Table 4.1 shows the history of national sizing surveys in the UK, and it is found that only children's anthropometric survey was started from 2000 (Shape Analysis Limited, no date).

Table 4.1 Sizing survey in the UK

(Reproduced from Shape Analysis Limited, no date)

Year	Project	Client	Profile
1997-1998	Women's wear survey	Next	Adult women (n=2,500)
1998-1999	Women's wear survey	M&S	Adult women (n=3,000)
1999	Men's wear survey	M&S	Adult men (n=3,500)
2000	Children's wear survey	M&S	Children aged 0-16 (n=3,500)
2000	Hosiery survey	Asistoc	Adult women (n=750)
2001	Bra survey	M&S	Adult women (n=1,700)
2001-2002	SizeUK – UK national sizing survey	DTI (UK governments) & retailers	Adult men and women (n=11,000)
2004-2006	BVI – Adult pilot survey	Heartlands Hospital & Aston University (UK)	Adult men and women (n=60)

Commenced 2007	BVI – Adult survey	Mayo Clinic (USA)	Adult men and women (n=600)
Commenced 2008	BVI – Children survey	Heartlands Hospital (UK) and other collaborators	Children aged 4-17 (n=600)
2009-2013	Shape GB – UK National Children's wear Survey– Phase 1	Next, Monsoon, ASDA, Shop Direct and other collaborators	Children aged 4-17 (n=2500)

4.1.1 SizeUK

'SizeUK' was the first national sizing survey of the UK population from 2001 to 2002, and this survey was for developing adequate clothing size and shape for customers and updating clothing size charts for retailers. This survey collaborated with 16 major UK clothing retailers, six academic institutions and the UK government (see the Table 4.2) (SizeUK, no date).

Table 4.2 Collaboration clothing retailers and universities in SizeUK

(Reproduced from SizeUK, no date)

Clothing retailers (n=16)	Arcadia Group, Bhs, Debenhams, Otto UK (Freemans & Grattans), Great Universal Stores (now part of Shop Direct), House of Fraser, John Lewis Partnership, Littlewoods (now part of Shop Direct), Marks & Spencer, N Brown Group, Monsoon Accessorize, Oasis Stores, RedcatsUK, Rohan Designs, Speedo International, Tesco Stores.
Academic institutions (n=7)	Heriot-Watt University, Leeds College of Art & Design, University of Central England, Nottingham Trent University, University College London and London College of Fashion, University of Wales Institute, Southampton Institute

4.1.1.1 Sampling

The retailers in the SizeUK recruited subjects to measure using the national media and retailers and the SizeUK's websites. A quota sampling method was used to select subjects for collecting information on the national statistics of age, ethnic origin, socio-economic groups and geo-demographics. A total number of subjects were 11,000, and those were 50% male and 50% female approximately. The age range of the SizeUK was between the ages of 16 and 85+. The data collecting points were eight in total: Birmingham, Cardiff, Edinburgh, Leeds, London, Manchester, Nottingham, and Southampton (Sizemic, no date).

4.1.1.2 Methods and data collection

SizeUK was the first sizing survey to use 3D body scanners to measure the body sizes automatically in the world. The 3D body scanner for this survey was [TC]² body scanner which was also used for the SizeUSA project. Both standing and seated poses were scanned while subjects were wearing only underwear. 130 body measurement dimensions were collected from each subject by 3D body scanners, and 8-10 measurements which cannot be captured by 3D scanners were also taken by manual methods. Subjects were also asked to complete the market research with a questionnaire comprising 40 questions including their personal details and shopping tendency about clothing issues (Sizemic, no date).

4.1.1.3 Data analysis

The data of SizeUK was analysed by experts from the University College London, London College of Fashion and Shape Analysis Ltd. The details of the analysis are the average height, chest, waist, hip and weight measurements as well as average shapes of the UK males and females and the results of data were also compared with SizeUSA data (UAL, no date).

The only data opened to the public of SizeUK on their website are the mean dimensions of height, chest, waist, and including the weight of the adult males and females in the UK (see Table 4.3). The data of SizeUK can be purchased by Sizemic Ltd., and the data license fee is different depending on the company size. ‘SizeUK Generic Mannequin,' a dress form which was developed using the measurement data of SizeUK by Sizemic, and software tools of data are also provided (Sizemic, no date).

Table 4.3 SizeUK: average measurements for male and female

(Reproduced from SizeUK, no date)

	Height	Chest	Waist	Hips	Weight
Male	177 cm	107 cm	94 cm	102 cm	79 kg
Female	163 cm	98 cm	86 cm	103 cm	65 kg

4.1.2 Shape GB

‘Shape GB’ is the first children’s wear measurement survey using 3D body scanners by Select Research from March 2008 to August 2010 in the UK. This project was sponsored by six retailers (George, M&S, Monsoon, Next, Shop Direct and Tesco) and five universities involved data collection (Aston University, Hull University, Loughborough University, Manchester Metropolitan University, University of Hertfordshire). Shape GB aimed to present and update the sizes and shapes of children for the UK clothing industries in order to suggest the manufacture of better fitting clothes and establish a sizing standard for children’s wear (Shape GB, no date).

4.1.2.1 Sampling

The subjects for the Shape GB were recruited by collaborating retailers and Select Research using emails, in-store and on street advertisements, public media, and local marketing campaigns. The scanning data were collected in nine different locations; Birmingham, Cardiff, Edinburgh, Leicester, London, Loughborough, Manchester, Hertfordshire, and Hull (Select Research, 2011).

A total of 2,885 children between the age 4 and 16 were scanned at twelve locations in England, Scotland and Wales. Among 2,885 of the total participants, 82.7% were White Caucasian, and other ethnicities are African-Caribbean (n=191), Mixed Race (n=156), South Asian (n=136), and Unknown (n=15) (Select Research, 2011).

Participant profiling was done by ‘ACORN,' the consumer classification tool to categorise the UK population into demographic types. Acorn has six categories, 18 groups, and 62 types which were divided from different households, postcodes and neighbourhoods. This segmentation enabled the analysis of the demographic data, social factors, and population and consumer behaviour for consumer insight (CACI, 2013).

4.1.2.2 Methods and data collection

The 3D body scanner for Shape GB was [TC]² NX-16 3D body scanner. This scanning technology helps to obtain whole body measurements in seconds and creates a 3D body model with over 400 measurement data extractions (Select Research, 2011). The child for scanning was asked to wear tight fitted skin coloured underwear when all jewellery were removed. There was

a demonstrator to guide the child on how and where they could stand inside the scanner. Additional manual measurements were taken by a tape measure in centimetres including head circumference, hand length, and knuckle girth. Height was measured using a Leicester height scale and weight was measured by a SECA digital weight scale (see Table 4.4) (Select Research, 2011).

Table 4.4 Height and weight measurement equipment in Shape GB
(Reproduced from Health for All Children, 2016 and SECA, no date)

Leicester height scale	SECA digital weight scale
	

4.1.2.3 Data verification

Each scanned data was evaluated based on the scanned quality then changed manually using landmarking software when specific errors were found. This software helps to move the error points into the places where the 3D scanner should be taken initially. After alteration of individually scanned data errors, 65% the data were modified, and 228 scans were deleted. The final number pf participants according to age is shown in Table 4.5. The scanning program extracted the requested measurements from the retailers such as waist to hip, bust, bust to waist, and all data were arranged in Excel files according to each age and gender. The final results of data were rearranged from age and gender into the height range (ex. 152.1-158 cm) and compared with the manual measurements to find out the correspondence (Select Research, 2011).

Table 4.5 Number of children with successful scans in Shape GB

(Reproduced from Select Research, 2011)

Age	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
Boys	60	87	89	102	116	105	118	112	91	67	53	51	49	44	1144
Girls	51	65	114	110	111	120	122	115	95	78	69	58	63	45	1206
Total	111	152	203	212	227	225	240	227	186	145	122	109	112	89	2350

4.1.2.4 Data analysis

The collected data was provided with specific formats which were the age by the calendar year, height by retailers' age range, a national model for future industry plan, comparison with existing retailers and health sizing charts.

The children's sizing report, the results of the Shape GB was published in 2013, and it can be purchased at their website (http://www.shapegb.org/). This report was written by 'Alvanon Inc.', which is one of the global dress forms manufacturing companies. The Alvanon Inc. presented the summarised key data from the collected Shape GB data and developed 'Fit form,' dress forms by adapting the range of the body size and shape of the children in the UK. This report included the distribution graphs of few body dimensions and mean body measurements by age and height as well as the measurements of the fit form with representative images from age 4 to 16 (CACI, 2013).

4.2 Sizing survey in Korea

Korea has conducted the national anthropometry survey since 1979 by a Korean government division, the KATS (Korean Agency for Technology and Standard) (see Table 4.6).

A total of seven sizing surveys were conducted in Korea, and each survey was ordered from the first to seventh. The recent survey was undertaken in 2015, and every survey results which were arranged into Excel files with a report can be downloaded at the KATS website (KATS, no date).

Around 17,000 samples in various regions of the country aged from 0 to 50 having whole 117 measurement dimensions were collected by manual measurement method for the first survey in Korea. From that time, the Korean government has been updating a national anthropometric survey

every 5 or 6 years. The Korean sizing surveys were done by manual measurement methods, but 3D scanning technology has been used since 2003. The age of subjects has changed at every survey, and the age from newborn to six was not selected in the 6thsurvey. The most recent national sizing survey in Korea was conducted in 2015 but the only analysed body measurement data was updated without a report, and the participants' ages were from 16 to 69 (KATS, no date).

Table 4.6 History of sizing survey in Korea
(Reproduced from KATS, no date)

Year	Number of dimensions	Profile of participants
1979 (1st)	117	Age 0-50 (n=16,977)
1986 (2nd)	80	Age 0-51 (n=21,648)
1992 (3rd)	84	Age 6-50 (n=8,886)
1997 (4th)	120	Age 0-70 (Male: n=6,578 Female: n=6,484 - Total: n=13,062)
2003-2004 (5th)	Manual: 359 Movement: 35 3D scanning: 205	Manual: Age 0-90 (n=16,127) 3D scanning: Age 8-75 (n=5,168)
2010-2013 (6th)	**Manual: 139 3D scanning: 177**	**Manual: Age 7-69 (n=14,016)** 3D scanning: Age20-39 (n=848) in 2010 **Age 7-13 (n=1238) in 2011** Age 40~69 (n=1228) in 2012 Age 13~18 (n=1464) in 2013
2015 (7th)	113	Age 16-69 (Male: n=3,192, Female: n=3,221 – Total: n=6,413)

4.2.1 6thSizeKorea national sizing survey

The 6th SizeKorea was chosen for the comparison with Shape GB the recent UK children's sizing survey published in 2011 because the 6th SizeKorea is the recent Korean's children survey data, and this project was conducted with the similar period of Shape GB.

The report of the 6th Korean 3D measurement body size research was published on the 15th of December 2015 by Korean Agency for Technology and Standards (KATS). This report includes the outline of the survey including the background, purpose, contents, subjects, regions, and timeline

with manual measurement equipment and results of the survey (KATS, no date).

4.2.1.1 Sampling

The 6th Size Korea survey used the non-proportional quota sampling method which is categorising subjects who have a probability to be selected by a common characteristic. The age group category from the results of the body characteristic analysis was subdivided into gender category then a specific number of subjects were divided into each category. Therefore, 4,600 subjects were targeted after 23 of age categories were set firstly then those were subdivided into 46 of gender units each having 100 subjects. From the age of 7-19, the one year age gap was used as the unit but the five years' gap was adjusted after the age of 70 to consider of body shape changes according to growth (KATS, 2010).

4.2.1.2 Subject data management

The particular code was given to each of the subjects for classification purposes, and the basic information for the division was a birth year and gender. Each subject had 9 code files; Q: Questionnaire, D: Direct measurements, H: Standing posture, E: Erect posture, O: Optional standing posture, S: Seated posture, C: Body composition analysis, F: Foot (Right), and G: Glove (Right) (KATS, 2010).

4.2.1.3 Measurement equipment

Two measurement techniques, the manual measurement methods and using 3D scanning technology were used in the 6th SizeKorea. The equipment for the manual measurements is a Martin anthropometer which includes a large sliding calliper, a spreading calliper, a sliding calliper as well as a tape measure and a scale (see the Figure 4.1). Supportive equipment was used such as an elastic band for marking the waistline and two footrests for subjects and a person for manual measurement. In addition, two acrylic panels for measuring crotch height and back length were also used (KATS, 2010).

Figure 4.1 Martin anthropometer and examples of their uses
(Reproduced from SEED Technology, 2016; KATS, 2010)

Three 3D scanning machines for the whole body, feet, and hands were used in the 6th SizeKorea. The body scanner in this survey was the 'Hamamatsu's Body Lines34' scanning system made by Japan which is a laser scanning type using invisible lasers to measure the body in 10 seconds. The principle of this scanner uses triangulation and screening a point or a line/ lines and a video camera offset is used for viewing laser light onto the subject (Treleaven and Wells, 2007). Foot and Hand scanners in this survey were EnFOOT and EnHAND system developed by 'K&I Technology Ltd.', in Korea which have the analysis programs 'FootSizer' and 'Hand Measure' (see Table 4.7) (KATS, 2010). Body composition analysis was conducted using 'InBody 720' program made by 'Biospace Co.' to measure weight, BMI including the percentage of fat, bone, water, and muscles (KATS, 2010).

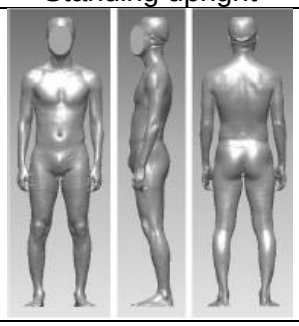
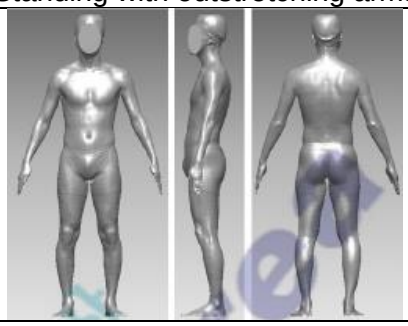
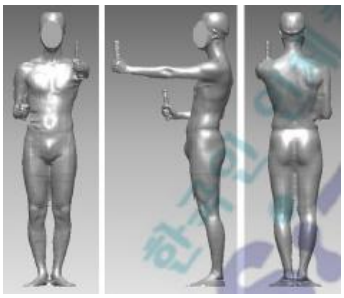
Table 4.7 Three 3D scanners in the 6th SizeKorea
(Reproduced from Treleaven and Wells, 2007; ZEUS, 2016)

3D body scanner	Foot scanner (EnFOOT system)	Hand scanner (EnHAND system)
Hamamatsu BL scanner (Japan)	K&I technology Ltd. (Korea)	K&I technology Ltd. (Korea)
		

4.2.1.4 Measurement methods and process

The manual measurements were followed by KSA 7004 (Basic human body measurements for ergonomic design) in 1992 and KS A7003 (Basic human body measurement for garment construction) in 1997, but this standard was revised to KS A 8559 (Basic Human Body Measurements for Technological Design). 3D scanned images were taken with four different poses; 1. Standing upright, 2. Standing with outstretching arms, 3. Applied standing, and 4. Applied sitting (KATS, 2010) (see Table 4.8).

Table 4.8 Four postures for 3D scanning images in 6th Size Korea
(Reproduced from KATS, 2010)

Standing upright	Standing with outstretching arms
	
Applied standing	**Applied sitting**
	

<u>Reference points and measurement dimensions</u>

The reference points in the 6th SizeKorea can be seen in Table 4.9. The SizeKorea made a standardisation of the reference points which be landmarks for the body measurements with a total number of 70. Each reference point is divided into Head (n=10), Neck (n=4), Body (n=27), Leg (n=13), Foot (n=4), Arm (n=9), Hand (n=3). Most of the reference points are marked onto the body before measurements, but some points are not marked when these are difficult or easy to mark. For example, the point of

'Vertex[3]' and 'Inion[4]' are difficult to mark due to the hair and 'Dactylion Ⅲ[5]' is easy to find during the measurement. In addition, none of all the reference points on the face was marked. All reference points without marking onto the body having '*' mark at the end of their terminologies (see Table 4.9) (KATS, 2010).

Table 4.9 Reference points for body measurements in SizeKorea
(Reproduced from KATS, 2010)

Head	Vertex*	Body	Acromion -right and left
	Euryon -right and left		Lateral Shoulder -right and left
	Glabella		Mid shoulder
	Ectocanthus*		Axilla*
	Inferior Orbitale(Infraorbitale) *		Anterior Axilla -right and left
	Tragion -right and left*		Posterior Axilla -right and left
	Sellion(Nasion)		Anterior Midaxilla -right andleft*
	Menton		Posterior Midaxilla -right and left*
	Occiput		Axillary Level at Midspine
	Inion		Anterior Axillary Fold –right and left
Neck	Cervicale		Posterior Axillary Fold -right and left
	Anterior Neck		Mesosternal
	Lateral Neck -right and left		Nipple -right and left
	Inferior Thyroid(Infrathyroid)		Inferior Breast*
Arm	Deltoid Point -right and left*		Tenth Rib*
	Biceps*		Iliocristale
	Radiale		Lateral Waist (natural Indentation) right and ⑬ left
	Center Olecranon		Anterior Waist (natural indentation)
	Rear Olecranon*		Posterior Waist (natural indentation)
	Bottom Olecranon		Anterior Waist (omphalion)*
	Lateral Humeral Epicondyle*		Lateral Waist (omphalion) right and left
	Ulnar Styloid		Posterior Waist (omphalion)
	Radial Styloid		Anterior Superior Iliac Spine

3 The highest point; the top or apex (Oxford Dictionary, 2016)

4 The projecting part of the occipital bone at the base of the skull (Oxford Dictionary, 2016)

5 The tip of the middle finger (Merriam-Webster, 2016)

Hand	Metacarpale Ⅴ		Buttock Protrusion
	Metacarpale Ⅱ		Gluteal Fold
	Dactylion Ⅲ*		Crotch*
Leg	Medial Malleous*	Foot	Abdominal Protrusion, Sitting*
	Lateral Malleous		Metatarsophalangeal Ⅰ
	Superior Thigh, Sitting		Metatarsophalangeal Ⅴ
	Anterior Knee, Sitting*		Acropodion*
	Posterior Juncture of Calf and Thigh -Sitting*		Pternion*
	Tibiale		
	Superior Patella (Suprapatella)		
	Midpatella		
	Inferior Patella (Infrapatella)		
	Midthigh		
	Posterior Juncture of Calf and		
	Thigh		
	Calf Protrusion*		
	Inferior Leg*		

All the body measurement dimensions are also standardised in the SizeKorea, and these are divided into four groups of dimensions; 1. ‘Height’, ‘Breadth’, and ‘Depth’ mainly measured by an anthropometer and a large sliding calliper, 2. ‘Circumference’ and ‘Length’ by a tape measure, 3. Body dimensions in the sitting position using an anthropometer and a large sliding calliper, 4. Body dimensions of head, hands, and feet (see Tables 4.10 and 4.11) (KATS, 2010).

Table 4.10 Body measurements parts in SizeKorea

(Reproduced from KATS, 2010)

No.	Height, Breadth, Depth	No.	Length, Circumference
101	Overhead Fist Reach	201	Waist Front Length
102	Stature	202	Waist Front Length (Omphalion)
103	Eye Height	203	Interscye, front
104	Cervical Height	204	Interscye Fold, front
105	Acromion Height	205	Bust Point-Bust Point
106	Shoulder Height	206	Neck Circumference
107	Axilla Height	207	Neck Base Circumference
108	Elbow Height	208	Chest Circumference
109	Hip Height	209	Bust Circumference
110	Crotch Height	210	Under bust Circumference
111	Fist Height	211	Waist Circumference (Natural Indentation)
112	Waist Height	212	Waist Circumference (Omphalion)
113	Waist Height (Omphalion)	213	Hip Circumference
114	Iliac Spine Height	214	Thigh Circumference
115	Knee Height	215	Mid-thigh Circumference
116	Chest Breadth	216	Knee Circumference
117	Bust Breadth	217	Lower Knee Circumference
118	Waist Breadth I (Natural Indentation)	218	Calf Circumference
119	Waist Breadth (Omphalion)	219	Minimum Leg Circumference
120	Hip Width	220	Ankle Circumference
121	Armscye Depth	221	Shoulder Length
122	Chest Depth, standing	222	Scye depth
123	Bust Depth	223	Waist Back Length (Natural Indentation)
124	Waist Depth (Natural Indentation)	224	Waist Back Length (Omphalion)
125	Waist Depth (Omphalion)	225	Cervicale to Popliteal Length
126	Hip Depth	226	Total length
127	Body Rise	227	Thigh Vertical Length
128	Vertical Trunk Length	228	Biacromion Length
129	Grip Reach; forward	229	Bishoulder Length
130	Body depth, standing	230	Back Interscye, Length
131	Wall-Acromion Distance	231	Back Interscye Fold, Length
132	Weight	232	Cervical to Breast Point Length

Table 4.11 Body measurements parts in SizeKorea (continued)

(Reproduced from KATS, 2010)

No.	Length, Circumference	No.	Sitting posture
233	Cervical to Waist Length	301	Sitting Height
234	Neck Point to Breast Point	302	Eye Height, sitting
235	Neck Point to Breast Point to Waistline	303	Cervicale Height, sitting
236	Upper arm Length	304	Shoulder Height, sitting
237	Arm Length	305	Elbow Height, sitting
238	Underarm Length	306	Thigh Clearance
239	Cervicale to Wrist Length	307	Knee Height, sitting
240	Armscye Circumference	308	Popliteal Height
241	Upper Arm Circumference	309	Buttock-Knee Length
242	Elbow Circumference	310	Buttock-Popliteal Length
243	Wrist Circumference	311	Buttock-Abdomen Depth, sitting
244	Waist to Hip Length	312	Elbow-Wrist Length
245	Outside Leg Length	313	Shoulder-Elbow Length
246	Trunk Circumference	314	Forearm-Fingertip Length
247	Crotch Length (Natural Indentation)	315	Elbow-Grip Length
248	Crotch Length (Omphalion)	316	Abdominal Depth, sitting
		317	Biacromial Breadth
		318	Bideltoid Breadth
		319	Elbow to Elbow Breadth
		320	Hip Breadth, sitting
Head, hand, foot			
401	Head Length	411	Hand Breadth at Metacarpals
402	Head Breadth	412	Index Finger Length
403	Head Height	413	Index Finger Breadth, Proximal
404	Face Length	414	Index Finger Breadth, Distal
405	Head Circumference	415	Hand Depth
406	Bitragion Arc	416	Inner Grip Circumference
407	Sagital Arc	417	Hand Circumference
408	Interpupilary Breadth	418	Foot Breadth
409	Hand Length	419	Foot Length
410	Palm Length Perpendicular	420	Lateral Malleolus Height

The SizeKorea website also gives information on the measurements method with pictures, pictograms, videos, and descriptions (see Figures 4.2 and 4.3). Figures 4.2 and 4.3 show cervical height measurement method which is provided by the SizeKorea (KATS, no date).

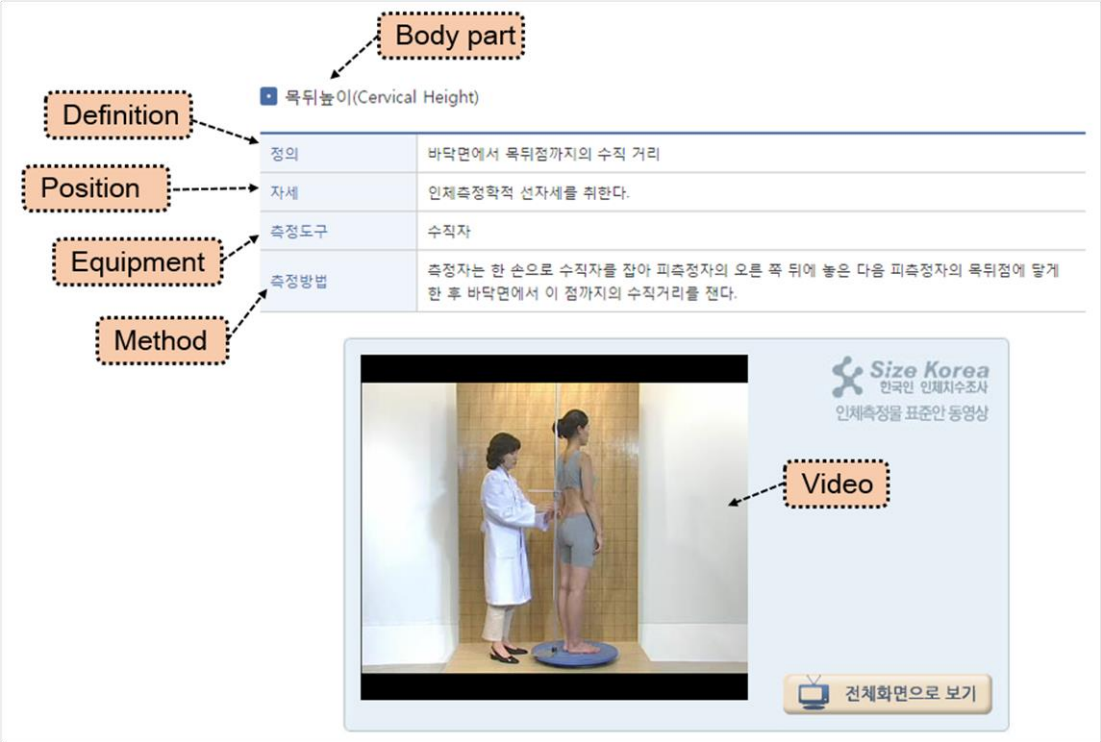


Figure 4.2 Example of SizeKorea measurement information (1)
(Reproduced from KATS, no date)

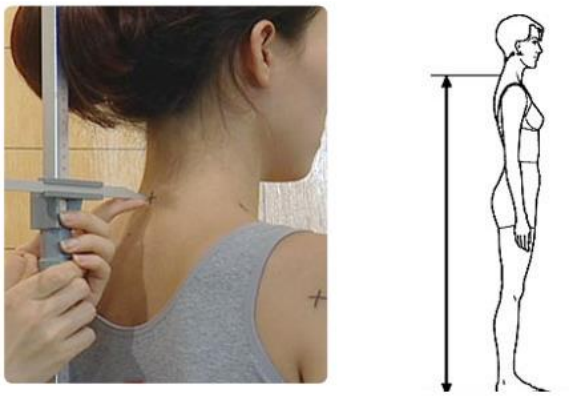


Figure 4.3 Example of SizeKorea measurement information (2)
(Reproduced from KATS, no date)

Measurement process of 3D body scanning

The ‘Human body measurement centre’ for body measurements in the SizeKorea composed a waiting room, a changing room, and a 3D scanned data measurement room for the convenient measurement processes. The procedure of 3D measurements was described in this order; 1. Entering a waiting room → 2. Entering the measurement room → 3. Wearing the experimental garments → 4. Reference points attachments onto the body → 5. Taking 3D body scanned images → 6. Taking manual measurements → 7. Foot and hand 3D scanning → 8. Taking off the experimental garments → 9. Leaving the measurements room (KATS, 2010).

4.2.1.5 Data verification

The statistical analyses to verify the reliability of the data were conducted having three stages; 1. Data error elimination based on the average and standard deviation, 2. Data verification using the correlative equation, 3. Data verification using correlation and regression analysis. The data error which was found at the measuring and inputting data stages were modified after comparison with the original data, but some data were also deleted when the cause of the error was not found precisely (KATS, 2010).

Data error elimination based on the average and standard deviation

As to process to figure out data error, finding average data was started which is located in the middle of the normal distribution curve. The error data was found when it was over ±3σ from the average data, and the data without validity was also removed when this data was compared with other subjects’ data (see Figure 4.4). The error was assumed that some data was miss-read having measurement errors and some data was input into a computer incorrectly (KATS, 2010).

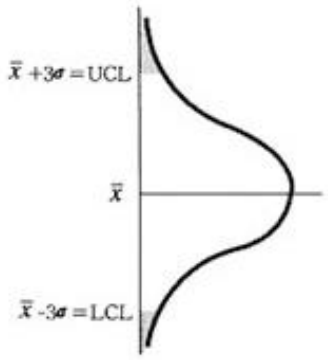


Figure 4.4 Finding error data using the average and standard deviation
(Reproduced from KATS, 2010)

Data verification using correlative equation

The data from the first verification was re-verified using a correlation equation between the measurement dimensions. For example, a minimum of 50 mm of difference at the correlation between eye height and height is normal, but one of those two is found as an error if the eye height is measured bigger than height or there is a minor difference. In this case, cervical height can be the reference to decide the error data (KATS, 2010).

Data verification using correlation and regression analysis

The correlation and regression analyses were verified using the distribution between the data from each dimension and age which have proportional relations. The data having a high correlation with over 0.8 of the coefficient of correlation was deleted. For example, height has high relations with eye height, shoulder height, arm length, and knee height. Some data which is found outside of this relation boundary line was considered as error data. Figure 4.5 shows the relationship between height and waist height and the data which is located in the upper section at the left can be assumed either height or waist height was measured incorrectly; because it is clear that those measurements cannot be measured except the subjects with deformity (KATS, 2010).

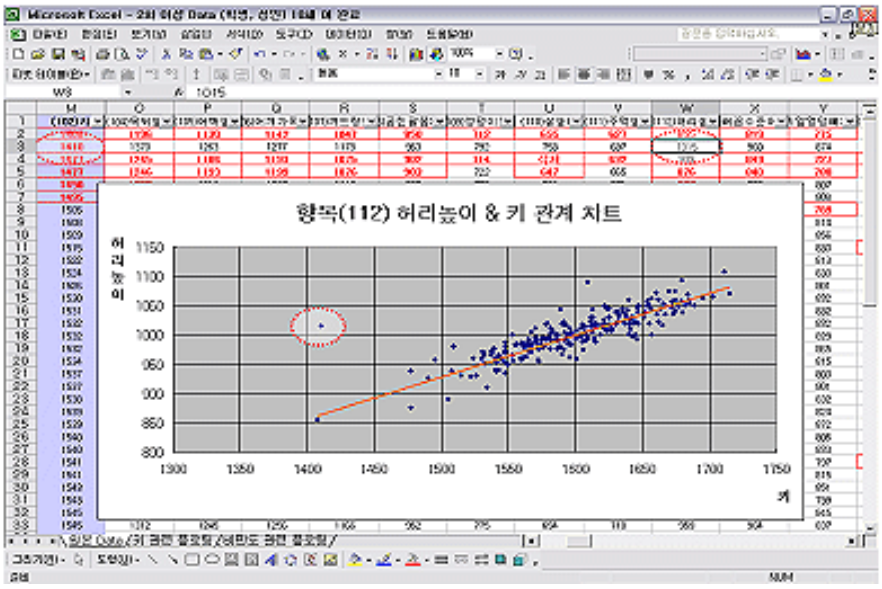


Figure 4.5 Example of data verification using correlation and regression analysis (1)

(Reproduced from KATS, 2010)

Most of the data in the graph in Figure 4.6 has an appropriate relation, but the data at the upper section at the right can be highly assumed that there would be a mistake when the age of the subject was input. Therefore, the amount of data recorded was much larger than their age, and this data was also deleted (KATS, 2010).

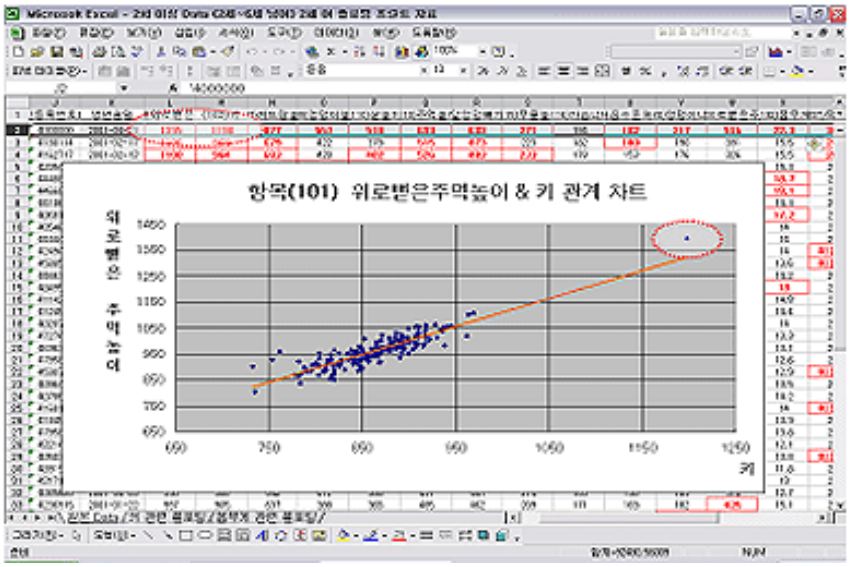


Figure 4.6 Example of data verification using correlation and regression analysis (2)

(Reproduced from KATS, 2010)

The final body measurement data for analysis in SizeKorea established after three stages of verifications with reliability as well as the degree of precision in the ISO, International standard organisation (KATS, 2010).

4.3 Comparison of national sizing surveys between the UK and Korea

For the comparison with Shape GB from 2008 to 2010, the 6th SizeKorea which was conducted between 2010 and 2011 was selected because of the similar period for the measurement and both sizing surveys used 3D scanning technology. However, the age range which can be compared with the same condition are aged from 7 to 16 because the age range of 3D measurements in the 6th SizeKorea was started from the age 7, and the Shape GB was covered from the age of 4 to 16.

4.3.1 Data collection

The comparison between Shape GB and the 6th SizeKorea was planned to be conducted using their body dimension measurement data and the background information from their reports. The children's sizing report which was issued by Shape GB was purchased on their official website (http://www.shapegb.org/), and the raw data of body dimension and their report in the 6th SizeKorea were downloaded from their website free of charge (http://sizekorea.kats.go.kr/). Unlike limited information from the Shape GB report, the detailed information and all raw data which was arranged by Microsoft Excel in the SizeKorea are accessed to the public. Due to the limited anthropometric raw data from the Shape GB report, the researcher contacted the persons in charge of the sizing survey in Shape GB and requested some critical dimensions of specific age groups, but only the mean dimensions could be acquired. Also, the only initial background of the sizing survey could be obtained by one of the supportive clothing manufacturing companies for the Shape GB survey.

4.3.2 Number and age of the samples

The total number of subjects in Shape GB was 1,884 of which 908 were boys, and 976 were girls. The number of each age group decreased as age increased in the Shape GB. The 6th SizeKorea had 1,159 boys and 1,138 girls as subjects with a total of 2,297 (see the Table 4.12) (Shape GB, 2013; KATS, 2010).

Table 4.12 Number of subjects

(Reproduced from the Shape GB, 2013; KATS, 2010)

Shape GB												
Age	7	8	9	10	11	12	13	14	15	16	17	Total
Boys	102	116	105	118	112	91	67	53	51	49	44	908
Girls	110	111	120	122	115	95	78	69	58	63	45	976
Total	212	227	225	240	227	186	145	122	109	112	89	1884
6th SizeKorea												
Age	7	8	9	10	11	12	13	14	15	16	17	Total
Boys	62	108	83	111	108	86	122	99	100	132	148	1159
Girls	81	93	91	101	133	92	121	99	102	99	126	1138
Total	143	201	174	212	241	178	243	198	202	231	274	2297

Table 4.13 shows the differences of subject numbers between the Shape GB survey and the 6th SizeKorea survey. A total of 413 more subjects were measured in the 6th SizeKorea with 251 more boys and 162 more girls. The Shape GB subjects aged 7 to 10 were measured more than 6th SizeKorea but the number of Korean subjects increased when the age group was older until the age of 17 (Shape GB, 2013; KATS, 2010).

Table 4.13 Subject number differences

(Reproduced from Shape GB, 2013; KATS, 2010)

Age	7	8	9	10	11	12	13	14	15	16	17	Total
UK Total	212	227	225	240	227	186	145	122	109	112	89	1884
Korea Total	143	201	174	212	241	178	243	198	202	231	274	2297
Difference	**69**	**26**	**51**	**28**	**-14**	**8**	**-98**	**-76**	**-93**	**-119**	**-185**	**-413**

4.3.3 Terminology unconformity

It was found that the terminology of a body dimension in the Shape GB and the 6th SizeKorea were not correctly matched. Due to the limited information of the Shape GB report, it was not able to get the measurement methods and definition of each body dimension. However, some of the corresponding terminologies between Shape GB and the 6th Size Korea could be predicted and compared. As can be seen in Table 4.13, each terminology at the national sizing survey (Shape GB and SizeKorea) were also compared with the sizing standard which define the body dimensions of each country (BS EN 13402-1 - Size designation of clothes. Terms, definitions and body measurement procedure and KS A ISO 8559- Garment construction and anthropometric surveys – Body dimensions).

It can be seen that many terminologies were not matched between two countries and some terminology in the sizing survey and sizing standard in the same country also were used differently (see Table 4.14). Moreover, some terminologies in the sizing survey could not be found in their sizing standard. For example, both the UK and Korea use ‘Stature’ in the sizing surveys, but their standards’ terminology was ‘Height.'

Table 4.14 Corresponding terminologies

(Reproduced from the Shape GB, 2013; KATS, 2010)

UK		**Korea**	
Shape GB	**BS EN 13402-1**	**6th SizeKorea**	**KS A ISO 8559**
Stature	Height	Stature	Height
Weight	Weight	Weight	Body mass
Neck Base	-	Neck base circumference	Neck base circumference
Chest	Chest Girth	Chest circumference	Chest circumference
Waist	Waist Girth	Waist (Natural Indentation) circumference	Waist circumference
Hip	Hip Girth	Hip circumference	Hip circumference
Thigh	-	Thigh circumference	Thigh circumference
Back Shoulder Width	-	-	-
Inseam	-	-	-
CB Neck to Wrist	-	-	Cervical to Wrist Length

When the Shape GB was compared with the BS EN 13402-1, some terminologies in the Shape GB could not be found in the BS EN 13402-1 because the standard only provides few dimensions. Moreover, the Shape GB did not provide exact descriptions of body dimensions. For example, ‘neck base’ in the Shape GB is assumed that it is representing ‘neck base circumference' (Shape GB, 2013). It is usually accepted that omitting the precise measurement unit in the size charts, but the accurate explanation of each dimension should be required; because one body part can be measured at different sides and directions. For example, hip in the SizeKorea, it has different measurement dimensions; hip height, hip circumference, hip length, hip width, and hip depth (KATS, no date).

In addition, the BS EN 13402-1 uses the ‘Circumference’ which corresponds with ‘Girth’ in the Shape GB survey and the ISO 8559, but both the SizeKorea survey and KS A ISO 8559 use circumference (Shape GB, 2013; KATS, 2010; ISO1989). However, there was not much confusion to understanding the definitions of ‘Girth’ and ‘Circumference’ because those are similar to the Oxford dictionary (2017); ‘Girth- the measurement around the middle of something, especially a person’s waist and ‘Circumference - the distance around something.'

As to waist in the Shape GB, it is not clear how it was measured using either ‘Natural Indentation’ or ‘Omphalion’ as the reference points which are the SizeKorea used. There was the 1.2cm difference between the waist circumference at the position of the ‘Natural Indentation’ (57.9 cm) and ‘Omphalion’ (59.1 cm) for age 7 in the 6th SizeKorea. It is referred that children’s distinctive body shapes which have protruding abdomen are considered in the SizeKorea.

Some unofficial terminologies in the Shape GB were found which the ISO international standard and also Korean standard do not use; ‘Back Shoulder Width,' ‘Inseam’ and ‘CB Neck to Wrist.'

Before finding the corresponding terminology in SizeKorea or sizing standards, the exact definition of ‘Width’ and ‘Breadth’ were found. ‘Width’ and ‘Breadth’ have the similar meaning which is the distance between certain sides, but the Oxford Dictionary (2016) says ‘Breadth’ came from the 16th century and ‘Width’ has been used since the 17th century which was one century later than the use of ‘Breadth.' Moreover, ‘Breadth’ was originated ‘on the pattern of length’ but ‘Width’ was ‘on the pattern of breadth.' It is understood that ‘Breadth’ was used earlier than ‘Width’ having the meaning of length but ‘Width’ was derived from the meaning of breadth. ‘Width’ was

additionally defined as ‘the lesser of two or the least of the three dimensions of a body’ (see Table 4.15).

Table 4.15 Definition of 'Width' and 'Breadth'

(Reproduced from Oxford Dictionary, 2016)

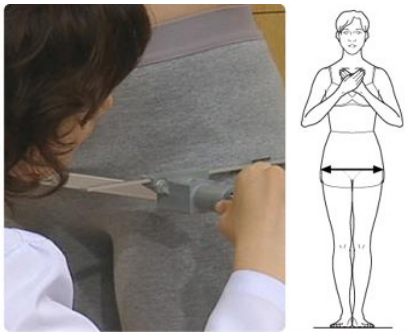
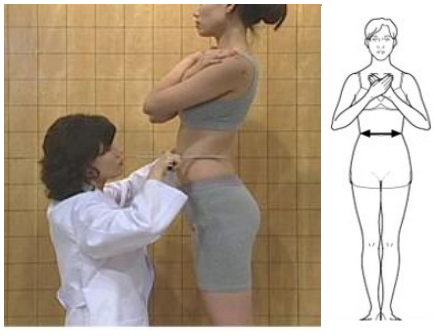
Width	Breadth
• the measurement or extent of something from side to side	• the distance or measurement from side to side of something
• the lesser of two or the least of three dimensions of a body	
• originated in the early 17th century: on the pattern of breadth	• originated in the early 16th century: on the pattern of length

In the 6th SizeKorea, the only hip has a width dimension and the other parts of the body such as waist, chest and head use ‘Breadth’ to represent the distance between a particular part of the body points. However, ‘Width’ and ‘Breadth’ were equally interpreted into the Korean language using the same Korean word in the SizeKorea (KATS, no date).

For the measurement methods of the ‘Width’ and ‘Breadth,' it can be said that both measurement methods have no difference because of the same measurement equipment and position (see Table 4.16). Moreover, both width and breadth dimensions were considered to measure ‘horizontal distance.' Hip width is defined as ‘the horizontal distance between both buttock protrusions’, and waist breadth is given the following description ‘the horizontal distance right and left lateral waist' (KATS, no date). Therefore, it is found that the use of width and breadth in Korea have no differences.

Table 4.16 Measurement difference of ‘Width’ and ‘Breadth’

(Reproduced from the KATS, no date)

Hip Width	Waist Breadth
	

For the additional information for the comparison, ‘Depth’ which is one of the dimension terminologies in SizeKorea is defined as ‘the distance from the front to the back of something’ in the Oxford dictionary (2016). In the same sense of the definition, ‘Waist Depth’ is determined as ‘the horizontal distance from ‘Anterior Waist’ to ‘Posterior Waist’ and this is measured by a large sliding calliper, the same as the measurement of width and breadth (see Figure 4.7).

Figure 4.7 Manual measurements of waist depth
(Reproduced from KATS, no date)

When more usages of width are found, ISO 8559 defines both ‘Shoulder Width’ and ‘Back Width’ as all horizontal distances using different reference points (see Figure 4.8) (ISO, 1989). ‘Shoulder width’ is described as ‘The horizontal distance between the acromion[6] extremities, measured with the arms hanging naturally’ and ‘Back width’ is explained as ‘The horizontal distance across the back measured half-way between the upper and lower scye[7] levels’. Therefore, it is predicted that the ‘Back Shoulder Width’ in Shape GB is aimed to measure ‘Shoulder Width’ in the ISO 8559.

[6] A bony process forming the lateral or distal end of the spine of the scapula, with which (in humans and certain other mammals) the clavicle articulates. (Oxford Dictionary, 2016)

[7] An armhole (or, occasionally, a leg hole) in tailoring and dressmaking (Wiktionary, no date)

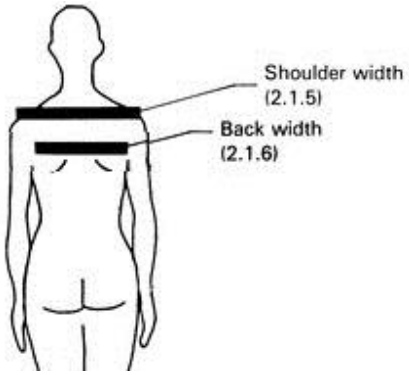


Figure 4.8 Shoulder width and Back width at the ISO 8559
(Reproduced from ISO, 1989)

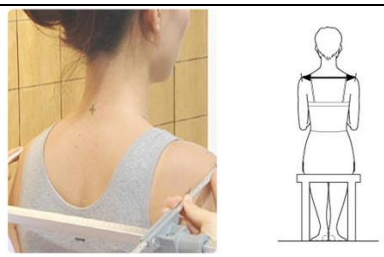
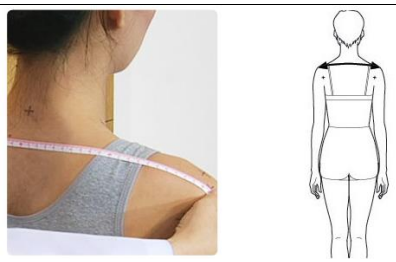
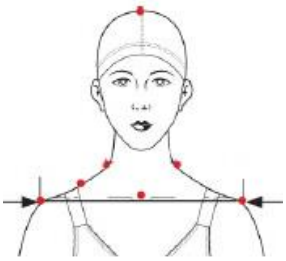
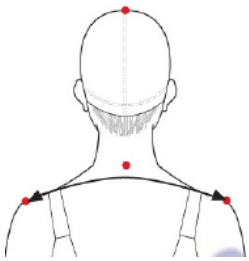
As to the corresponding body measurements in the SizeKorea with ‘Back Shoulder Width’ in the Shape GB, finding relevant body parts was considered first. The SizeKorea used three terminologies for shoulder measurements; ‘Back Neck Bishoulder Length’ and ‘Bishoulder Breadth’, and ‘Bishoulder Length’ in 2010 but the Size Korea changed to use ‘Biacromion Breadth,' ‘Biacromion Length,' and ‘Bishoulder Length’ in 2016. According to the reference for shoulder points, ‘Acromion’ and ‘Lateral Shoulder’ in SizeKorea, width and length of the shoulder can be defined differently (KATS, no date).

Table 4.17 shows the illustrations of four shoulder areas’ breadth and lengths; ‘Biacromion Breadth,' ‘Biacromion Length,' ‘Bishoulder Breadth’ and ‘Bishoulder Length.' ‘Biacromion Breadth’ is defined as a horizontal distance’ between ‘Acromion’ and it is measured at the sitting position using an immovable horizontal ruler at the back side.

However, this is also defined using ‘lateral points’ as reference points; ‘the distance between the most lateral points of the two acromion processes in a subject standing upright with arms hanging loosely at the sides. It is a measure of shoulder width’ (Oxford Dictionary, 2016). The definition of the ‘Biacromion Length’ is a distance between ‘Acromion’ at the standing position along the body surface. ‘Bishoulder Breadth’ and ‘Bishoulder Length’ use ‘Lateral Shoulder’ as a reference point to measurement. ‘Bishoulder Breadth’ is a horizontal distance between the right and left ‘Lateral Shoulder’ at the front. Regarding ‘Bishoulder Length,' a tape measure should be followed by body surface from the right ‘Lateral Shoulder’ to the left ‘Lateral Shoulder’ at the back.

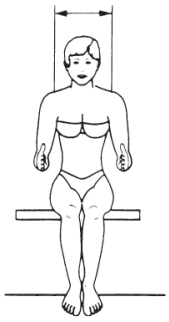
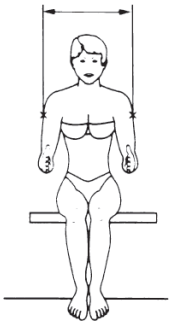
Table 4.17 Shoulder part measurements

(Reproduced from KATS, no date; KATS, 2010)

Biacromion Breadth	Biacromion Length
	
Bishoulder Breadth	**Bishoulder Length**
	

BS EN ISO 7250-1 (Basic human body measurements for technological design- Body measurement definitions and landmarks) defines shoulder breadth (biacromial and bideltoid) measurements and descriptions (see Table 4.18) (British Standards Institution, 2010). Both dimensions are measured by a large sliding calliper or large spreading calliper while subjects sit or stand fully erect with shoulders relaxed. It is defined that shoulder (biacromial) breadth is a straight distance between acromions and shoulder (bideltoid) breadth is a distance between the maximum protrusion between the right and left deltoid muscles. Even though the measurement methods of how the both measurements are taken whether, at the front or the back of subjects, it is assumed that shoulder (biacromial) breadth is measured at the back due to the positions of the acromion which are the reference points for measurement. In addition, the term breadth in BS EN ISO 7250-1 is assumed to mean width. Therefore, the description of shoulder (biacromial) breadth corresponds with the explanation of 'Back shoulder width' in the Shape GB.

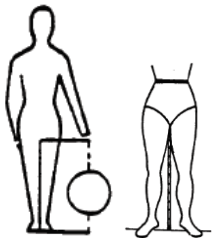
Table 4.18 Shoulder breadth measurements in BS EN ISO 7250-1
(Reproduced from British Standards Institution, 2010)

	Shoulder (biacromial) breadth	Shoulder (bideltoid) breadth
Pictogram		
Description	The distance along a straight line from acromion to acromion.	The distance across the maximum lateral protrusions of the right and left deltoid muscles.

Overall, ‘Back shoulder width’ in the Shape GB is probably able to replace ‘Biacromion breadth’ in the SizeKorea which have both definitions of the horizontal distance between acromion. However, it is still debatable because the reference points and measurement methods of the Shape GB are not provided precisely to compare with the SizeKorea.

Another terminology of ‘Inseam’ in the Shape GB was also found in the BS EN 13402-1 including other sizing standards. The definition of inseam is ‘the inner seam on the leg of a pair of pants, extending from crotch to cuff’ Oxford Dictionary, 2017). Therefore, it is said that the terminology of inseam can be only used for representing the length of the clothes, not a body part. However, it is also assumed that ‘Inseam’ was used as denoting ‘Inside leg length’ or ‘crotch height.' As can be seen in Table 4.19, BS EN13402-1 and ISO 8559 which the Korean standard defines that ‘Inside leg length’ is ‘the distance between the crotch and the ground, measured using the tape measure in a straight line with the subject upright, feet slightly apart, and the body mass equally distributed on both legs’ (British Standards Institution, 2010, International Organisation for Standardisation, 1989). Also, ISO 8559 describes ‘Inside leg length’ is the same as ‘crotch height’. The SizeKorea acquires the measurement of the ‘Inside leg length’ from the direct measurement from 3D scanned body image. Therefore, it is concluded that the ‘Inseam’ in Shape GB is not able to be compared with either ‘Inside leg length’ or ‘Crotch height’ in the SizeKorea due to uncertain information in the Shape GB.

Table 4.19 Diagrams of 'Inside leg length'
(Reproduced from British Standards Institution, 2010, International Organisation for Standardisation, 1989)

BS EN13402-1	ISO 8559
	

The final dimension of the Shape GB, 'CB Neck to Wrist' can be corresponded with the 'Cervical to Wrist Length' in the KS A ISO 8559 which is defined as 'the length from the 'Cervical' to the 'Ulnar Styloid[8]' (medial point of wrist) passing by the 'Centre Olecranon[9]'(middle of elbow) (see Figure 4.9).

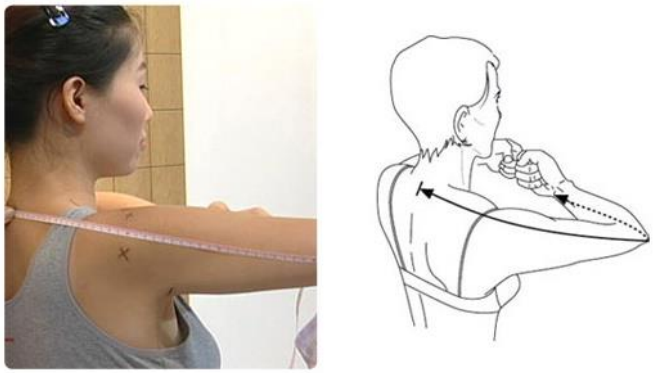


Figure 4.9 Manual measurement of 'Cervical to Wrist Length'
(Reproduced from the KATS, no date)

The ISO 8559 refers to '7th-cervical-to-wrist length' which can be replaced with 'CB Neck to Wrist' in Shape GB and the 'Cervical to Wrist Length' in the KS A ISO 8559. This dimension was described to be measured as 'The distance between the 7th cervical vertebra[10] to the extremity of the wrist

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8 The inner and larger bone of the forearm, on the side opposite the thumb (Concise Medical Dictionary, 2010)

9 A bony prominence at the elbow, on the upper end of the ulna (Oxford Dictionary, 2016)

10 Each of the series of small bones forming the backbone, having several projections for articulation and muscle attachment, and a hole through which the spinal cord passes (Oxford Dictionary, 2016)

bone (outer point of cubitus[11]), measured on the body using the tape measure passed over the top of the shoulder (acromion) and along the arm bent at 90° in a horizontal position' (see Figure 4.10)

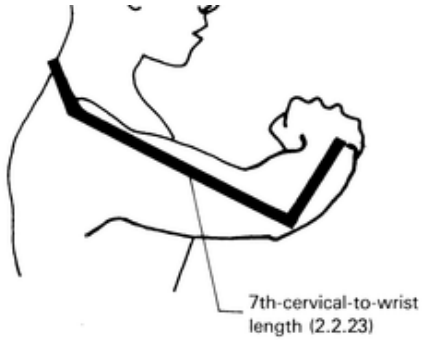

Figure 4.10 Measurement of the '7th-cervical-to-wrist length'
(Reproduced from ISO, no date)

However, the SizeKorea only provides 'Arm length' not 'Cervical to Wrist Length' and it is represented as 'the length from 'Lateral Shoulder to 'Ulnar Styloid' passing by 'Radiale[12]' (lateral bone of lower arm) (see Figure 4.11)

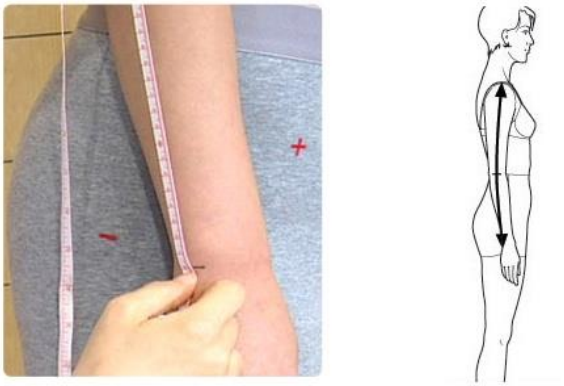

Figure 4.11 'Arm length' in the SizeKorea
(Reproduced from the KATS, no date)

The definition of the 'Arm length' was differently described in the British Standard (BS EN 13402-1) and the international standard (ISO 8559) which is called as 'Arm length (shoulder to wrist).' In the BS EN 13402-1 and the ISO 8559, 'Arm length' is defined as 'Distance, measured using the tape

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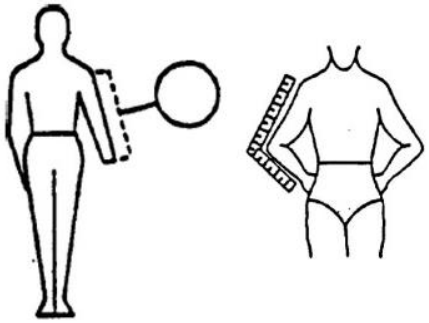
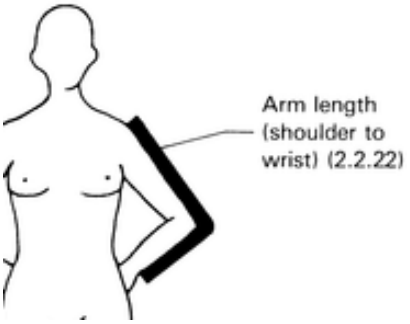
11 Elbow (Oxford Dictionary, 2016)

12 The carpal bone which lies on the radial side at the base of the carpus in the tetrapod forelimb (Oxford Dictionary, 2016)

measure, from the armscye/shoulder line intersection (acromion), over the elbow, to the far end of the prominent wrist bone (ulna), with the subject's right fist clenched and placed on the hip, and with the arm bent at 90º' (see Table 4.20).

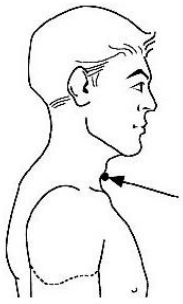
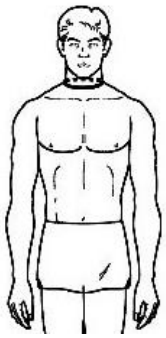
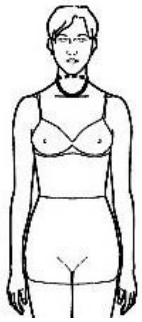
Overall, the length of 'CB Neck to Wrist' in Shape GB can be corresponded with the 'Cervical to Wrist Length' in the SizeKorea. However, the only measurement guide without measurement size information of cervical to wrist length is only given in the SizeKorea.

Table 4.20 Arm length in the BS EN 13402-1and ISO 8559
(Reproduced from BSI, 2001; ISO, 1989)

BS EN 13402-1	ISO 8559
	

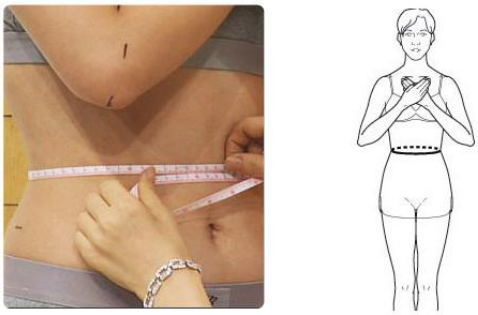
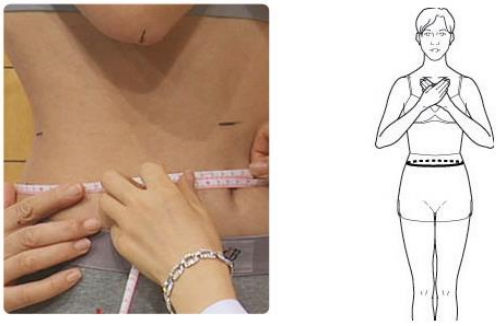
According to the 6th SizeKorea report, 'Neck circumference' is measured for males and 'Neck base circumference' for females but both dimensions were measured using manual measurements. Table 4.21 illustrates 'Inferior Thyroid (Infrathyroid)' which the reference point of neck circumference and pictograms of neck circumference and neck base circumference. Neck circumference is defined as 'the circumference passing 'Cervicale' and 'Inferior Thyroid (Infrathyroid)', and neck base circumference is defined as 'the circumference passing 'Cervicale' – 'Lateral Neck right' – 'Anterior' – 'Lateral Neck left'. As to the Shape GB, only 'Neck base' was provided. Therefore, it is found that the comparison of neck base circumference is not possible in this research.

Table 4.21 Neck and neck base circumferences
(Reproduced from the KATS, no date)

Inferior Thyroid (Infrathyroid)	Neck circumference	Neck base circumference
		

In addition, there are two waist circumferences based on the different reference points and positions which are ‘Waist (Natural Indentation)’ and ‘Waist (Omphalion)’ circumference in the SizeKorea (see Table 4.22). Both waist measurements are defined as horizontal circumferences on the waist, but Waist (Natural indentation) is measured at the narrowest point on the waist while Waist (Omphalion) is referred to the circumference using the umbilicus (navel) as a reference point.

Table 4.22 Waist (Natural Indentation) and Waist (Omphalion) circumferences
(Reproduced from the KATS, no date)

Waist Circumference (Natural Indentation)	Waist Circumference (Omphalion)
	

As can be seen in Table 4.23, there are notable differences between waist measurements followed by natural indentation and omphalion in the SizeKorea. The bigger differences between the two waist measurements for girls are found, and the differences are increased as being aged. Waist circumference (Natural Indentation) in the SizeKorea is chosen for the comparison with the Shape GB even though the detailed waist measurement

reference was not found in the Shape GB due to the evaluation of the dimension data suitability.

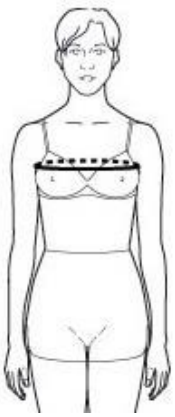
Table 4.23 Measurement differences between Waist (Natural Indentation) and Waist (Omphalion) in SizeKorea
(Reproduced from the KATS, 2010)

(cm)

Age / Gender / Part	7		8		9		10	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Waist Circumference (Natural Indentation)	57.9	56.6	62.7	56.8	61.7	60.3	67.0	64.1
Waist Circumference (Omphalion)	59.1	59.1	64.5	59.6	63.8	63.7	70.3	68.3
Difference	**1.2**	**2.5**	**1.8**	**2.8**	**2.1**	**3.4**	**3.3**	**4.2**

The SizeKorea provides detailed chest circumference, bust circumference, and under bust circumference for boys and girls but it is not able to figure out the ShapeGB's differentiate gender distinction. Table 4.24 shows different measurement methods of the chest, bust, and under bust circumferences which use mensoternal[13], nipple, and inferior breast as reference points respectively.

Table 4.24 Measurements of chest, bust, and under bust circumferences in the SizeKorea
(Reproduced from the SizeKorea)

Chest Circumference	Bust Circumference	Under bust Circumference
		

[13] the middle plate of the sternum (breastbone) (Oxford Dictionary, 2016)

Regarding SizeKorea survey, ‘Weight’ is used the same as the Shape GB and the BS EN 13402-1 but KS A ISO 8599 uses ‘Body Mass.'

Overall, it is concluded that height, chest, waist, hip, and thigh in Shape GB correspond with the stature, chest circumference, waist circumference, hip circumference, and thigh circumference in the SizeKorea.

4.3.4 Anthropometric data comparison

The dimensions of children aged 7 to 16 from the Shape GB report were 10; height, weight, chest, waist, hip, thigh, inseam, back shoulder width, CB neck to wrist, neck base. The number of dimension from the 6th SizeKorea survey are 73 but inseam, back shoulder width and CB neck to wrist could not be found with the corresponding dimensions, only stature, weight, chest, waist, hip, thigh, and neck base could be compared between the two countries. In addition, the Shape GB does not provide all age groups of children skipping every two years from the age of 10 and only the age group which could be acquired from the Shape GB were selected from the 6th SizeKorea which were the ages of 7, 8, 10, 12, 14 and 16.

Table 4.25 and 4.26 show both boys’ and girls’ selected age of body dimensions in the UK and Korea respectively.

Table 4.25 Body dimensions in Shape GB
(Reproduced from Shape GB, 2013)

(cm)

Boys (UK)	**7**	**8**	**10**	**12**	**14**	**16**
Stature	127.4	131.4	141.7	154.4	166.0	176.1
Weight	27.3	29.3	37.7	48.0	57.2	66.9
Chest	66.3	70.4	76.4	84.2	89.0	96.6
Waist	59.1	62.2	67.6	74.0	76.2	81.4
Hip	66.7	70.9	77.0	84.6	90.1	95.2
Thigh	37.1	39.9	44.6	47.6	52.5	55.1
Neck Base	30.1	31.1	32.8	34.8	37.6	39.8
Girls (UK)	**7**	**8**	**10**	**12**	**14**	**16**
Stature	124.8	131.7	143.0	153.7	161.0	164.2
Weight	25.8	29.6	38.2	47.2	55.5	59.8
Chest	63.6	66.0	74.1	80.7	88.2	89.8
Waist	59.1	62.3	69.0	72.2	77.5	77.9
Hip	67.6	71.0	78.2	85.2	92.0	95.8
Thigh	39.2	41.6	45.8	49.1	53.5	56.5
Neck Base	29.6	30.8	32.0	33.2	35.2	35.3

Table 4.26 Body dimensions in the 6th SizeKorea
(Reproduced from KATS, 2010)

(cm)

Boys (Korea)	7	8	10	12	14	16
Stature	124.0	130.3	141.7	153.3	165.0	171.7
Weight	25.1	30.5	37.3	47.0	55.7	66.7
Chest	66.4	71.9	78.0	83.7	83.4	90.4
Waist	57.9	62.7	67.0	70.8	73.2	77.9
Hip	66.2	71.2	78.0	84.2	91.1	95.1
Thigh	40.5	43.5	48.7	52.1	52.0	53.3
Neck	30.9	32.8	34.2	37.0	39.5	41.1
Girls (Korea)	**7**	**8**	**10**	**12**	**14**	**16**
Stature	124.1	127.7	141.3	154.1	158.0	159.8
Weight	24.4	25.7	35.6	45.1	51.0	53.1
Chest	66.6	67.3	76.5	82.4	81.6	82.4
Waist	56.6	56.8	64.1	66.7	68.5	68.6
Hip	66.7	67.9	76.8	85.4	92.7	92.6
Thigh	40.6	41.5	46.7	51.4	53.8	53.9
Neck Base	30.3	30.6	33.5	35.8	36.9	37.3

4.3.4.1 Height differences

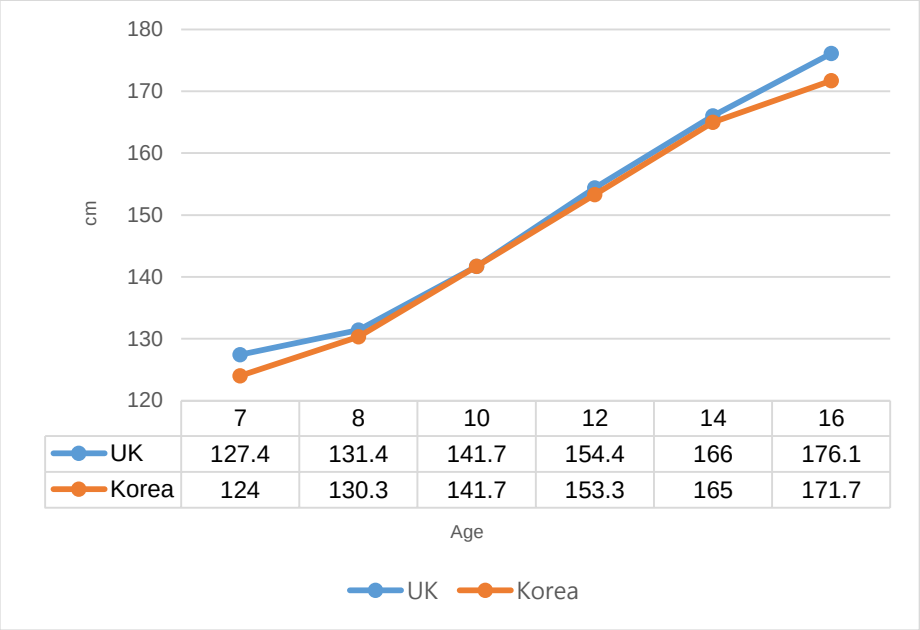
Table 4.27 shows height differences from age 7 to 16 between the Shape GB and Size Korea. Boys and girls in whole selected age group in the UK are taller except age 12 of the UK with 0.4 cm of difference. It was found that age 10 of boys in the UK and Korea measured with the same height and the minimum difference was shown in and age 12 girls between the two countries (-0.4 cm).

Table 4.27 Height differences
(Reproduced from the Shape GB, 2013; KATS, 2010)

(cm)

Gender	Country	Age					
		7	8	10	12	14	16
Boy	UK	127.4	131.4	141.7	154.4	166	176.1
	Korea	124	130.3	141.7	153.3	165	171.7
	Difference	**3.4**	**1.1**	**0.0**	**1.1**	**1.0**	**4.4**
Girls	UK	124.8	131.7	143	153.7	161	164.2
	Korea	124.1	127.7	141.3	154.1	158	159.8
	Difference	**0.7**	**4.0**	**1.7**	**-0.4**	**3.0**	**4.4**

As to age seven, the UK boys are 3.4 cm taller than Korean boys. However, the difference between the two countries is decreased and height in age ten is measured equally. Then the UK boys are found almost 1 cm taller than Korean boys at the age 12 and 14. Finally, it was found that there is very remarkable growth at age 16 having 4.4 cm of difference between the UK and Korean boys (see Figure 4.12).



	7	8	10	12	14	16
UK	127.4	131.4	141.7	154.4	166	176.1
Korea	124	130.3	141.7	153.3	165	171.7

Figure 4.12 Boys' Height differences

(Reproduced from Shape GB, 2013; KATS, 2010)

As shown in Figure 4.13, there are significant height differences for the UK and Korean girls at age 8 and 16 with almost 4 cm differences. Age 14 of the UK girls are measured slightly smaller than Korea (0.4 cm), but the other age groups in the UK girls were found taller than Korea. Comparing boys' differences between the UK and Korea, the more dramatic difference are shown from age 12.

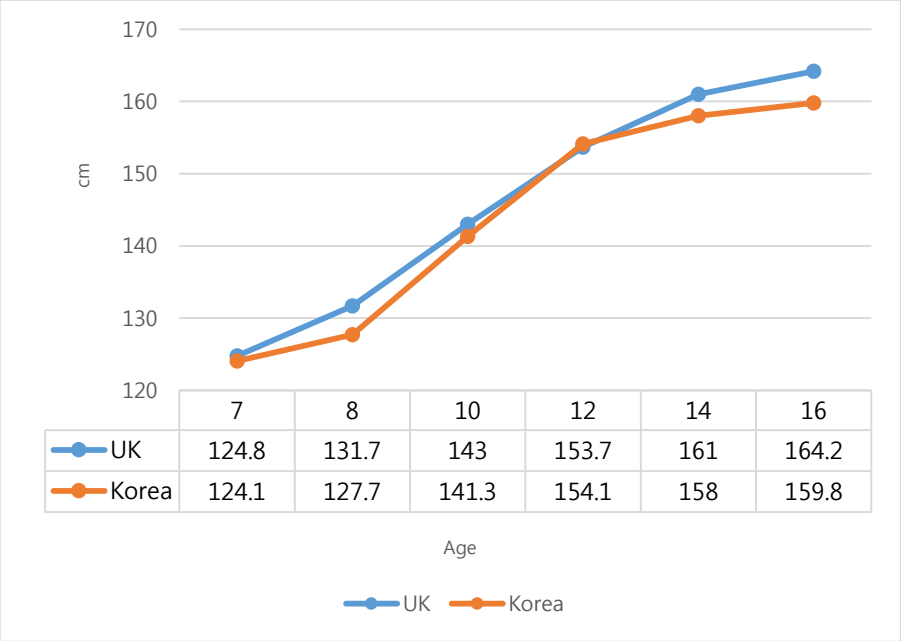


Figure 4.13 Girls' Height differences

(Reproduced from Shape GB, 2013; KATS, 2010)

4.3.4.2 Weight differences

Table 4.28 demonstrates how much weight measurements are different between boys and girls in the UK and Korea. Almost all age groups of boys and girls in the UK were measured heavier than Korean boys and girls except the age 8 and 10 of boys with 0.3 kg and 0.5 kg differences. As similar as the height growth trend and difference, there were notable weight differences are found at the age 16 of boys and girls between the two countries.

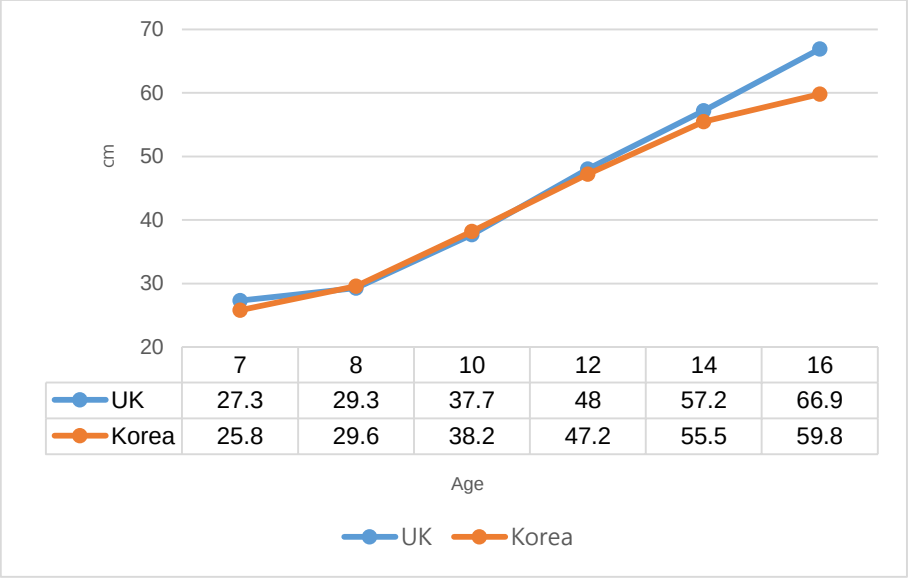
Table 4.28 Weight differences

(Reproduced from Shape GB, 2013; KATS, 2010)

(kg)

Gender	Country	Age					
		7	8	10	12	14	16
Boys	UK	27.3	29.3	37.7	48.0	57.2	66.9
	Korea	25.8	29.6	38.2	47.2	55.5	59.8
	Difference	**1.5**	**-0.3**	**-0.5**	**0.8**	**1.7**	**7.1**
Girls	UK	25.8	29.6	38.2	47.2	55.5	59.8
	Korea	24.4	25.7	35.6	45.1	51.0	53.1
	Difference	**1.4**	**3.9**	**2.6**	**2.1**	**4.5**	**6.7**

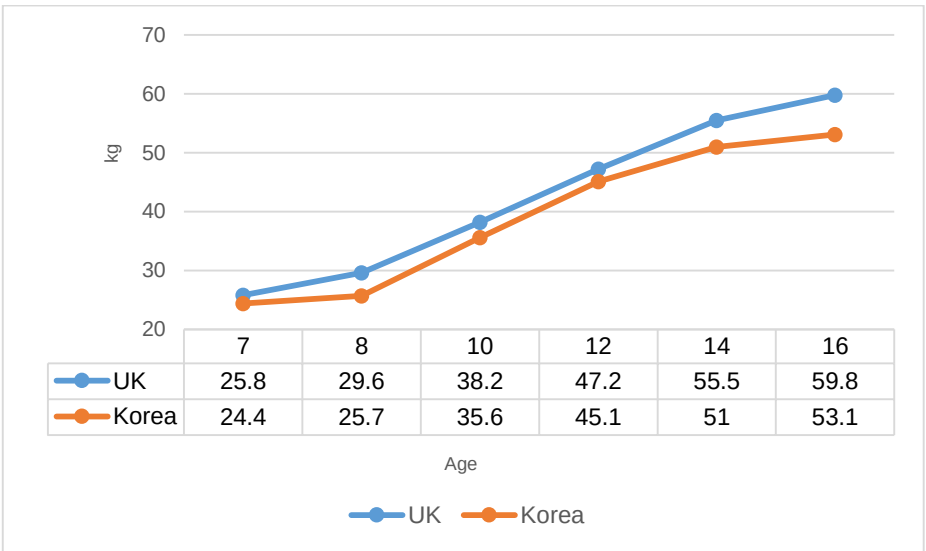
As can be seen the Figure 4.14, there are small differences between the UK and Korean boys' weight from age 8 to 12, but the UK boys became distinctively heavier when they are age 16 with 7.1 kg difference comparing with Korean boys.



	7	8	10	12	14	16
UK	27.3	29.3	37.7	48	57.2	66.9
Korea	25.8	29.6	38.2	47.2	55.5	59.8

Figure 4.14 Boys' Weight difference
(Reproduced from KATS, 2010)

More substantial weight differences are found between the UK and Korean girls (see Figure 4.15). All age groups in the UK are heavier than Korean girls and age 8, 14, and 16 have significant differences are shown (3.9 kg, 4.5 kg and 6.7 kg respectively).



	7	8	10	12	14	16
UK	25.8	29.6	38.2	47.2	55.5	59.8
Korea	24.4	25.7	35.6	45.1	51	53.1

Figure 4.15 Girls' Weight difference
(Reproduced from KATS, 2010)

4.3.4.3 Chest, waist and hip differences

Table 4.29 compares chest, waist, and hip different means in the UK and Korea provided both countries' children measurement surveys. It is found that all measurements of the chest in boys and waist in girls in the UK are bigger than Korean. However, almost 72 % of measurements in the UK are measured larger than Korean children.

Table 4.29 Chest, waist and hip differences
(Reproduced from Shape GB, 2013; KATS, 2010)

(cm)

Part	Gender	Country	Age					
			7	8	10	12	14	16
Chest	Boys	UK	66.3	70.4	76.4	84.2	89.0	96.6
		Korea	63.6	66.0	74.1	80.7	88.2	89.8
		Difference	**2.7**	**4.4**	**2.3**	**3.5**	**0.8**	**6.8**
	Girls	UK	63.6	66.0	74.1	80.7	88.2	89.8
		Korea	66.6	67.3	76.5	82.4	81.6	82.4
		Difference	**-3**	**-1.3**	**-2.4**	**-1.7**	**6.6**	**7.4**
Waist	Boys	UK	59.1	62.2	67.6	74.0	76.2	81.4
		Korea	57.9	62.7	67.0	70.8	73.2	77.9
		Difference	**1.2**	**-0.5**	**0.6**	**3.2**	**3**	**3.5**
	Girls	UK	59.1	62.3	69.0	72.2	77.5	77.9
		Korea	56.6	56.8	64.1	66.7	68.5	68.6
		Difference	**2.5**	**5.5**	**4.9**	**5.5**	**9**	**9.3**
Hip	Boys	UK	66.7	70.9	77.0	84.6	90.1	95.2
		Korea	66.2	71.2	78.0	84.2	91.1	95.1
		Difference	**0.5**	**-0.3**	**-1**	**0.4**	**-1**	**0.1**
	Girls	UK	67.6	71.0	78.2	85.2	92.0	95.8
		Korea	66.7	67.9	76.8	85.4	92.7	92.6
		Difference	**0.9**	**3.1**	**1.4**	**-0.2**	**-0.7**	**3.2**

The UK boys' chest measurements are bigger than Korean boys in all age groups. Interestingly, Korean girls chests aged 7 to 12 are measured bigger than the UK girls, but the UK girls are found considerable growth than Korean girls from age 12. Both age 16 in boys and girls have substantial differences (6.8 cm and 7.4 cm respectively) (see Figure 4.16).

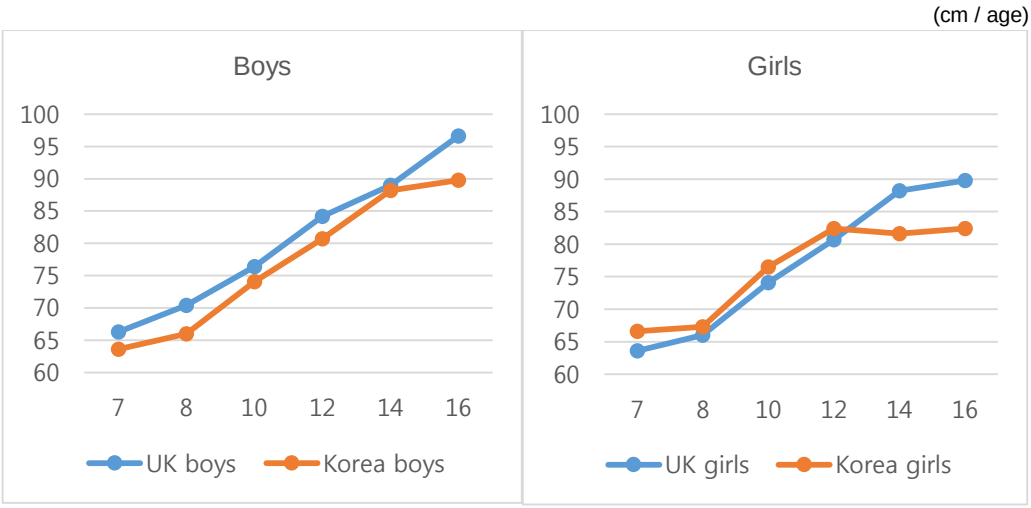


Figure 4.16 Chest differences
(Reproduced from Shape GB, 2013; KATS, 2010)

Figure 4.17 shows comparisons of children's waist in the UK and Korea. It is found that almost similar differences which the UK boys are bigger than Korean boys are shown from age 12. However, more notable differences are found between the UK and Korean girls which have almost 5 cm of differences from age 8 to 12, and the gaps are distinctively increased at age 14 and 16 having nearly 9 cm differences.

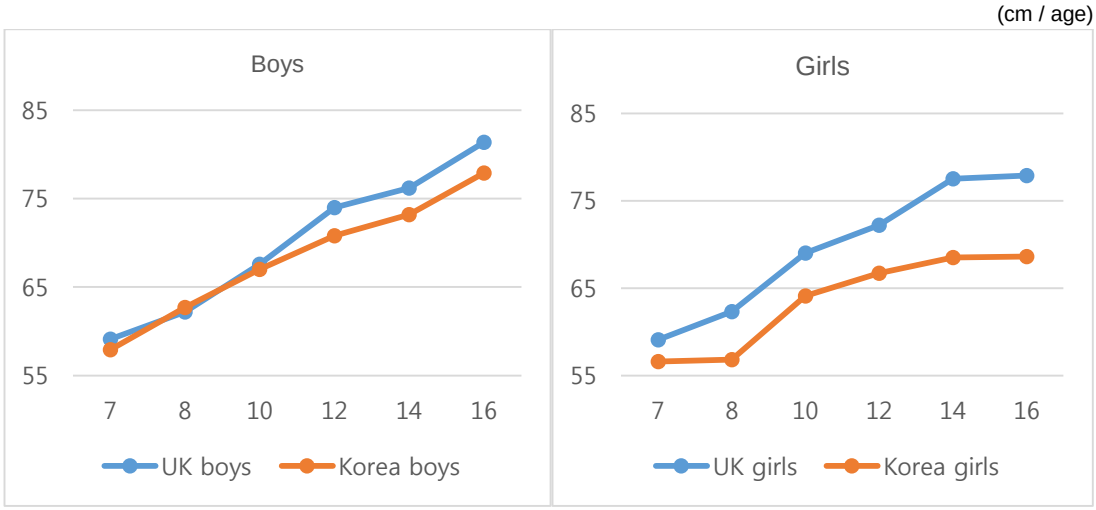


Figure 4.17 Waist differences
(Reproduced from Shape GB, 2013; KATS, 2010)

As can be seen in Figure 4.18, the boys' hip growth rate of the UK and Korean are found from age 7 to 16. Comparing with boys, the UK girls' hip growth rate are found bigger at age 8 but Korean girls' hip is measured slightly bigger than the UK at the age 12 and 14. However, the UK girls' considerable hip difference is found in age 16 having 3.2 cm difference.

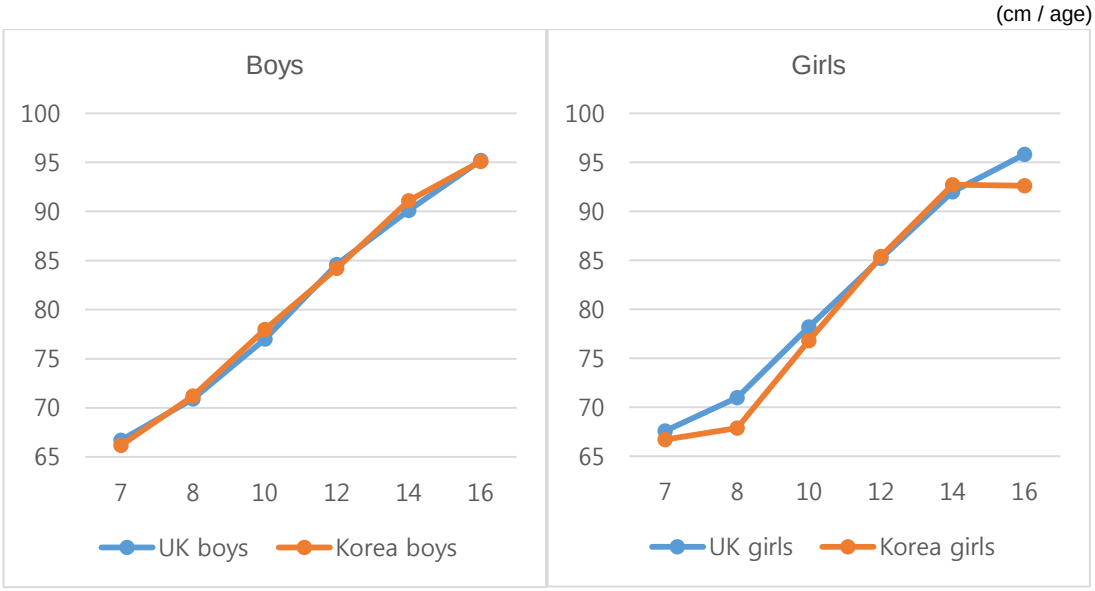


Figure 4.18 Hip differences

(Reproduced from Shape GB, 2013; KATS, 2010)

4.3.4.4 Thigh differences

As to thigh and neck differences between the UK and Korean children, most age groups in the UK are found smaller than Korean (see Table 4.30). Thigh measurements of boys are considerably different having 3.4 cm ~ 4.5 cm smaller boys' measurements while 1.3 cm ~ 3 cm smaller girls' measurements in the UK during age 7 and 12. However, hip sizes of both boys and girls in the UK are measured bigger at the age 14 and 16. As same as the thigh growth rate in two countries, neck base measurements in the UK' boys and girls are found smaller than Korean boys and girls except for only 0.2 cm bigger measurement at age 8.

Table 4.30 Thigh differences
(Reproduced from Shape GB, 2013; KATS, 2010)

(cm)

Part	Gender	Country	Age					
			7	8	10	12	14	16
Thigh	Boys	UK	37.1	39.9	44.6	47.6	52.5	55.1
		Korea	40.5	43.5	48.7	52.1	52.0	53.3
		Difference	**-3.4**	**-3.6**	**-4.1**	**-4.5**	**0.5**	**1.8**
	Girls	UK	39.2	41.6	45.8	49.1	53.5	56.5
		Korea	40.5	43.5	48.7	52.1	52.0	53.3
		Difference	**-1.3**	**-1.9**	**-2.9**	**-3**	**1.5**	**3.2**

As can be seen in Figure 4.19, the thigh growth in boys and girls have similar trends in all age groups, but the differences of boys are bigger from age 7 to 12 than girls but age 14 and 16 of differences in girls are bigger than boys.

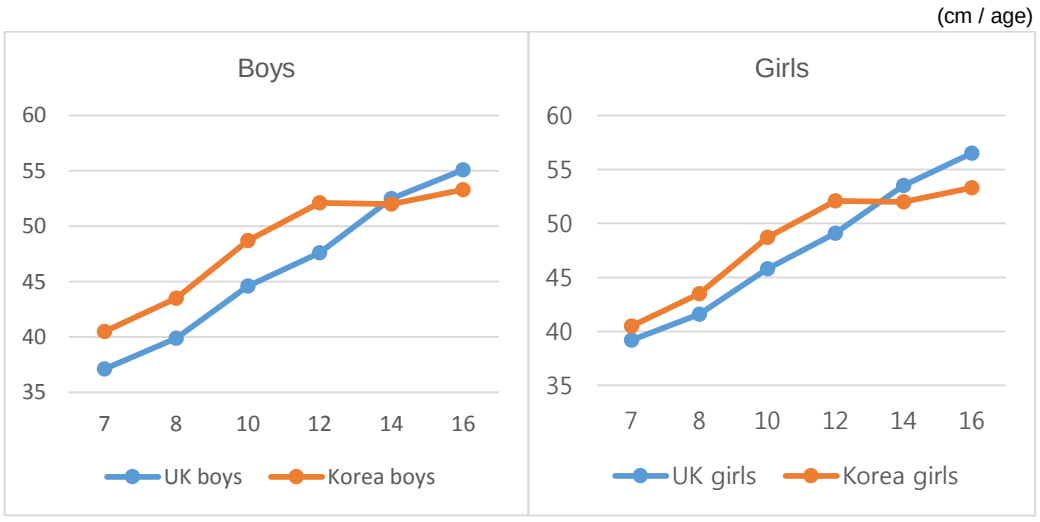


Figure 4.19 Thigh differences
(Reproduced from Shape GB, 2013; KATS, 2010)

As can be seen Figure 4.20, there is a consistent correlation between waist and thigh measurement in the SizeKorea. Therefore, bigger thigh measurements of Korean boys and girls are questionable that the UK measurements methods of the thigh are different with Korea. Also, it is referred that Korean boys and girls between ages 7 to 12 are more developed than the UK.

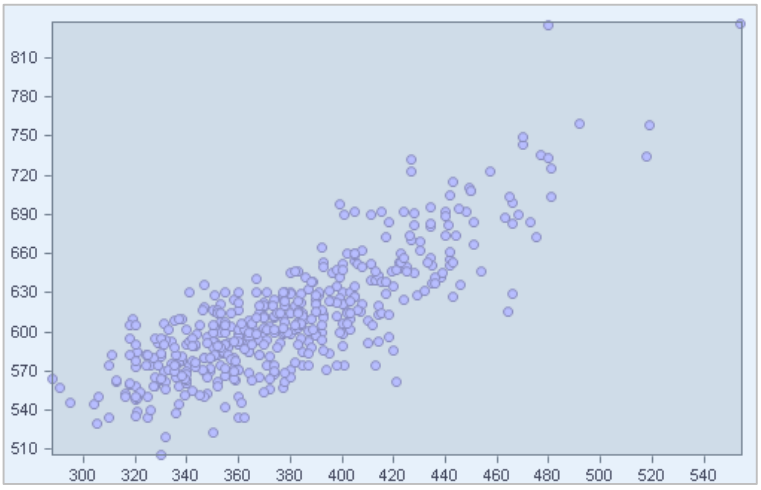


Figure 4.20 Korean age 7 of waist and thigh correlation
(Reproduced from KATS, no date)

4.3.5 Future developments

It is found that both the UK and Korea have had infant sizing development projects followed by children's sizing surveys.

Shape GB (0-4 scanning project) which is an infant sizing research was conducted using a data set of 2,350 scans in 2011. The completed babywear and toddler sizing research were released to the sponsoring retailers in 2015, but the report is still not available to purchase on their website (Shape GB, 2013).

As to Korea, 3D standard body figure development of Infants and toddlers was started in 2015 by the 'Ministry of Trade, Industry and Energy and the Culture' and 'Service Standards Division' in the 'Korean Agency for Technology and Standards.' The core size of the development was age three (29.4 ~ 41.3 months) based on the 5th SizeKorea survey data results (KATS, no date).

4.4 Summary

This chapter investigated the national sizing survey in the UK and Korea focused on data of the children's wear, then analysed how much the two sets of data were different. Firstly, the history of national sizing surveys for both the UK and Korea were compared including the most recent children's body measurement survey data (Shape GB and 6th SizeKorea). In general, it was found that the UK and Korea sizing surveys had a number of differences in the ranges of open information, data collection, definition, and

description methods of body parts. A large number of samples were measured in Korea than in the UK, and terminologies which defined primary dimensions were used differently. The detailed comparison of terminologies was provided using each country's description on their sizing survey and their national size standards. Moreover, the anthropometric data from age 7 to 16 both boys and girls in the Shape GB and SizeKorea were considerably different even though there are similar growth tendencies on each of the body parts.

The next chapter explores the national size standards in the UK and Korea to examine the applied degree of national sizing survey as well as both of the two countries' differences.

Chapter 5. National sizing standard in the UK and Korea

This chapter contains national sizing standard comparison in the UK and Korea based on children's wear. Firstly, general information of the International Standards which related with anthropometric data, clothing size, and clothing construction were investigated (Section 5.1). Next, British Standards and Korean Industrial Standards were scrutinised with a focus on children's clothing size and construction (Section 5.2 and 5.3) having a critical comparison (Section 5.4).

5.1 International Standards for clothing

The standards of ISO (the International Organisation for Standardisation) was developed by the experts within technical committees (TCs). TCs consist of deputies of industry, Non-governmental organisations (NGOs), and governments and each TC handles a different area. The member countries of ISO (member bodies) can choose to be either a participating member (P-member) or an observing member (O-member). According to each countries' decision, the P-member's countries can participate having duties to vote for the questions within the technical committee, and the O-member's countries follow the results of the vote from the P-member's countries. ISO have a total of 24 participating countries (light blue) and 22 observing countries (orange) as well as two secretariat countries (dark blue) (ISO, no date) (see Figure 5.1). Both the UK and Korea are the participating member countries since 1947 and 1963 respectively (see Table 5.1).

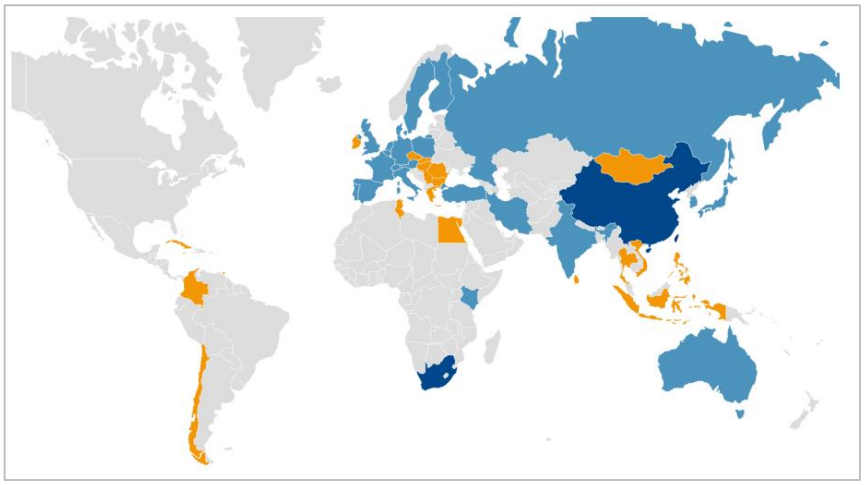


Figure 5.1 Member countries of ISO
(Reproduced from ISO, no date)

Table 5.1 List of ISO member countries

(Reproduced from ISO, no date)

Secretariat
South Africa (SABS), China (SAC) (Twinned secretariat)
Participating Countries (N=24)
Australia (SA), Austria (ASI), Belgium (NBN), China (SAC), Denmark (DS), Finland (SFS), France (AFNOR), Germany (DIN), India (BIS), Iran, Islamic Republic of (ISIRI), Italy (UNI), Japan (JISC), Kenya (KEBS), **Korea, Republic of (KATS)**, Netherlands (NEN), Poland (PKN), Portugal (IPQ), Russian Federation (GOST R), South Africa (SABS), Spain (AENOR), Sweden (SIS), Switzerland (SNV), Turkey (TSE), **United Kingdom (BSI)**
Observing Countries (N=22)
Bulgaria (BDS), Chile (INN), Colombia (ICONTEC), Cuba (NC), Czech Republic (UNMZ), Egypt (EOS), Greece (NQIS ELOT), Hong Kong (ITCHKSAR) (Correspondent member) Hungary (MSZT), Indonesia (BSN), Ireland (NSAI), Mauritius (MSB), Mongolia (MASM), Philippines (BPS), Romania (ASRO), Serbia (ISS), Slovakia (SOSMT), Sri Lanka (SLSI), Thailand (TISI), Trinidad and Tobago (TTBS), Tunisia (INNORPI), Vietnam (STAMEQ)

The technical committee for clothing is ISO/TC 133 (Clothing sizing systems - size designation, size measurement methods, and digital fittings), and it is structured by four sub-committed working groups for the areas of body measurement, digital fitting, measurement indicators, and garment measurements (see Table 5.2).

A total number of published ISO standards related to the TC 133 are 18. However, four (ISO 3636, ISO 3637, ISO 4415, and ISO 4416) were corrected by TC 133 in 1990. Table 5.2 shows both years of the original and updated versions.

Table 5.2 Standards and projects under the direct responsibility of ISO/TC 133

(Reproduced from ISO, no date)

	Number	Name
1	ISO 3636:1977, 1990	Size designation of clothes -- Men's and boys' outerwear garments
2	ISO 3637:1977, 1990	Size designation of clothes -- Women's and girls' outerwear garments
3	ISO 3638:1977	Size designation of clothes -- Infants' garments
4	ISO 4415:1981, 1990	Size designation of clothes -- Men's and boys' underwear, nightwear and shirts

5	ISO 4416:1981, 1990	Size designation of clothes -- Women's and girls' underwear, nightwear, foundation garments and shirts
6	ISO 4417:1977	Size designation of clothes -- Headwear
7	ISO 3635:1981	Size designation of clothes -- Definitions and body measurement procedure
8	ISO 5971:1981	Size designation of clothes -- Pantyhose
9	ISO 8559:1989	Garment construction and anthropometric surveys -- Body dimensions
10	ISO 4418:1978	Size designation of clothes -- Gloves
11	ISO 18163:2016	Clothing -- Digital fittings -- Vocabulary and terminology used for the virtual garment
12	ISO 18825-1:2016	Clothing -- Digital fittings -- Part 1: Vocabulary and terminology used for the virtual human body
13	ISO 18825-2:2016	Clothing -- Digital fittings -- Part 2: Vocabulary and terminology used for attributes of the virtual human body
14	ISO 18831:2016	Clothing -- Digital fittings -- Attributes of virtual garments

The European Union also have built their influence to the international market by running parallel with the International Standard enactment and by producing standards for common uses European countries (Kim et al., 2013). The European Committee (CEN) for Standardisation is an association for the National Standardisation Bodies of 33 European countries for developing technical guides. CEN also has a subcommittee within TCs (n=417), Technical Committees like ISO but the real standards development is conducted by experts of Working Groups (WCs) (N=1597) (CEN). In addition, they have CWAs, Committee Workshops (N=42) for specific urgent issues for up to date or rapidly changing issues to be renewed. The standards for body measurements and clothing sizes belong to ‘CEN/TC 248’: Textiles and textile products which have 351 standards and the working group named ‘CEN/TC 248/WG 10’ having a title of ‘Size system of clothing’ has the three scopes; 1. Definition of primary and secondary control dimensions, 2. Definition of measuring positions of primary and secondary control dimensions, 3. Definition of primary and secondary dimensions to be used in designation of the size of garments - Establishment of a size designation system of clothing’ (CEN, 2016).

5.2 British Standards

5.2.1 Sizing standards for clothing construction

The standards for clothing size and sizing system in the UK can be found in Table 5.3. These standards shown in Table 5.3 under the heading size designation of clothes have been adapted from the European Committee. Other European countries including in the UK have signed to adopt the European standards, but the UK also has its own standards called ‘British Standard’ by the British Standard Institution. They modify or adapt European standards or International Standards into their own standards. ‘BS 3728’ in 1964 and 1970 were withdrawn, and BS 3728 in 1982, BS 7231-1 and 2 in 1990 were confirmed. ‘BS EN 13402-3’ was revised in 2013 since the previous version was published in 2004 and amended by January 2014.

Table 5.3 Standards for infants and children’s clothing at the British Standards

(Reproduced from BSI group, no date)

Year	Name	Detail
1964	BS 3728	Recommendations on size marking for infants and girls wear
1970	BS 3728	Recommendations on size marking of children’s wear
1982	BS 3728	Specification for size designation of children's and infants' wear
1990	BS 7231-1	Body measurements of boys and girls from birth up to 16.9 years: Information in the form of tables
1990	BS 7231-2	Body measurements of boys and girls from birth up to 16.9 years: Recommendations of body dimensions for children
2001	BS EN 13402-1	Size designation of clothes - Part 1. Terms, definitions and body measurement procedure
2002	BS EN 13402-2	Size designation of clothes - Part 2. Primary and secondary dimensions
2013	BS EN 13402-3	Size designation of clothes - Part3. Body measurements and intervals

5.2.2 Body measurements for sizing system

BS EN 13402-1 (Size designation of clothes - Definitions and body measurement procedure) is an official English language version of EN 13402-1:2001. This standard for clothing size designation is related to ISO 3635:1981 (Size designation of clothes - Definitions and body measurement procedure) because it was examined to be appropriate for the European requirements (British Standards Institution, no date). Additional dimensions for garment construction are followed with ISO 8559:1989 (Garment construction and anthropometric surveys - Body dimensions). This Standard designates body dimensions for clothing and provides the measuring position and methods with the illustrations including pictograms for the clothing labels.

A total of 13 body measurements which include nine girth measurements, two heights, and two length measurements are illustrated in this standard using the pictograms, and the specific parts of the body are listed in Table 5.4.

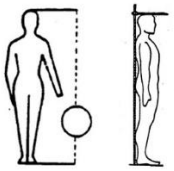
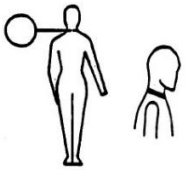
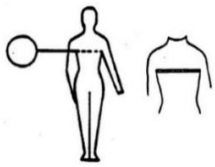
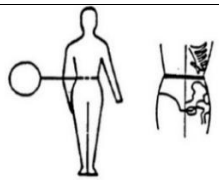
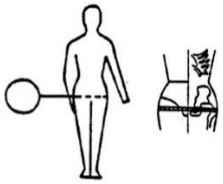
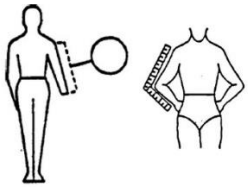
Table 5.4 Body measurements in the BS EN 13402-1
(Reproduced from British Standards Institution, 2001)

UK (Total n=13)	
Girth (n=9)	Head girth, Neck girth, Chest girth, Bust girth, Underbust girth, Waist girth, Hip girth, Hand girth, Foot girth
Height (n=2)	Height (subjects other than infants), Height (infants, not yet able to stand upright)
Length (n=2)	Inside leg length, Arm length (shoulder to wrist)

Table 5.5 shows six body part measurements methods with pictograms and definitions in BS EN 13402-1. The only body parts related to clothing items excluding the girth of hand and foot were listed.

Table 5.5 Body Measurement Method in the BS EN 13402-1

(Reproduced from British Standards Institution, 2001)

Name	Pictogram and Measuring position	Definition
Height (Subjects other than infants)		Vertical distance between the crown of the head and the soles of the feet, measured with the subject standing erect without shoes and with the feet together
Neck Girth		Girth of the neck measured with the tape measure passed 2cm below Adam's apple and at the level of the 7th cervical vertebra
Chest Girth		Maximum horizontal girth measured during normal breathing with the subject standing erect and the tape-measure pass over the shoulder blades (scapulae), under the armpits (axillae), and across the chest
Waist Girth		Girth of the natural waistline between the top of the hip bones (iliac crest) and the lower ribs, measured with the subject breathing normally and standing erect with the abdomen
Hip Girth		Horizontal girth measured round the buttocks at the level of maximum circumference
Arm length (Shoulder to Wrist)		Distance, measured using the tape measure, from the armscye/ shoulder line intersection (acromion), over the elbow, to the far end of the prominent wrist bone (ulna), with the subject's right first clenched and placed on the hip, and with the arm bent at 90 degree

The equipment for measuring the body dimensions are the measuring stand (anthropometer (see Figure 4.1 in section 4.2.1.3) and somatometer[14] (see Figure 5.2), a tape measure with 15 mm width graduating in centimetre and a balance for body mass (weight) (British Standards Institution, 2001).

[14] The somatometer is a device that shows the translation of the pelvis and measures the cervical lordosis curve, the lumbar and the sacral curve (Hakomed Italia, no date)

Figure 5.2 Somatometer
(Reproduced from Hakomed Italia, no date; BIO Postural System, no date)

The measurement of the body in the unclothed state or the least possible clothing is suggested for taking precise measurements. The measuring stand is used to measure the height except for infants who are not able to stand upright in which case a tape measure is used. A tape measure is also used to measure all other parts including infants' height applying a reasonable tension and rounding up to the next centimetre except where millimetre are required such as foot or hand. Body mass is measured by a balance (a scale). Using other measuring methods such as bio-stereometry and photogrammetry scanning are allowed if they are measured precisely.

5.2.3 Primary and Secondary dimensions for infants and children

BS EN 13402-2 (Size designation of clothes-part 2: Primary and Secondary dimensions) provides the definitions of primary and secondary dimension for clothes and those are listed according to clothing items.

Primary dimension (PD) is defined as 'body measurement, in centimetres that shall be used for designating the size of a garment', and secondary dimension (SD) is designated as 'body measurement, in centimetres, may additionally be used for designating the size of a garment or in the case of pantyhose, body mass (kg)' (British Standards Institution, 2002).

The primary dimension of boys and girls for all items of clothing is height. For boys, outer garments such as jackets, suits, overcoats and knits such as cardigans, sweaters, and T-shirts have the same PD for height and chest girth as SD but girls used bust girth as SD. In the case of trousers or shorts, Height is PD and waist girth is SD for both boys and girls. In case of the items for especially, boys such as shirts have neck girth as SD with height

as PD. The girls' blouses and dresses have bust girth as SD and skirt are designated to have waist girth as SD (see Table 5.6).

Table 5.6 Primary and Secondary dimensions for garments
(Reproduced from British Standards Institution, 2002)

Garments for Dimensions	Boys		Girls	
	PD	SD	PD	SD
Jackets	Height	Chest girth	Height	Bust girth
Suits	Height	Chest girth	Height	Bust girth
Overcoats	Height	Chest girth	Height	Bust girth
Trousers/Shorts	Height	Waist girth	Height	Waist girth
Skirts	-	-	Height	Waist girth
Dresses	-	-	Height	Bust girth
Knits: Cardigans, sweaters, T-shirts	Height	Chest girth	Height	Bust girth
Shirts	Height	Neck girth	-	-
Blouses	-	-	Height	Bust girth

Table 5.7 shows the primary and secondary dimensions for underwear. As same for outer garments, the PD of all items is height for boys and girls. Waist girth is designated as the SD for underpants for both boys and girls. Some items where a size difference is required according to genders such as vest and pyjamas use chest girth for boys and bust girth for girls for the SD. In terms of swimsuits /wear and bodies has two SD dimensions; chest girth and waist girth for boys and under bust girth and bust girth for girls.

Table 5.7 Primary and secondary dimensions for underwear
(Reproduced from British Standards Institution, 2002)

Garments for Dimensions	Boys		Girls	
	PD	SD	PD	SD
Vest	Height	Chest girth	Height	Bust girth
Underpants	Height	Waist girth	Height	Waist girth
Pyjamas, Ladies' nightdresses	Height	Chest girth	Height	Bust girth
Swim- Swimsuit and bodies	Height	Chest girth Waist girth	Height	Underbust girth Bust girth

5.2.4 The sizes and interval of body dimension for children's clothing

The body measurement sizes and intervals between the sizes for infants and children are found in the 'BS EN 13402-3' (Size designation of clothes - Part 3: Body measurements and intervals).

'BS EN 13402-3' mentions that 'height is used as the primary dimension for infants, boys and girls, not the individual age' because there is huge variation in height difference by age based on the different growth patterns in each country.

Some body dimensions which are correlated with height are also provided with a range of alternatives; they are chest girth, waist girth, neck girth, and arm length for boys and bust girth and waist girth for girls. The alternative ranges can be combined to suit the specific requirements of each country or company without restriction, and those are coded using letters named from 'C' to 'J' for infants and children.

Due to the reason that children may not have the precise height at the same age, British Standards Institution allows using the 'Range' from the primary or secondary dimension having ±1/2 of the interval. All ranges are recommended to the pictogram having rounded down to a whole number according to BS EN 13402-1. For example, if a country or company chooses a height of 92 cm, the range is 89 cm to 95 cm because ±1/2 of the interval which is provided as 6 cm are calculated (see Table 5.8).

Table 5.8 Example of height range for infants, boys and girls
(Reproduced from British Standards Institution, 2013)

Height	92	
Range	89	95
Interval	*6*	*6*

'BS EN 13402-3' provides some tables for the flexible use of chest/bust and waist girth related to the height for infants, boys, and girls. In the case of trousers, the waist girth is defined as a secondary dimension, and the alternatives of chest/bust and waist girth can be adjusted individually. Based on the specific body types of diverse European countries and companies, the alternatives can be chosen to describe their distinction having adequate adaptability. They give two descriptions which are 'choosing the same

alternative during the sizes' or 'changing the alternatives between the sizes' for the individual body types.

Table 5.9 shows the secondary dimensions and alternatives for infant boys in the British Standard, and it is described as the extent of height mean values and each alternatives' extent for all secondary dimensions. The height of infant boys is from 44 cm to 116 cm having 6 cm intervals. The secondary dimensions of infant boys are chest girth, waist girth, neck girth and arm length with seven alternatives. The amount of interval change depending on the growth and the intervals for specific height are given in Table 5.9. Chest girth has 2 cm alternative intervals, from 44 to 74 cm is 3.5 cm and their amount changes to 2.5cm for 74–86 cm, 2cm for 86–104 cm, and 1.5cm for 104–116 cm. The number of alternatives is seven for waist girth, three for neck girth, and six for arm length.

Table 5.9 Secondary dimension and alternatives for infant boys
(Reproduced from British Standards Institution, 2013)

(cm)

Alternative	Height	Chest girth	Waist girth	Neck girth	Arm length
C	44 … 116	26 … 55	23 … 48.5	19.7 … 25.9	12.5 … 36
D		28 … 57	25 … 50.5	21.2 … 27.4	14 … 37.5
E		30 … 59	27 … 52.5	22.7 … 28.9	15.5 … 39
F		32 … 61	29 … 54.5	-	17 … 40.5
G		34 … 63	31 … 56.5	-	18.5 … 42
H		36 … 65	33 … 58.5	-	20 … 43.5
J		38 … 67	35 … 60.5	-	-
Interval	6	1.5 ~ 3.5	1.5 ~ 2	0.3 ~ 1.5	1.5 ~ 3

In regard to the infant girls and girls, they both use 5 cm intervals for the height and bust girth and waist girth are the secondary dimensions (see Table 5.10). The height range of infant girls is 44-116 cm and 122-188 cm for girls. Bust girth and waist girth for both infant girls and girls have seven alternatives, and both intervals between the alternatives are 2 cm.

Table 5.10 Secondary dimension and alternatives for infant girls and girls
(Reproduced from British Standards Institution, 2013)

(cm)

Infant girls				Girls			
Alternative	Height	Bust girth	Waist girth	Alternative	Height	Bust girth	Waist girth
C	44 … 116	25.5 … 55.5	20.0 … 49.0	C	122 … 188	57.5 … 92.5	50.5 … 76
D		27.5… 57.5	22.0 … 51.0	D		59.5 … 94.5	52.5 … 78
E		29.5 … 59.5	24.0 … 53.0	E		61.5 … 96.5	54.5 … 80
F		31.5 … 61.5	26.0 … 55.0	F		63.5 … 98.5	56.5 … 82
G		33.5 … 63.5	28.0 … 57.0	G		65.5 … 100.5	58.5 … 84
H		35.5 … 65.5	30.0 … 59.0	H		67.5 … 102.5	60.5 … 86
J		37.5 … 67.5	32.0 … 61.0	J		69.5 … 104.5	62.5 … 88
Interval	6	2	2	Interval	7	2 ~ 4	2 ~ 3

The body dimensions of boys in the BS EN 13402-3 are height as a primary dimension and chest girth, waist girth, neck girth, and arm length as secondary dimensions are the same as the infant boys. Table 5.11 describes the range of each alternative according to the dimension and the interval between the correlated height's growths. The boys' height starts from 122 cm and ends at 188 cm with 6 cm intervals. The number of alternatives at each dimension is the same with infant boys; chest and waist girth (each n=7), neck girth (n=3), and arm length (n=6).

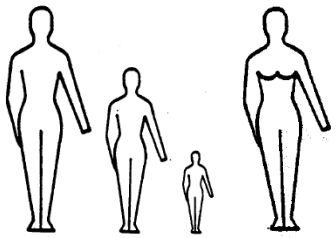
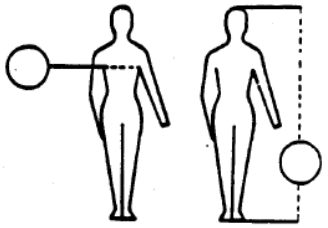
Table 5.11 Secondary dimension and alternatives for boys
(Reproduced from British Standards Institution, 2013)

(cm)

Alternative	Height	Chest girth	Waist girth	Neck girth	Arm length
C	122 … 188	57 … 93	50 … 77	26.7 … 37.5	38 … 63
D		59 … 95	52 … 79	28.2 … 39	39.5 … 64.5
E		61 … 97	54 … 81	29.7 … 40.5	41 … 66
F		63 … 99	56 … 83	-	42.5 … 67.5
G		65 … 101	58 … 85	-	44 … 69
H		67 … 103	60 … 87	-	45.5 … 70.5
J		69 … 107	62 … 89	-	-
Interval	6	2 ~3	1.5 ~ 3	0.8 ~ 1.5	1.5 ~ 2.5

The standard also recommends how a pictogram is used for indicating the position on related body dimensions. The standard pictogram is used without the numerals for labelling and the pictogram does not provide the technical information of measurements. The size of the pictogram is not stated, but it is designated that the pictogram should be large enough to show prompt understandable information with allowance easy readability of numerals. The basic form of the standard and modified pictograms are given in Table 5.12. The standard pictogram with breasts indicates the position of the under bust girth dimension. If the measurements are given, measurements of girth should be on the left side, and length measurements should be on the right side of the modified pictograms.

Table 5.12 Pictogram in BS EN 13402-3
(Reproduced from British Standards Institution, 2013)

Standard pictogram	Modified pictogram
	

5.3 Korean Industrial Standards

The Korean standard for body measurements guide for clothing construction is KS A ISO 8599 revised in 2008 and confirmed in 2013. The Korean standards for infants, boys, and girls (KS K 0052, KS K 9402, and KS K 9403) were published in 2009 and were revised in 2014 (see Table 5.13).

Table 5.13 Korean standards for infants and children's clothing
(Reproduced from Korean Standards Certification, no date)

Year	Name	Detail
2008	KS A ISO 8599	Garment Construction and Anthropometric Surveys -Body Dimensions
2009	KS K 0052	Sizing Systems for Infant's Garments
2009	KS K 9402	Sizing Systems for Boy's Garments
2009	KS K 9403	Sizing Systems for Girl's Garments

5.3.1 Sizing standards for clothing construction

'KS A ISO8599' (Garment construction and anthropometric surveys - Body dimensions) corresponds with BS EN 13402-1 which explains the measurement body dimensions and methods. As it is inferred from the title, this standard is adopted by ISO 8559, but these technical contents and the composition of the correspondent international standard are not modified. KS A ISO8599 is for the definition of the body parts and procedure for the measurements to establish the guide of clothing pattern blocks and standards. It is allowed that only some required body dimensions for specific clothing items can be selected and adapted at the clothing manufacturing process. Three classifications are used for body dimensions which are divided into horizontal measurements including circumference measurements, vertical measurements plus others. A total of 53 parts of the body measurement guide are provided at the KS A ISO8599. The horizontal measurements comprise 20 circumference parts, four length parts, and infants' height. More measurements are given for the vertical measurements parts which include 8 heights, 12 lengths and 6 other parts listed in Table 5.14. Finally, the slope of the shoulder and the body mass are provided in the measurements information.

Table 5.14 Body parts in KS A ISO 8599
(Reproduced from Korean Industrial Standards Association, 2008)

Horizontal measurements (n=25)	
Circumference (n=20)	Head, Neck (male), Neck-base (female), Chest, Bust, Underbust, Waist, Hip, Upper arm, Elbow, Wrist, Hand, Hand, Thigh, Mid-thigh, Knee, Lower knee, Calf, Minimum leg, Ankle,
Length and infant's height (n=5)	Shoulder length, Interscye (front), Interscye (back), Foot length, Height (infants, not yet able to stand upright)
Vertical measurements (n=26)	
Height (n=8)	Height, Waist height, hip height, Knee height, Lateral ankle height, Cervical height (sitting), Cervical height, Crotch height,
Length (n=12)	Vertical trunk length, Waist back length, Cervical to popliteal length, Neck point to breast front waist length, Waist to hip length, Crotch length (natural indentation), Upper arm length, Arm length, Cervical-to-waist length, Underarm length, Outside length, Thigh vertical length,
Other (N=6)	Body rise, Scye depth, Cervical to breast point, Neck shoulder point to breast point, Trunk circumference, Armscye circumference,
Other measurements (n=2)	
Shoulder slope, Body mass	

5.3.2 Measurement method and equipment

The measurements guide in the KS A ISO8599 are corresponded with the ISO 8599. Total 53 parts of body dimensions are illustrated by pictograms with descriptions of measurements. The guide of measurements for body size measurement is also provided in KS A ISO8599. For the height measurements, a measuring stand, an anthropometer, and a somatometer are required. The measuring stand should have the moving horizontal ruler with precise ‘mm’ gradations. The other tools are a tape measure with exact ‘mm’ gradations for following the body line and a chainette to guide for the measurement of the neck base. In addition, a balance (a scale) which can measure with less than 1% of an allowable error and an inclinometer[15] which allows to find out the percent of shoulder slope are suggested.

It is suggested that subjects are required to take off their clothes and shoes for the exact measurements which are required. In the case of infants who cannot stand up, a tape measure is used for their height measurement, but the tape measure should be stretched tight enough.

5.3.3 Primary and secondary dimensions for infants and children clothing

Sizing systems for infants’ garments (KS K 0052)

The body dimensions for infants clothing in Korea are published at the ‘KS K 0052:2009 (Sizing Systems for Infant’s Garments). The each terminology of the primary and secondary dimensions (PD and SD) as a British standard are translated into Korean as ‘Basic body dimension’ and the ‘Auxiliary body dimension.' However, PD and SD are used for the denomination of Korean standards terminologies and names because the English version of Korean Standard is following International Standard Organisation. The primary dimension for infant clothing in Korea is height which is designated as a unit for clothing size designation. A total of 26 secondary dimensions were selected which are listed in Table 5.15.

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15 A device for measuring the angle of inclination of something, especially from the horizontal (Oxford Dictionary, 2017)

Table 5.15 Secondary dimensions for Infant's garments
(Reproduced from Korean Industrial Standards Association, 2009a)

Secondary body dimension (n=26)
Neck circumference, Chest circumference, Waist circumference (Natural Indentation), Waist circumference (Omphalion), Hip circumference, Thigh circumference, Calf circumference, Minimum leg circumference, Axilla Height, Waist height(Omphalion), Hip height, Crotch height, Knee height, Biacromial Breadth, Chest Breadth, Waist Breadth (Natural Indentation), Hip Width, Head circumference, Bitragion Arc, Upper arm circumference, Wrist circumference, Fist Circumference, Arm length, Hand length, Foot length, Body mass

Sizing systems for children's garments (KS K 9402 and KS K 9403)

The information of the primary and secondary dimensions for children's clothing in the Korea Industrial Standard are addressed at the 'KS K 9402' (Sizing Systems for Boy's Garments) and 'KS K 9403' (Sizing Systems for Girl's Garments) which are established in 2009 and revised in 2014.

The body dimension for children's clothing in the Korean Industrial Standard are provided for both boys and girls in each gender's standard; The only difference is the secondary dimension of the chest and bust girth. The chest girth is used for boys and bust girth is adjusted for girls. All age itself can be used as a reference for the size denoting using brackets such as Size 7 (7 years old).

All clothing items having some examples in the KS K 9402 and KS K 9403 have height as the primary dimension. Only formal wear both top and bottom have the secondary dimensions and these types of clothes are described as the clothes which are required for appropriate fit. In addition, formal wear focuses the clothing size's stabilities for the body dimensions having a narrow range of body dimensions. However, all clothing items except for formal wear have a comparatively wide range, and the degree of fit is also rather more generous than formal wear. For the formal top, chest circumference for boys and bust girth for girls are designated as the SD and waist girth is also the SD for the formal trousers and skirts. Except for formal wear, all clothing items only have the PD of height (see Tables 5.16 and 5.17).

The basic body dimension of all 'Sportswear' for whole body type, top and bottom is height measurement. The whole body type includes any whole body type of sportswear, swimsuits, and gymnasium suits. The examples of the sportswear top are listed as training tops, and other sportswear tops, and the bottom sportswear are described as training bottoms, leggings, leotards,

tights, swimsuits, and other sportswear bottoms. In the case of underwear tops like vests and long sleeve underwear, chest (or bust) circumference is the PD according to gender, but the hip circumference is the PD for both boys' and girls' inner wear bottoms. In terms of nightwear, height is the PD for both top and bottom (Korean Industrial Standards Association, 2009b).

Table 5.16 Primary and secondary dimensions according to clothing items for boys' clothes
(Reproduced from Korean Industrial Standards Association, 2009b)

Types	Clothing item	Examples	Primary dimension	Secondary dimension
Top	Formal wear	Jacket, coat, waistcoat, shirt	Height	Chest
	Casual wear	Jacket, shirts, jumper, anorak, parka	Height	-
	Knitwear	Cardigan, sweater, pullover, pique shirt, waistcoat	Height	-
Bottom	Formal wear	Trousers	Height	Waist
	Casual wear	Trousers, jean, shorts, jodhpurs, skiing trousers	Height	-
Overalls	Coat	Overcoat, topcoat, half coat, rain coat	Height	-
	Overalls		Height	-
	Gown	Bath gown, experiment gown, nightgown	Height	-
Sportswear	Overalls	Overalls sportswear, swimsuit, gymnasium suit	Height	-
	Top	Training top, other sportswear top,	Height	-
	Bottom	Training bottom, leggings, leotard, tights, swim trousers, other sportswear bottom	Height	-
Innerwear	Top	Vest, long sleeve underwear	Chest	-
	Bottom	Pants, long leg underwear	Hip	-
Sleepwear	Top	Sleepwear top	Height	-
	Bottom	Sleepwear bottom	Height	-

The guidelines of girls' primary and secondary dimensions according to clothing items are illustrated as similar with boys' dimensions except for some specific female items such as blouses, skirts, and one-piece dresses. These items are marked in bold strokes in Table 5.17, and bust circumference is used for girls' clothes instead of using chest circumference.

In the case of one-piece dresses for girls, the formal one-piece dress with relative fitting has bust circumference as SD and casual one-piece dresses with generous fitting only have height as PD.

Table 5.17 Primary and secondary dimensions according to clothing items for girls' clothes
(Reproduced from Korean Industrial Standards Association, 2009c)

Types	Clothing item	Examples	Primary dimension	Secondary dimension
Top	Formal wear	Jacket, coat, waistcoat, **blouse** and shirt	Height	Bust
	Casual wear	Jacket, **blouse** and shirts, jumper, anorak, parka	Height	-
	Knitwear	Cardigan, sweater, pullover, pique shirt, waistcoat	Height	-
Bottom	Formal wear	Trousers, **skirt**	Height	Waist
	Casual wear	Trousers, jean, shorts, jodhpurs, skiing trousers, **skirt**	Height	-
Overalls	Coat	Overcoat, topcoat, half coat, rain coat	Height	-
	Formal one-piece dress	**One-piece dress, fitted jumper skirt**	Height	Bust
	Casual one-piece dress	**One-piece dress, jumper skirt**	Height	-
	Overalls		Height	-
	Gown	Bath gown, experiment gown, nightgown	Height	-
Sportswear	Overalls	Overalls sportswear, swimsuit, gymnasium suit	Height	-
	Top	Training top, other sportswear top,	Height	-
	Bottom	Training bottom, leggings, leotard, tights, swimwear bottom, other sportswear bottom	Height	-
Innerwear	Top	Vest, long sleeve underwear	Bust	-
	Bottom	Pants, long leg underwear	Hip	-
Sleepwear	Overalls	**Nightgown, one-piece sleepwear**	Height	
	Top	Sleepwear top	Height	-
	Bottom	Sleepwear bottom	Height	-

5.3.4 The sizes and interval of body dimension for children's clothing

The body measurement sizes and intervals between the sizes for infants and children in Korea are found in the 'KS K 0052' for the infants, 'KS K 9402' for the boys and 'KS K 9403' for the girls.

The terminology of body measurements for these standards are followed with the 'KS A ISO 8599 (Garment construction and anthropometric surveys – Body dimensions). Basic body measurements are defined as the measurements of the body parts which can be fundamental for the clothing size and the standard unit is 'cm.' The garment measurement is the size of specific parts of the garment which correspond to the basic body measurements. It is suggested that garment size can be specified if it is necessary. The measurement sizes should provide instinctively with body sizes to avoid the confusion of the body measurements.

Body measurements for infant's and children's garments

Body measurements for infants' garments

All detailed measurements for infant's garments in the 'KS K 0052' are height which is a primary dimension and a total of 26 secondary dimensions. It is mentioned that age is allowed to be used to denote the clothing size for infants' garments as an additional reference in the 'KS K 0052'.

The interval of height is 5 cm from 55 cm to 125 cm, and the secondary dimensions are listed in accordance with the age and height. However, some parts of the dimensions are provided with inference from the other body measurements, which are shown shaded in Table 5.16. The estimated ages and body parts are from 3 months to 12 months (n=10); neck circumference, waist circumference (omphalion), axilla height, waist height (omphalion), hip height, crotch height, knee height, biacromial breadth, waist breadth (natural indentation), itragion arc from 18 months to age six (n=4); waist circumference (Natural Indentation), minimum leg circumference, wrist circumference, arm length (see Table 5.18).

Table 5.18 Infants' body dimensions and size according to the size in KS K 0052: 2009
(Reproduced from Korean Industrial Standards Association, 2009c)

(cm)

Size	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125
Height	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125
Age	3M	3M	6M	9M	12M	18M	2 year	3 year	3 year	4 year	4 year	5 year	5 year	6 year	6 year
Neck circumference	21.9	22.5	22.9	23.2	23.4	24.2	24.3	24.5	24.8	25.1	25.5	25.9	26.5	27.0	27.8
Chest circumference	36.4	40.5	42.4	44.1	45.5	47.7	49.7	51.1	52.5	53.5	55.0	56.6	58.4	60.4	63.1
Waist circumference (Natural Indentation)	34.5	38.2	40.3	41.5	42.5	44.2	46.2	47.5	46.9	50.1	52.0	54.0	56.3	58.8	62.2
Waist circumference (Omphalion)	40.2	42.5	43.6	44.5	45.1	45.4	47.4	48.5	49.2	50.1	51.3	52.4	54.0	56.0	58.1
Hip circumference	36.4	40.9	44.2	45.4	45.9	47.6	49.8	51.3	53.0	54.3	56.5	58.4	60.6	62.9	65.7
Thigh circumference	16.2	20.2	23.2	24.1	24.8	26.5	28.4	30.2	30.8	31.4	33.1	34.0	35.5	36.8	38.8
Calf circumference	12.9	15.4	17.4	18.3	18.7	19.5	20.2	20.8	21.1	21.5	22.4	23.1	23.9	24.9	26.1
Minimum leg circumference	9.8	11.4	12.5	13.2	13.5	14.1	14.8	15.2	15.6	16.0	16.7	17.3	18.1	19.0	20.1
Axilla height	34.6	38.7	42.6	46.6	50.4	55.7	58.9	62.2	66.0	70.1	74.1	78.2	82.0	85.7	89.1
Waist height (Omphalion)	22.6	26.3	29.8	33.4	36.9	41.3	44.1	47.6	51.0	54.8	58.4	62.1	65.2	68.2	71.3
Hip height	17.5	20.7	23.7	26.8	29.8	33.8	36.3	39.0	42.0	45.4	48.4	51.5	54.5	57.1	60.0
Crotch height	13.8	16.9	19.9	22.9	25.6	29.1	31.7	34.8	37.8	41.1	44.1	47.1	49.7	52.1	54.1
Knee height	10.3	11.9	13.4	15.0	16.5	18.8	19.9	21.0	22.5	24.2	25.7	27.5	28.9	30.2	31.6
Biacromial Breadth	14.7	15.8	16.7	17.5	18.1	19.2	20.0	21.1	21.8	22.6	23.3	24.3	25.3	26.2	27.4

Chest Breadth	12.0	13.7	14.2	14.8	15.4	16.2	16.6	16.8	17.1	17.5	18.0	18.4	19.0	19.6	20.7
Waist Breadth (Natural Indentation)	12.0	13.2	13.6	14.1	14.6	14.8	15.6	16.0	16.3	16.9	17.3	17.8	18.5	1.2	20.1
Hip Width	12.6	14.4	15.6	16.0	16.1	16.4	17.2	17.7	18.2	18.7	19.5	20.2	21.0	21.6	22.8
Head circumference	36.9	39.9	41.7	43.0	45.1	46.7	47.6	48.3	49.1	49.5	50.0	50.5	51.0	51.5	52.4
Bitragion Arc	38.4	40.1	41.8	43.1	44.7	45.8	47.3	48.5	49.6	50.7	51.7	52.6	53.7	54.5	55.8
Upperarm circumference	11.7	13.8	14.9	15.2	15.5	15.8	16.0	16.2	16.3	16.5	17.0	17.4	18.0	18.6	19.8
Wrist circumference	8.9	9.6	10.4	10.7	11.1	11.3	11.7	12.0	12.3	12.6	13.2	13.7	14.5	15.3	16.4
Fist Circumference	11.2	12.2	13.2	14.0	14.7	15.1	15.4	15.7	16.2	16.6	17.3	17.8	18.4	18.9	19.6
Arm length	16.3	17.7	19.4	20.9	22.6	24.1	25.8	27.4	29.0	30.7	32.4	34.2	36.1	37.9	40.0
Hand length	6.3	6.7	7.2	7.7	8.1	8.9	9.9	10.5	11.0	11.4	11.9	12.4	12.8	13.2	13.5
Foot length	8.1	8.6	9.5	10.2	11.1	12.3	13.4	14.1	14.9	15.5	16.3	17.0	17.7	18.4	19.1
Body mass (kg)	4.6	6.2	7.4	8.6	9.6	10.8	12.3	13.4	14.6	15.8	17.4	19.1	21.1	23.2	26.0

‘KS K 0052’ provides a few tables of distribution rates which are height and age, height and chest circumference, height and weight. In addition, there is the average weight based on chest circumference, height, and age as well as the average chest circumference based on the height and weight. Moreover, the correlations of body dimensions are illustrated and the body dimensions for the correlation were height, weight, chest circumference, waist circumference, hip circumference, calf circumference, minimum leg circumference, biacromial breadth, chest breadth, hip width, upper arm circumference, arm length.

The anthropometric data of infant boys and girls are also provided having six dimensions (height, weight, chest circumference, waist circumference, hip circumference, and calf circumference) with the percentiles and Table 5.19 only shows their averages, but the detailed standard deviation value are found in the Korean standard. In regard to the waist circumference, the age from 3 to 18 months is measured with reference to ‘Natural Indentation’ but the ‘Omphalion’ was used for two to six years.

Table 5.19 Body measurements of infant boys and girls in the Korean Standards

(Reproduced from Korean Industrial Standards Association, 2009a)

(M=months, Y=years/ cm)

Part / Age	Height		Weight		Chest		Waist		Hip		Calf	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
3 M	59.6	58.3	6.0	5.3	39.8	38.6	37.4	36.4	40.1	38.6	15.0	14.0
6 M	66.7	64.1	8.0	7.0	43.7	41.9	41.1	39.7	44.9	43.7	18.1	17.0
9 M	71.4	69.5	8.9	8.4	43.9	43.8	41.5	41.4	45.3	46.1	18.4	18.4
12 M	75.0	73.8	10.1	9.2	46.5	45.0	43	42.7	47.0	45.9	19.1	18.5
18 M	80.0	78.2	10.9	10.0	47.6	46.3	44.1	42.9	46.7	46.1	19.5	18.9
2 Y	87.8	86.4	13.2	12.5	51.3	49.6	48.3	47.3	50.8	50.3	20.7	20.2
3 Y	95.2	94.4	14.8	14.3	52.9	51.8	49.4	49.2	53.0	52.6	21.2	21.0
4 Y	102.3	101.1	16.7	16.1	54.8	53.3	50.9	50.6	55.4	55.0	21.9	21.7
5 Y	109.0	107.9	19.1	18.3	57.0	55.5	52.4	51.8	58.1	57.5	23.1	22.7
6 Y	115.5	114.6	21.5	20.9	59.1	57.8	54.3	53.6	60.8	60.6	24.2	23.8

Body measurements for children's garments

Body measurement for boy's and girl's garments are provided separately in the KS K 9402 and KS K 9403 respectively. Body measurement dimensions are provided according to the clothing types whether the relevant fittings are required or not. It is also adapted when primary and secondary dimensions are decided depending on the clothing types which are classified as formal wear and all clothes except formal wear.

The body dimensions of boys' formal wear are height, chest circumference, waist circumference, and hip circumference. The interval of height is 5 cm, but the other parts are 3 cm (see Table 5.20). The hip circumference is measured as the circumference using the 'Buttock Protrusion' as a reference point maintaining the horizontal level, but the amount of protrusion degree of the abdomen is not included.

Table 5.20 Boys' body dimension of basic required measurements
(Reproduced from Korean Industrial Standards Association, 2009b; 2009c)

Part \ Size	Formal wear (Relevant fit)		Other clothes (Generous fit)	
	Interval	Body dimension	Interval	Body dimension
Height	5	115, 120 … , 175	5	115, 120 … , 175
Chest circumference	3	49, 52 … 94, 97	5	45, 50 … 90, 95
Waist circumference	3	58, 61 … 100, 103	5	55, 60 … 90, 95
Hip circumference	3	55, 58 … 100, 103	5	55, 60 … 90, 95

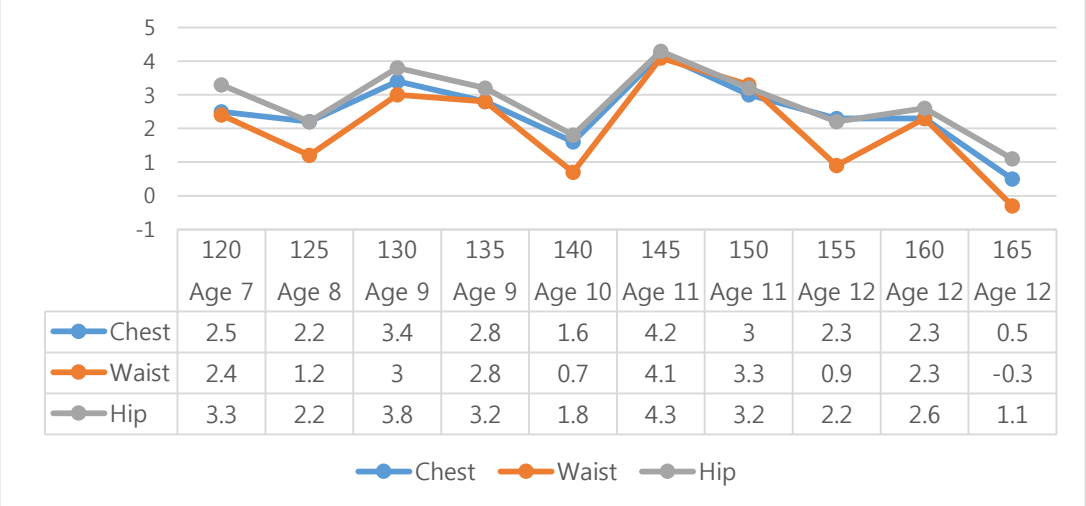
As can be seen in Table 5.21, the primary dimensions of formal top and trousers for boys are 'Height - Chest circumference' and 'Height – Waist circumference' respectively. The secondary dimensions which are provided for the basic requirement for the formal top were waist circumference, hip circumference, neck base circumference, waist back length, arm length. In respect of formal trouser for boys, hip circumference, outside leg length, and crotch length (natural indentation) are the secondary dimensions. Table 5.20 shows the distribution of each alternative chest and waist for height measurements and shaded parts indicate the top five which are occupied in whole ranges (top: 125-61, 125-64, 130-64, 135-67,140-67, bottom: 125-52, 125-55, 125-58, 140-55, 130-58, 135-58).

Table 5.21 Primary dimensions of formal top and trousers for boys
(Reproduced from Korean Industrial Standards Association, 2009b)

Age	7	7	8	8-9	9-10	10-11	10-11	11-12	12
Height	115	120	125	130	135	140	145	150	155
Chest	58	58	58	61	61	64	67	70	76
		61	61	64	64	67	70	73	
		64	64	67	67	70	73	76	
			67	70	70	73	76		
				73	73	76	79		
					76	79	82		
Waist	52	49	49	52	55	55	58	61	64
		52	52	55	58	58	61	64	
		55	55	58	61	61	64	67	
		58	58	61	64	64	67		
			61	64	67	67	70		
				67			73		

The clothing items where a proper fit is not required for boys are described as a casual top, knitted top, overall, casual bottom, sportswear, and sleepwear in Korean standard. The primary dimension is only height and secondary dimensions are chest circumference, waist circumference, hip circumference, outside leg length, crotch length (natural indentation), waist back length (natural indentation), biacromion length, and arm length. The height starts from 120 cm and ends at 165 cm, and each related age is provided as additional information. It is found that the interval of chest, waist and hip for casual clothes in boys are varied but all parts of dimension have similar growth trends according to the same height increase rate (see Figure 5.3).

(cm)

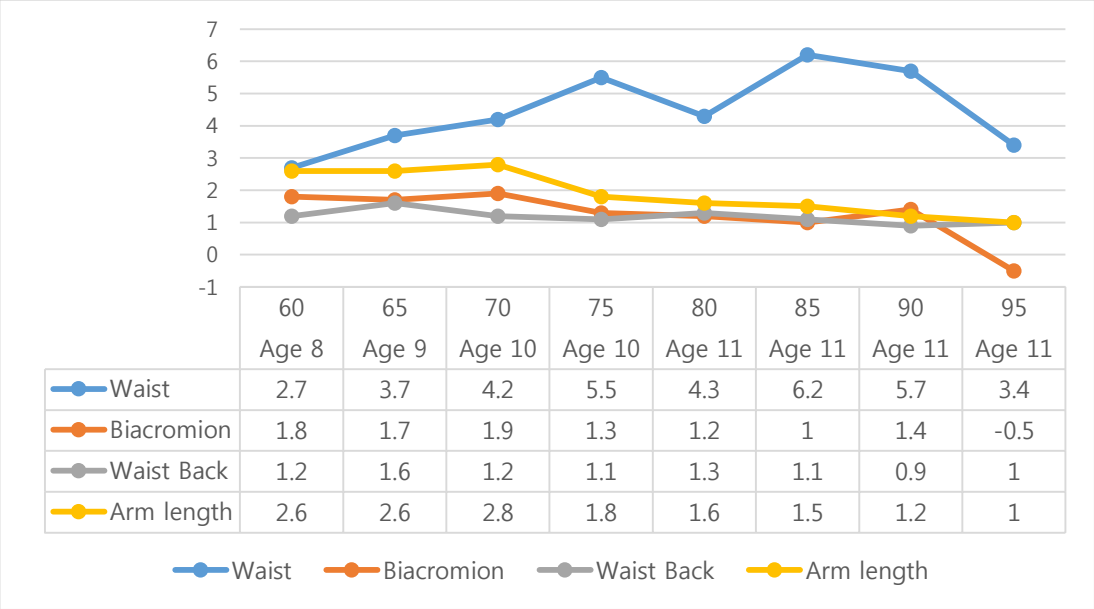


	120 Age 7	125 Age 8	130 Age 9	135 Age 9	140 Age 10	145 Age 11	150 Age 11	155 Age 12	160 Age 12	165 Age 12
Chest	2.5	2.2	3.4	2.8	1.6	4.2	3	2.3	2.3	0.5
Waist	2.4	1.2	3	2.8	0.7	4.1	3.3	0.9	2.3	-0.3
Hip	3.3	2.2	3.8	3.2	1.8	4.3	3.2	2.2	2.6	1.1

Figure 5.3 Primary dimensions and secondary dimensions of generous fitted clothes for boys
(Reproduced from Korean Industrial Standards Association, 2009b)

As to innerwear (top) for boys, the primary dimension is chest circumference and the secondary dimensions are waist circumference, biacromion length, waist back length (natural indentation), and arm length. The interval of the secondary dimensions is not increased with the same growth rate not the same as the 5 cm's interval of the primary dimension (chest circumference). It is found that the waist is growing until age 10, but there is distinctive drop when chest size is increased from 75 cm to 80 cm. However, the other secondary dimensions have a similar growing tendency of increase and decrease (see Figure 5.4).

(cm)

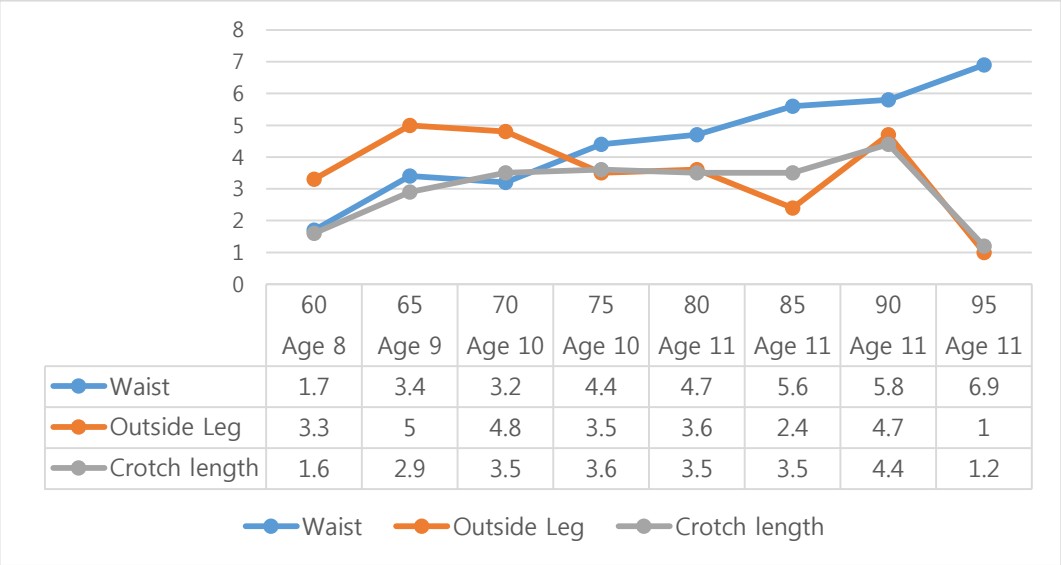


	60 Age 8	65 Age 9	70 Age 10	75 Age 10	80 Age 11	85 Age 11	90 Age 11	95 Age 11
Waist	2.7	3.7	4.2	5.5	4.3	6.2	5.7	3.4
Biacromion	1.8	1.7	1.9	1.3	1.2	1	1.4	-0.5
Waist Back	1.2	1.6	1.2	1.1	1.3	1.1	0.9	1
Arm length	2.6	2.6	2.8	1.8	1.6	1.5	1.2	1

Figure 5.4 Primary and secondary dimensions of inner wear (top) for boys
(Reproduced from Korean Industrial Standards Association, 2009b)

Figure 5.5 shows the primary and secondary dimensions' interval of inner wear (bottom) for boys in Korean standard. The hip circumference is the primary dimension while waist circumference, outside leg length, crotch length (natural indentation) are found as the secondary dimensions. The interval of waist circumference is increased according to the hip circumference's growing trend and outside leg, and crotch length is found that these secondary dimensions have approximately comparable trends' of the interval.

(cm)



	60 Age 8	65 Age 9	70 Age 10	75 Age 10	80 Age 11	85 Age 11	90 Age 11	95 Age 11
Waist	1.7	3.4	3.2	4.4	4.7	5.6	5.8	6.9
Outside Leg	3.3	5	4.8	3.5	3.6	2.4	4.7	1
Crotch length	1.6	2.9	3.5	3.6	3.5	3.5	4.4	1.2

Figure 5.5 Primary and secondary dimensions of inner wear (bottom) for boys
(Reproduced from Korean Industrial Standards Association, 2009b)

The distribution rates according to clothing items are given in the ‘KS K 9402,’ and the items are divided into fitted clothes, formal wear and casual wear in both top and bottom. Each percentage is based on two main primary dimensions which are described according to items. Table 5.22 shows the distribution rate of boys’ formal top according to the combined dimensions (height and chest circumference) with the interval of 5 cm in height and 3 cm in chest circumference. The other given items of two dimensions for a bottom in distribution tables are height and waist circumference.

Table 5.18 Primary dimensions distribution rates of boys' formal top

(Reproduced from Korean Industrial Standards Association, 2009b)

(%)

Height	Chest circumference																	Total
	55	58	61	64	67	70	73	76	79	82	85	88	91	94	97	100	103	
115	0.72	1.70	0.65	0.13	0.07													3.25
120	0.91	2.02	2.42	1.11	0.59	0.20	0.07											7.31
125	0.20	2.35	4.96	4.05	1.57	0.85	0.33	0.07	0.13									14.49
130	0.07	0.52	2.81	4.18	2.94	2.15	1.17	0.78	0.20	0.13	0.13	0.20						14.95
135		0.13	1.44	3.46	3.98	2.22	1.89	1.31	0.78	0.39	0.20	0.07						15.93
140		0.07	0.39	1.89	3.59	2.68	1.96	1.76	1.11	0.46	0.72	0.26	0.20	0.07		0.07		14.15
145		0.07	0.07	0.33	1.24	2.81	2.02	2.02	1.24	1.31	0.59	0.46	0.33	0.20	0.07	0.07		12.40
150				0.07	0.33	1.31	1.17	1.31	0.91	0.85	0.65	0.52	0.59	0.07		0.13		7.84
155						0.52	0.98	1.31	0.98	0.52	0.33	0.13	0.13	0.13	0.07		0.07	6.27
160						0.98	0.07	0.59	0.26	0.20	0.13	0.13	0.07	0.13				2.02
165						0.07	0.07	0.26	0.13	0.20		0.13			0.07			1.11
170									0.07	0.13								0.39
175									0.07									0.07
Total	1.89	6.85	12.73	15.21	14.30	12.79	9.73	9.40	5.87	4.18	2.74	1.89	1.31	0.59	0.20	0.26	0.07	100

‘KS K 9402’ is also allowed to use the sizing system with range according to somatotypes and height in casual wear for boys. The size measurements can be appointed by each item’s requirements but it is recommended that a type of physique is noted ahead, then height measurement is followed by symbol of ‘-‘. Table 5.23 shows the meanings of the ranged sizing system, size ‘S’ and ‘115’. The somatotypes for boys’ casualwear have ‘S,' ‘M,' ‘L’ and ‘XL’ with the height ranged from 115 cm to 165 cm with 10 cm of the interval.

Table 5.19 Definitions of ranged sizing system

(Reproduced from Korean Industrial Standards Association, 2009b)

Designation		Definition
Size of somatotype	S	The abbreviation which is meant a small build
Size of height	115	The number which is meant a height over 110 cm and under 120 cm

Detailed size ranges and distribution rates of casual wear for boys are shown in Table 5.24, and only primary dimensions for top (height and chest) and bottom (height and waist) were selected from the ‘KS K 9402’. As to the distribution of top and bottom, it is found that there is a few size ranges with remarkable rates. The highest percentages of top and bottom are S-135 (17.23% and 17.99% respectively), and M-145 (17.09 and 13.65% respectively) is followed. It is referred that this distribution in Table 5.24 which provide the Korean standards will be a guide to figure out an appropriate manufacturing output per size of products in boys’ casual wear.

Table 5.20 Detailed size ranges and distribution rates of casual wear
(Reproduced from Korean Industrial Standards Association, 2009b)

(cm)

Size	Height	Chest (Top)	%	Waist (Bottom)	%
S-115	110-120	57-66	1.14	51-60	1.24
S-125	120-130	57-66	15.08	51-60	13.37
M-125		66-75	1.88	60-69	2.62
L-125		75-84	0.13	69-78	0.28
S-135	130-140	57-66	17.23	51-60	17.99
M-135		66-75	11.19	60-69	9.51
L-135		75-84	1.81	69-78	2.55
XL-135		84-92	0.07	78-86	0.34
S-145	140-150	57-66	5.36	51-60	10.06
M-145		66-75	17.09	60-69	13.65
L-145		75-84	6.70	69-78	5.44
XL-145		84-92	0.94	78-86	1.52
S-155	150-160	57-66	0.13	51-60	1.72
M-155		66-75	6.37	60-69	8.06
L-155		75-84	7.37	69-78	4.07
XL-155		84-92	2.55	78-86	2.69
S-165	160-170	-	-	51-60	0.07
M-165		65-75	0.60	60-69	1.86
L-165		75-84	2.21	69-78	1.31
XL-165		84-92	1.54	78-86	1.10
S-175	170-180	-	-	51-60	0.07
M-175		66-75	0.07	60-69	0.28
L-175		75-84	0.40	69-78	0.14
XL-175		84-92	0.13	78-86	0.07

Finally, boys' average body measurements according to age are given in 'KS K 9402' from age 7 to 12 (Table 5.25).

Table 5.21 Average body measurements of Korean boys
(Reproduced from Korean Industrial Standards Association, 2009b)

(cm)

Part \ Age	7	8	9	10	11	12
Stature	122.0	127.8	133.3	138.0	144.9	150.7
Cervical Height	100.7	106.2	111.3	115.8	122.3	127.9
Waist Height	73.9	78.2	82.3	86.0	91.1	95.3
Crotch Height	54.0	57.3	60.6	63.5	67.5	70.6
Waist Front Length	25.1	26.0	26.8	27.4	28.5	29.2
Interscye, front	23.9	25.0	26.1	27.0	28.4	29.4
Interscye Fold, front	28.6	30.0	31.2	31.9	33.5	34.7
Biacromion Length	30.5	31.7	33.2	34.0	35.7	36.9
Waist Back Length (Natural Indentation)	27.9	29.2	30.3	31.0	32.7	34.0
Waist to Hip Length	14.9	15.6	16.2	16.7	17.5	18.2
Outside Leg Length	74.2	78.6	82.6	86.3	91.4	95.8
Crotch Length (Natural Indentation)	53.0	55.8	58.0	60.1	63.5	66.0
Arm Length	40.5	42.5	44.5	46.5	49.1	51.3
Cervical to Wrist Length	56.5	59.6	62.4	64.9	68.9	71.7
Neck Circumference	27.1	27.9	28.8	29.3	30.4	31.1
Chest Circumference	62.4	65.5	68.7	70.9	75.0	77.0
Waist Circumference (Natural Indentation)	56.1	58.6	61.3	63.0	66.9	67.4
Hip Circumference	64.5	68.1	71.4	74.0	78.1	80.6
Knee Circumference	27.2	28.7	30.0	31.2	33.1	34.3
Thigh Circumference	38.0	40.4	42.6	44.5	47.4	48.6
Waist Circumference (Omphalion)	57.4	60.3	63.2	65.1	69.3	70.1
Minimum Leg Circumference	17.3	18.0	18.7	19.2	20.3	20.9
Upper Arm Circumference	19.2	20.2	21.3	21.9	23.5	23.8
Elbow Circumference	19.6	20.3	21.3	22.0	23.3	23.9
Wrist Circumference	12.7	13.1	13.6	13.8	14.6	14.9
Trunk Circumference	107.6	113.0	117.6	121.1	128.3	132.9
Weight	24.9	28.5	32.3	35.4	41.5	45.2

Korean standard for girls' clothes is described in 'KS K 9403,' and the contents of the standard consists the same as the sizing standard for boys', 'KS K 9402'. The body measurement dimensions are provided according to the clothing types including primary and secondary dimensions of each clothing items. As for girls' body dimension of basic required measurements,

the body dimensions of girls' formal wear are height, bust circumference, waist circumference, and hip circumference. In the case of girl's clothes, bust circumference is used while chest circumference is used for boys' clothes and hip circumference is measured using the 'Buttock Protrusion' as a reference point which amount of protrusion degree of the abdomen is not included as the same as boys' dimension.

The interval of height is 5 cm, and 3 cm of the interval is used for bust, waist and hip circumference in formal wear. However, all intervals of body dimension for the other clothes with generous fit are 5 cm (see Table 5.26).

Table 5.22 Girls' body dimension of basic required measurements
(Reproduced from Korean Industrial Standards Association, 2009c)

Part \ Size	Formal wear (Relevant fit)		Other clothes (Generous fit)	
	Interval	Body dimension	Interval	Body dimension
Height	5	110,115 …, 160	5	110,115 … 160
Chest circumference	3	52,55 … 88,91	5	55, 60 … 80,85
Waist circumference	3	46,49 … 82,85	5	55, 60 … 80,85
Hip circumference	3	55,58 … 94,97	5	55,60 … 90, 95

As to the distribution rates according to clothing items, specific size range for girls clothes are also provided in 'KS K 9403' with the same sequence as boys' clothes in 'KS K 9402,' but the bust circumference is used for specific girls' clothing items. Primary dimensions at the detailed size range of information provide height and bust circumference as the primary dimensions and the range of height is from 110-120 cm to 160-170cm with 10 cm of the interval. Girls' average body measurements according to age from age 7 to 12 are also given in 'KS K 9403' (see Table 5.27).

Table 5.23 Average body measurements of Korean girls
(Reproduced from Korean Industrial Standards Association, 2009c)

(cm)

Part \ Age	7	8	9	10	11	12
Stature	120.5	126.5	131.9	138.4	145.0	150.9
Cervical Height	99.9	10.5.5	110.6	116.5	122.7	128.1
Waist Height	73.3	78.0	81.7	86.7	91.4	95.4
Crotch Height	53.5	57.2	60.3	64.1	67.5	70.3
Waist Front Length	24.2	24.8	25.7	26.8	27.6	28.6
Neck Point to Breast Point	16.5	17.3	18.0	19.0	20.0	21.4
Neck Point to Breast Point to Waistline	28.6	29.4	30.6	32.1	33.3	34.7
Interscye, front	24.0	25.0	25.9	27.1	28.0	29.1
Interscye Fold, front	28.2	29.5	31.0	32.0	33.2	34.7
Bust Point-Bust Point	13.1	13.6	14.2	14.9	15.3	16.0
Biacromion Length	30.9	32.3	33.8	34.8	36.3	37.7
Waist Back Length (Natural Indentation)	27.9	29.0	30.4	31.6	33.0	34.5
Waist to Hip Length	15.8	16.6	17.5	18.5	19.7	20.9
Outside Leg Length	73.5	78.5	82.4	87.2	91.9	96.2
Crotch Length (Natural Indentation)	51.9	54.9	57.1	60.2	62.6	66.3
Arm Length	39.3	41.8	43.6	46.1	48.5	50.8
Cervical to Wrist Length	55.2	58.5	61.4	64.7	68.2	71.4
Neck Base Circumference	29.5	30.5	31.6	32.5	33.4	34.6
Chest Circumference	60.0	63.0	65.7	69.3	71.2	75.1
Bust Circumference	57.9	60.7	63.5	67.0	69.3	73.6
Under bust Circumference	55.0	57.3	59.6	62.0	63.7	66.3
Waist Circumference (Natural Indentation)	53.2	55.5	57.8	60.4	61.2	63.6
Waist Circumference (Omphalion)	55.3	58.1	60.4	63.9	65.0	68.2
Hip Circumference	63.3	66.6	69.6	73.7	76.8	81.9
Thigh Circumference	37.5	39.7	41.7	44.4	45.9	48.7
Knee Circumference	25.9	27.4	28.6	30.3	31.4	32.9
Minimum Leg Circumference	16.4	17.2	17.8	18.6	19.2	20.0
Upper Arm Circumference	18.7	19.6	20.4	21.3	21.8	22.9
Elbow Circumference	18.8	19.7	20.5	21.3	22.1	22.9
Wrist Circumference	12.2	12.5	13.0	13.4	13.9	14.2
Trunk Circumference	106.4	111.4	116.7	121.7	127.3	133.8
Weight	23.3	26.6	29.9	34.5	37.8	43.5

5.4 Comparison of national sizing systems in the UK and Korea

5.4.1 General information

The published years of the British standards related with clothing sizes are BS EN 13402-1, BS EN 13402-2, BS EN 13402-3 were in 2001, 2002, and 2013 respectively. It is found that BS EN 13402-3 was amended in January 2014, but it was not found whether BS EN 13402-2 and BS EN 13402-3 were modified after publication years. Regarding Korean standards, KS A ISO 8599 was published in 2008 and amended in December 2013 while KS K 0052, KS K 9402, and KS K 9403 were published in 2009 and confirmed in December 2014 (see Table 5.28).

As to the reference to body measurements and intervals, BS EN 13402-3 was referenced by EN 13402-2, EN 13402-1:2001, and ISO 3635:1981 while KS A ISO 8599 corresponds with ISP 8559:1989. There are three codes to divide how much Korean standards are followed by the international standards; IDT (Identical), MOD (Modified), NEQ (Non-equivalent), and KS A ISO 8599 is provided with a code IDT.

Table 5.24 Publication and amended years of the British and Korean standards
(Reproduced from British Standards Institution, no date; Korean Industrial Standards Association, no date)

Country	Year	Amended	Name	Detail
UK	2001	-	BS EN 13402-1	Size designation of clothes - Part 1. Terms, definitions and body measurement procedure
	2002	-	BS EN 13402-2	Size designation of clothes - Part 2. Primary and secondary dimensions
	2013	-	BS EN 13402-3	Size designation of clothes - Part3. Body measurements and intervals
Korea	2008	31/12/2013	KS A ISO 8599	Garment Construction and Anthropometric Surveys -Body Dimensions
	2009	30/12/2014	KS K 0052	Sizing Systems for Infant's Garments
	2009	30/12/2014	KS K 9402	Sizing Systems for Boy's Garments
	2009	30/12/2014	KS K 9403	Sizing Systems for Girl's Garments

5.4.2 Body measurements of sizing system

As can be seen in Table 5.29, BS EN 13402-1 and KS A ISO8599 provide a different number of body dimensions in their standards. A total of 13 body measurements are found in the British standard while Korean standard provides 53 of body measurements. In addition, the British standard uses a terminology of girth when Korean standard uses circumference to refer the same part of the dimension.

Table 5.25 Provided body measurement dimensions in the British and Korean standards
(Reproduced from British Standards Institution, 2001; Korean Industrial Standards Association, 2008)

Part	BS EN 13402-1	KS A ISO8599
Girth (UK) / Circumference (Korea)	Head girth, Neck girth, Chest girth, Bust girth, Underbust girth, Waist girth, Hip girth, Hand girth, Foot girth	Head, Neck (male), Neck-base (female), Chest, Bust, Underbust, Waist, Hip, Upper arm, Elbow, Wrist, Hand, Hand, Thigh, Mid-thigh, Knee, Lower knee, Calf, Minimum leg, Ankle
	n=9	**n=20**
Height	Height (subjects other than infants), Height (infants, not yet able to stand upright)	Height, Waist height, hip height, Knee height, Lateral ankle height, Cervical height (sitting), Cervical height, Crotch height,
	n=2	**n=8**
Length	Inside leg length, Arm length (shoulder to wrist)	Vertical: Vertical trunk length, Waist back length, Cervical to popliteal length, Neck point to breast front waist length, Waist to hip length, Crotch length (natural indentation), Upper arm length, Arm length, Cervical-to-waist length, Underarm length, Outside length, Thigh vertical length,
		Horizontal: Shoulder length, Interscye (front), Interscye (back), Foot length, Height (infants, not yet able to stand upright)
	n=2	**n=17**
Other	-	Vertical: Body rise, Scye depth, Cervical to breast point, Neck shoulder point to breast point, Trunk circumference, Armscye circumference,
		Shoulder slope, Body mass
	n=0	**n=8**
Total	**n=13**	**n=53**

5.4.3 Measurement equipment and methods

It is found that both the British and Korean standards use the same measurement equipment for body measurements; a measuring stand, an anthropometer, a somatometer, a tape measure, and a balance.

The measurement methods of the British and Korean standards have considerable similarity. However, a few more reference points are provided in the Korean standard, and some measurement parts are not the same. For example, neck girth is measured 2cm below 'Adam's apple' which is 'Inferior thyroid' (see Table 4.21) in the UK when Korean standard does not specify the exact amount of measurements position. As to the chest girth, both countries measured the horizontal circumference across the chest, but Korean standard specifies that it is crossed the chest nipples. Regarding the hip girth, horizontal circumference at the maximum level of the hip are measured in both the UK and Korea, but Korean standard provides lateral trochanteric projections (thigh protuberance) as the detailed reference point (see Table 5.30).

Table 5.30 Body measurement methods in the British and Korean standards
(Reproduced from British Standards Institution, 2001; Korean Industrial Standards Association, 2008)

Name	BS EN 13402-1	KS A ISO8599
Height (Subjects other than infants)	Vertical distance between the crown of the head and the soles of the feet, measured with the subject standing erect without shoes and with the feet together	The vertical distance between the crown of the head and the ground, measured using the measuring stand (anthropometer), with the subject standing upright without shoes and with the feet together
Neck Girth	Girth of the neck measured with the tape measure passed 2cm below the Adam's apple and at the level of the 7th cervical vertebra	The girth of the neck measured using the tape-measure passed round below the Adam's apple and at the level of the 7th cervical vertebra
Chest Girth	Maximum horizontal girth measured during normal breathing with the subject standing erect and the tape-measure pass over the shoulder blades (scapulae), under the armpits (axillae), and across the chest	The maximum horizontal girth measured during normal breathing with the subject standing upright and the tape-measure passed over the shoulder blades (scapulae), under the armpits (axillae), and across the chest nipples

Waist Girth	Girth of the natural waistline between the top of the hip bones (iliac crest) and the lower ribs, measured with the subject breathing normally and standing erect with the abdomen	The girth of the natural waistline between the top of the hip bones (iliac crests) and the lower ribs, measured with the subject breathing normally and standing upright with the abdomen relaxed
Hip Girth	Horizontal girth measured round the buttocks at the level of maximum circumference	The horizontal girth measured round the buttocks at the level of the greatest lateral trochanteric projections, with the subject standing upright
Arm length (Shoulder to Wrist)	Distance, measured using the tape measure, from the armscye/ shoulder line intersection (acromion), over the elbow, to the far end of the prominent wrist bone (ulna), with the subject's right first clenched and placed on the hip, and with the arm bent at 90 degree	The distance, measured using the tape measure, from the armscye/shoulder line intersection (acromion), over the elbow, to the far end of the prominent wrist bone (ulna), with the subject's right fist clenched and placed on the hip, and with the arm bent at 90°

5.4.4 Key dimensions according to clothing types in the British and Korean standards

As can be seen in Table 5.31, the key dimensions which are designated as primary and secondary dimensions between the UK and Korea are comparable with their usage for each clothing item. Table 5.30 shows most of the clothing items in the British and Korean standard except for underwear. Infants' clothing is sized by height in both the British and Korean standards. As for Korean standards, there is a division of formal wear and casual wear whether relevant clothes fit is required or not in Korean standard, and formal wear for Korean boys have height and chest girth while Korean girls have bust girth and also height as key dimensions. However, clothing item division based on clothing ease amount line like the Korean standard is not found in the British standard, and both top and bottom of boys and girls have height with chest and bust respectively.

Table 5.31 Key dimensions in the British and Korean standards
(Reproduced from British Standards Institution, 2002, 2013; Korean Industrial Standards Association, 2009a, 2009b, 2009c)

Country	Item	Height	Chest girth	Bust girth	Waist girth	Hip girth	Neck girth
British Standard	Infants' clothing	○					
	Boys' top	○	○			○	
	Boys' shirts	○					○
	Boys' bottom	○			○		
	Girls' top	○		○			
	Girls' bottom	○			○		
Korean standard	Infants' clothing	○					
	Boys' formal wear - top	○	○				
	Boys' formal wear - bottom	○			○		
	Girls' formal wear - top	○		○			
	Girls' formal wear - bottom	○			○		
	Boys' and girls' casual wear top and bottom including almost all items	○					

5.4.5 Size classification

The British standard provides three age groups which are infants', boys', and girls' for the clothing size classification, but age is not used to define the infants and children. However, Korean standard has more particular gender and age divisions which are infants (3 months-6 years), boys and girls (7-12 years), young males and females (12-18 years).

As for the infants' height range, the British standard starts and finishes at the smaller height than Korean standard. It is found that the Korean standard has more subdivided gender groups such as boys and young males while the British standard is provided only boys and girls with a larger range of height. The boys and girls age range are from age 7 to 12, and young males and females are from age 12 to 18. The girls and young females' height is found smaller than boys and young males in the Korean standard when the British standard use the same range of height for all genders (see Table 5.32).

Table 5.26 Size classification in the British and Korean standards
(Reproduced from British Standards Institution, 2002, 2013; Korean Industrial Standards Association, 2009a, 2009b, 2009c, 2014a, 2014b)

Country	Age groups	Age	Range of Height
British Standard	Infants	-	44-116 cm
	Boys	-	122-188 cm
	Girls	-	122-188 cm
Korean standard	Infants	3 months - 6 years	55-125 cm
	Boys	7-12 years	115-175 cm
	Girls		110-160 cm
	Young males	12-18 years	135-185 cm
	Young females		140-170 cm

5.5 Summary

In this chapter, the national sizing standards in the UK and Korea were analysed. Firstly, British Standards and Korean Industrial Standards related to infants and children's clothing were selected, and the fundamental information of each standard was investigated. The details of the examinations were body measurements provided in the sizing standards, primary and secondary dimensions, sizes and interval of body dimensions for infants and children's clothing in both countries. Next, the comparisons with deeper and critical points of view between two countries' standards were conducted. In short, the selected British Standards were published before the Korean Standards, and Korean Standards specified when they were amended. The number of provided body measurement dimensions in British Standards (BS) was less than Korean Standards (KS) (n=13 and n=53 respectively). The body measurements method of two standards were relatively similar, but a few more reference points were provided in the Korean Standards. As for the provided key dimensions according to clothing types, Korean Standards provided more detailed clothing types such as formal and casual wear divisions than the British Standards. However, both standards have height and chest (bust) circumference as the key standards with the additional waist, hip, neck circumferences. When size classifications were investigated, the specified age groups for the body measurements range were only shown in the Korean Standards, and Korean Standards had subdivided boys and girls age divisions which are young males and females. The range of height for each age group was different between British and Korean Standards; infants (44-116 cm in BS and 55-125 cm in KS), Boys

(122-188 cm in BS and 115-185 cm in KS), Girls (122-188 cm in BS and 110-170cm in KS).

Overall, it was found that the British Standards and Korean Standards in infants and children's clothing have some differences even though the two standards were based on the International Standards. It is inferred that both countries revised the International Standards to be applied to the actual circumstances because following the International Standards is voluntary. However, provided information's detail in each countries' standards should be consistent to prevent the confusion of industry and customers.

In the next chapter, infants and children's size charts which retailers currently use in the UK and Korea will be reviewed. It shows how the clothing industry adapts the national sizing survey data and sizing standards including the investigation of the construction characteristics and its classification.

Chapter 6. Brand size charts in the UK and Korea

As outlined in the previous chapters, 4 and 5, national sizing survey and size standard in the UK and Korea had considerable differences. This chapter investigates the brand size charts which were used in the current children's wear market in the UK and Korea (Section 6.1 and 6.2). Children's wear size charts in both countries were investigated, then the comparison included general information, size chart division methods, and body dimensions were conducted (Section 6.3).

The targeted number of collected size charts were 100 in the UK and the same in Korea. Web pages of children's clothing brands in the two countries were accessed to collect size charts data. All collected brands' size charts in both countries were arranged with the alphabetical and numerical order individually, and final chosen brands for comparison were shown in Appendix A.

6.1 Infants and children's wear size charts in the UK

A total of 103 clothing size charts among the infants and children's clothing brands in the UK were collected via online. From the collected brand charts, some brands were not able to be analysed either because they did not provide the size charts or they only provided the age as a reference of the size. After the data elimination process, 87 brand charts were used for the UK size charts' analysis.

The starting point of all sizing charts was premature baby (P), then new born (N) and it ends at age 17. Among the 87 brands, the highest coverage of age were ages five, six, and eight (n=76) and four, seven, nine, and ten (n=73) were followed. In general, it was found that selected brands from the UK were mostly targeted to the age range of four to ten (see Figure 6.1).

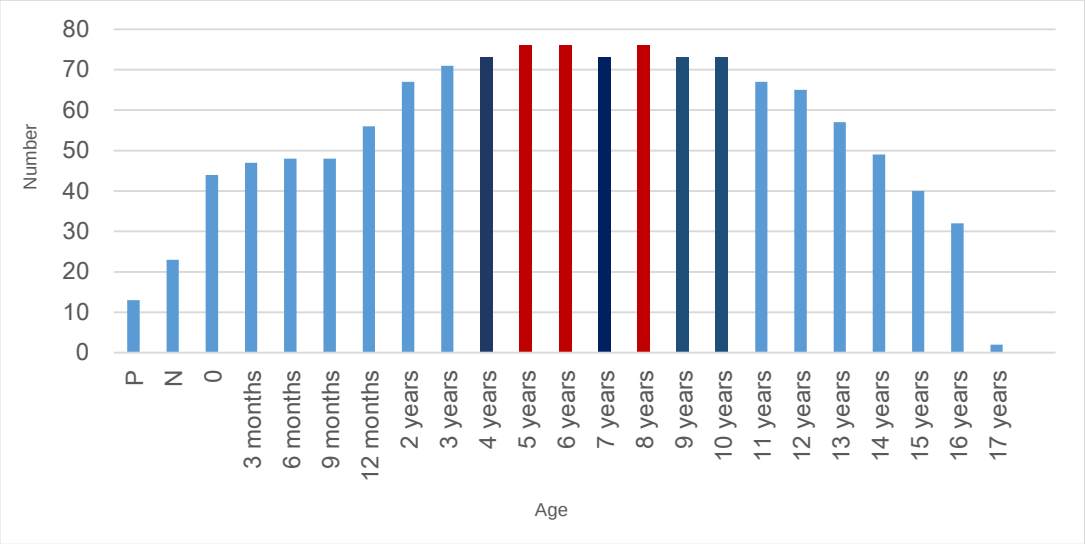


Figure 6.1 Age coverage of selected size charts in the UK

6.1.1 Construction consideration of the size charts

The components of the size charts were targeted for age and main body dimensions. The table of the size charts can be constructed by a combination of age and corresponding body dimensions.

All size charts could be divided according to the use of the range at their age and size. The terminology for designating body dimension range was ‘Dual size’ or ‘Double size’ and ‘Single size’ was used if they did not provide the range of body dimension. It was found that there were only three brands (B9’, ‘N61’, and ‘N62’) which specified the terminology of dual size and terminology of double sizing were used at the ‘M59’ and ‘T81’.

Therefore, the size charts could be classified as ‘No range age – Single size’, No range age – Dual size’, ‘Range age – Single size’, ‘Range age – Dual size’ and this classification was based whether age and size measurements had the range or not. Age five is given an example in Table 6.1. Age five which does not have a range is single size with the size of height (115 cm), chest (62 cm), waist (57 cm), and hip (64 cm) but the same age five also has a dual size of height, chest, waist and hip such as 107-113 cm of height, 59-61 cm of chest, 56-58 cm of waist, and 63-65 cm of hip. This range of body dimension was also adjusted to age with a range such as 4-5 years.

Table 6.1 Examples of size charts division (Age 5)

(cm)

Type of size chart	Age	Height	Chest	Waist	Hip
No range age – Single size	5 years	115	62	57	64
No range age – Dual size	5 years	107-113	59-61	56-58	63-65
Range age – Single size	4-5 years	110	58	55	64
Range age – Dual size	4-5 years	104-110	57-59	55-57	62-65

6.1.2 Basic size measurement information of size charts

The dimensions of body parts found from the collected size charts in the UK were height, chest, waist, hip and a few other dimensions. Some of the brand charts included head girth and foot length, but these were excluded due to aiming for only main body parts in this research.

These dimensions were used solely or conjointly with the size charts and the specific classification to divide into primary and secondary dimensions was not found. As Aldrich (2009) mentioned, the use of the standard by manufacturers is not compulsory even though there have been trials in the UK and Europe to acquire a more consistent sizing system and garment manufacturers and retailers still give less information.

Figure 6.2 shows 34 brands provided the dimensions of the combination of height, chest, and waist' (H-C-W)' which was similarly followed with having 30 of height, chest, waist and hip's combination (H-C-W-H). These two types of size charts occupied around 70% of the collected size charts.

15 brands used the combination size charts with height and chest dimensions (H-C) and seven brands provided only the height dimension (H). The number of brands providing only chest dimension (C)'s charts was three and the combination of 'chest, waist and hip' (C-W-H) were two (see Figure 6.2). Only one brand used the combination of 'chest-waist' (C-W) and around 6 % of brands did not give height dimension even though it was designated as a primary dimension in the British standard.

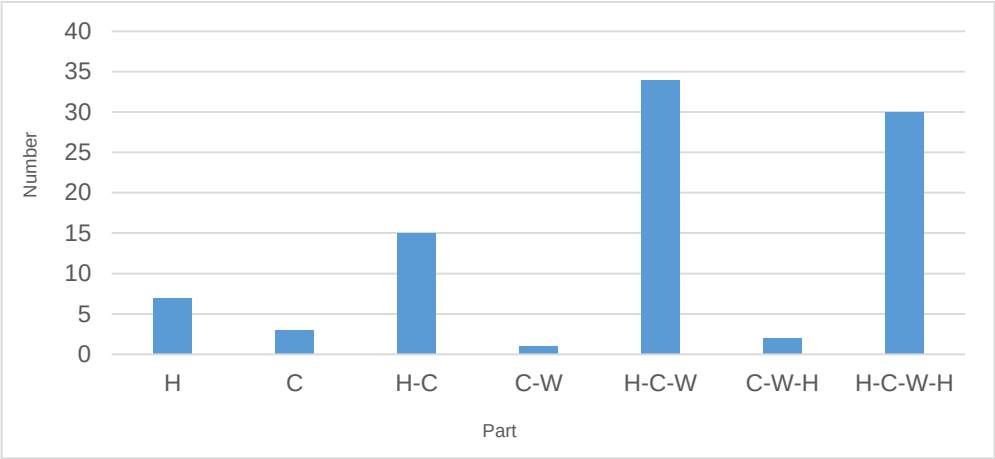


Figure 6.2 Body dimensions in the size charts in the UK (1)

Except for the combination of using height, chest, waist and hip and using alone, eight of other body dimensions were found as additional information for customers; ‘Inside leg’, ‘Out leg’, ‘Sleeve length’, ‘Collar’, ‘Top (front body) length’, ‘Neck point to Wrist’, and ‘Seat’ (see Figure 6.3).

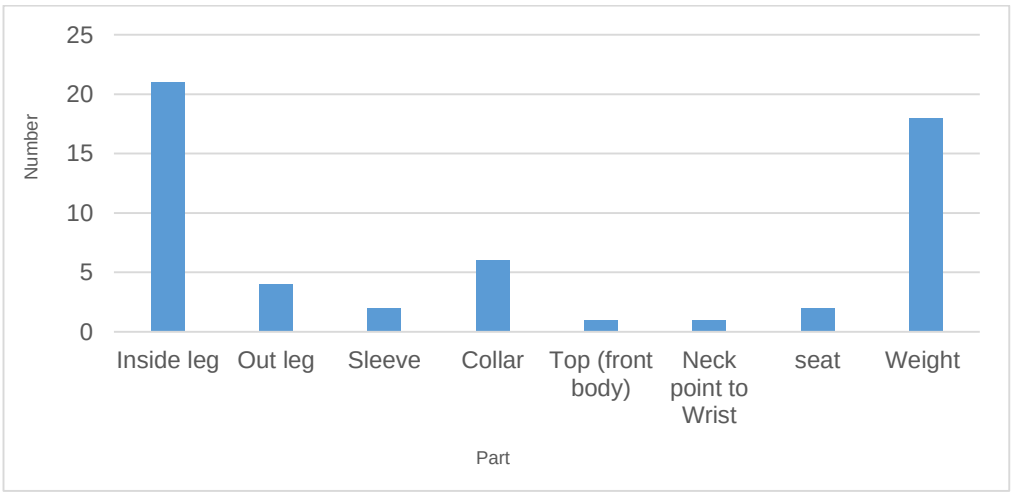


Figure 6.3 Body dimensions in the size charts in the UK (2)

As can be seen in Figure 6.3, the dimension of the ‘Inside leg’ was found at most except for height, chest, waist, and hip measurements having a total of 21 brands. There were two brands of ‘Inseam’ designated the meaning of inside leg even though the two definitions are different on the standard (Chapter 4, p.92 Table 4.19). In particular, the company named ‘J40’ had two subdivided measurements for the inside leg length; ‘Regular’ and ‘Long’ legs having 5 cm size difference. Four brands used ‘Out leg length’ in their size charts and one brand additionally described as ‘Out leg length’ was ‘Waist to floor’. The size chart of ‘A1’ provided a different length for the

outside legs which were ‘Standard’ outside leg and ‘Longer’ outside leg with 3 cm difference. When the brands provide out leg length, the inside leg length was not given in the size charts but ‘B9’ and ‘T76’ provided for the ‘Shorter length’ and ‘Longer length’ as well as having inside leg length.

The collar size measurement was shown in the six brands’ size charts. Collar size was only provided for boys’ size charts, and it was inferred that neck dimension is the secondary dimension for the boys’ shirt. The other body measurements which were found in the size charts were sleeve length and seat (n=2) and the size measurement of the seat can be predicted as the sitting height. One of the brands gave the information of the top (front body) length and this size could be understood as the length of lateral neck to waist. According to the, the bespoke tailoring shop in Australia which is named ‘InStitchu’ described the measurement of the front length as “Place the tape measure at the highest point of the shoulder, where the shirt joins the neck seam and then take the tape measure right down the front of your body to the desired length” (InStitchu, no date).

The number of brands which provided weight measurement were 21 in the UK (see Table 6.2). 21 brands were mainly targeted to the infants or broadly targeted mostly to aged children from infants to teenagers. ‘NB’, ‘TB’, and ‘P’ are shorten from ‘Newborn’, ‘Tiny’ and ‘Petit’ baby. In addition, ‘m’ and ‘y’ were designated ‘month’ and ‘year’ respectively.

The age ranges having weight measurement shaded dark grey followed with the total age range with a light grey shade of the size charts are shown in Table 6.2. The age of weight measurement information started the same as the age where their size charts started, but the age to be finished were considerably different. Most of the size charts with weight measurements were covered from the age of newborn to children aged seven to 16 with the exclusion of the brand of ‘E23’ which only focused on very early aged infants. Their targeted age was from tiny baby to three months, and they provide weight measurements for the whole range of their sizes. Another exceptional case was ‘M56’ because they only provide the weight measurement from tiny baby to newborn even though their targeted age range was from premature baby to age of 16.

A total of eight brands’ size charts provided the most age ranges from premature baby up to the age of 16. In regard to only these brands, the weight measurement was given for 12 months to 3 years (see Table 6.2). However, a total of 21 brands which provided weight information, the number of brands with the latest age for providing weight measurement were

followed; up to new born (n=1), 3 months (n=1), 9 months (n=1) , 12 months (n=5), 18 months (n=2), 2 years (n=7), 3 years (n=2), and 6 years (n=2). In general, around 33% of brands gave weight information until 2 years of age similarly following by 12 months (23.8%).

Table 6.2 Brands with weight measurement and range in the UK

No.	Name	Range	Range with Weight	Month(s)							Years														
				P	N	0	3	6	9	12	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	A1	NB - 10 y	Small new born to 18-24 m																						
2	B12	0 m – 12 y	0-3 m to 18-24 m																						
3	B13	0 m – 5 y	0-3 m to 2-3 y																						
4	D19	TB - 16 y	Tiny baby to 18-24 m																						
5	E23	TB – 3 m	Tiny baby - 3 m																						
6	F24	P – 16 y	Tiny baby - 12-18 m																						
7	G29	P – 16 y	Premature to 18-24 m																						
8	H35	0 m – 2 y	0-3 m to 6-12 m																						
9	H37	3 m – 10 y	3 m to 18 m																						
10	J42	P – 16 y	Tiny baby to 18-24 m																						
11	L44	NB - 7 y	Newborn to 9-12 m																						
12	L45	3 m – 2 y	0-3 m to 18-24 m																						
13	M53	P – 16 y	Tiny baby to 24-36 m																						
14	M54	P – 6 y	Premature to 5- 6 y																						
15	M56	TB - 16 y	Tiny baby to Newborn																						
16	M60	P – 8 y	Premature (3lb) to 9-12 m																						
17	N62	P – 16 y	5 LBS to 9-12 m																						
18	P66	6 m - 14 y	6-9 m to 5-6 y																						
19	R70	NB – 11 y	Newborn to 9 m																						
20	V84	NB - 16 y	Newborn to 18-24 m																						
21	Z87	0 m – 10 y	0-1 m to 18-24 m																						

6.1.3 Type of size charts in the UK

6.1.3.1 Size chart division by age

A total of 36 size charts providing age division with the designation of the size range were collected from the 87 size charts. It was found that around 41.4 % of brands provided the size charts with age classification and the highly recorded case was having two age groups such as division of infant and toddlers (n=23). The size charts which were divided into three types of age group such as ‘Newborn – Baby – Older boys’ (N62) were occupied around 30.6% (n=11) and only two brands classified their size charts into four types of age group (ex. Newborn – Baby – Junior – Teen: M57).

The terminology for dividing age group ranges was varied at the size charts in the UK. All terminology for age designation were found to be; ‘Newborn’, ‘Tiny baby’, ‘Infant’, ‘Baby’, ‘Mini’, ‘Preschool’, ‘Kids’, ‘Toddler’, ‘Junior’, ‘Older’, ‘Boys and Girls’, and ‘Teen (Teenagers)’. Overall, The terminology of age division in the selected size charts was divided into mainly four types in order of age; ‘Newborn’ – ‘Infant/ Baby’ – ‘Boys and Girls’ – ‘Teenagers’ (see Table 6.3).

In regard to ‘Newborn’, both baby and newborn were used to denote this age range covered from premature baby having less developed weight to maximum 24 months except for ‘Z87’ having the terminology of ‘Mini’ with the range of 0-1 month to 9-12 months.

The mostly used terminology for the age to be designated the next physical stage was ‘Baby’ (n =24). Three brands used ‘Infant’ and four brands named toddlers and boys and girls even though the age range was younger or similar with the other brands’ baby. Only one brand (N61) used ‘Preschool’ with the range of 6-9 months to 2-3 years. The age range of baby was much broad than infant which covered from newborn to 7 years. However, most of the brands’ baby age started from a tiny baby, newborn or 0 month to 24 months or 3 years. Only five brands provided their age range of the baby until 5-6 years or 6-7 years.

‘Boy and Girl / Boys’ and Girls’ were found the most at the next age range of the size charts (n=20). Next was ‘Kids’ (n=5) following with ‘Junior’ (n=3), ‘Older’ (n=2) and ‘Toddler’ (n=2). The age of boys and girls in the collected size charts were from 1 year to the maximum age of 16 years with a much wider range than their baby’s age range. Likewise, the age overlapped usage between newborn and baby, the older age of the infant was also repeated at the earlier age of boys and girls. For example, the baby size of

‘B12’ was 0 month to 4 years but their boys’ and girls’ was 2 years to 12 years. Except for example within one brand, the divisions of the age range of each brand was found uncertain and different. The last age stage of the children’s wear was designated as ‘Teenager’, but only six brands had this age range after boys and girls with the range of 3-4 years to 16 years.

In general, all age divisions did not clearly correspond with each other, and the age range was also different respectively. For example, the age range of baby of ‘P65’ was 1 month to 3 years but ‘C15’ designated their baby’s age range as 0-3 months to 18 months which was younger than the age group of ‘P65’. In addition, some age ranges overlapped between the age groups. ‘M53’ divided their size charts as ‘Baby -Boys and Girls’ and the age range of baby (premature baby to 24-36 months) overlapped the boys and girls (1 year ~ 15-6 years).

It is found that the terminology of ‘Infant’ was used to define older age than a Concise Medical Dictionary and a Dictionary of Public Health defines the age of infant which is the age between birth and one year of age.

Overall, the terminology which is designated a certain age group between infants and child was various in the size charts. In addition, the age range of each terminology was also different, and it referred that the united terms and size range for every clothing manufacturing companies were required.

Table 6.3 Age group denoting and division

	Whole age	Terminology	Age range	Terminology	Age range	Terminology	Age range	Terminology	Age range
A1	NB - 10 y	-	-	Baby	0-3 m - 18-24 m	Boys and girls	2 y - 10 y	-	-
A3	3m – 13y	-	-	Baby	0-3 m - 12-18 m	Kids	1-2 y to 12-13 y	-	-
A4	2y – 16y	-	-	Infant	2 y - 5-6 y	Boys and girls	7-8 y to 15-16 y	-	-
B8	0 y - 16 y	Baby	0-1- m to 9 m	Toddler	9 m - 4-5 y	Kids & Teen	6-7 y to 11-12 y	-	-
B10	NB - 16 y	-	-	Baby	NB - 2 y	Girl	2 y to 16 y	-	-
B11	0m – 6y	-	-	Baby	0-6 m to 12-18 m	Kids	1-2 y to 5-6 y	-	-
B12	0m – 12y	-	-	Baby	0 - 4 y	Boys and girls	2 y - 12 y	Boys and girls	5 y - 12 y
C15	0 m - 16 y	-	-	Baby	0-3 m to 18 m	Juniors	2 y to 7-8 y	Teenagers	9-10 y to 16 y
D19	TB - 16 y	-	-	Baby & toddler	TB to 6 y	Boys and Girls	4 y to 16 y	-	-
D21	NB - 16 y	-	-	Baby	NB to 2 y	Boys and Girls	2 y to 15-16 y	-	-
F25	0m – 13m	-	-	Baby	0-3 m to 18 m	Kids	1-2 y to 12-13 y	-	-
G29	P – 16y	-	-	Baby	PB to 18-24 m	Boys and Girls	6-9 m to 15-16 y	-	-
G30	P- 14 y	-	-	Baby	NB to 2 y	Junior	2 y to 6 y	Teen	3-4 y to 13-14 y
H31	0m – 14y	-	-	Boy and Girl	0 m to 18-24 m	Boy and Girl	1½ y to 14+ y	-	-
H38	NB - 16 y	-	-	Baby	NB to 2 y	Boys	2 y to 15-16 y	-	-
J42	P – 16y	-	-	Baby	TB to 18-24 m	Boys and Girls	2 y to 16 y	-	-
L44	NB - 7 y	-	-	Babywear	NB to 18-24 m	Toddlers	1-1½ to 6-7 y	-	-
L48	0m – 8y	-	-	Baby	0-3 m to 18-24 m	Kids	1-2 y to 7-8 y	-	-
L49	0m – 12y	-	-	Baby	0-3 m to 18-24 m	Boy and Girl	3 y to 11-12 y	-	-
L50	NB - 16 y	-	-	Baby	NB to 2 y	Boys and Girls	2 y to 15-16 y	-	-
M53	P – 16y	-	-	Baby	TB to 24-36 m	Boys and Girls	1 y to 15-16 y	-	-
M56	TB - 16 y	-	-	Infant	TB to 3-4 y	Boys Girls	3 y to 16 y	-	-
M57	0m - 16 y	Newborn	0-1 m to 12 m	Baby	3 m to 24 m	Junior	2 y to 9 y	Teen	8 y to 16 y
M59	3m – 13 y	-	-	Baby	0-3 m to 2-3 y	Older boy and girls	3 y to 10 y	Girl and Teen	8 y to 15 y
M60	P – 8y	PM/ Newborn	3lb to 9-12 m	Baby	3-6 m to 2-3 y	Boys and Girls	12-18 m to 7-8 y	-	-
N61	0m – 12y	Newborn	0-1 m to 6-9 m	Preschool	6-9 m to 2-3 y	Older	3-4 y to 11-12 y	-	-
N62	P – 16y	Newborn	5 lbs to 9-12 m	Baby	12-18 m to 5-6 y	Older boys	3 y to 16 y	-	-
N63	3 y - 15 y	-	-	-	-	Boys and Girls	3-4 y to 6-7 y	Boys/ girls	8-10 y to 14-15 y
P65	0m – 16y	-	-	Baby	1 m to 3 y	Boys and Girls	2 y to 16 y	-	-
P67	0m – 2y	-	-	Baby	0-1 m to 18-24 m	Kids	2-3 y to 11-12 y	-	-
R70	NB - 11y	Baby	NB to 6 m	Infant	6 m to 18-24 m	Toddler Boys	18-24 m to 6 y	-	-
T77	N – 16y	-	-	Baby	NB to 2 y	Boys and Girls	2 y to 15-16 y	-	-
T80	0 m - 16 y	Baby	0-3 m to 18-24 m	Toddler	1 y to 7 y	Boys and Girls	4 y to 16 y	-	-
T81	5lb - 16 y	-	-	Unisex	0-7 y	Boys and Girls	8 y to 16 y	-	-
V84	NB - 16 y	Baby	NB to 18-24 m	Toddler	12-18 m to 6-7 y	Boys and Girls	5 y to 16 y	-	-
Z87	0m – 10y	Mini	0-1 m to 9-12 m	Baby	3-6 m to 3-4 y	Boy and Girl	4 y to 13-14 y	-	-

6.1.3.2 Size chart division by gender

The number of size charts which had separate boys' and girls' size charts was 35 (40.2%) among the 87 selected size charts in the UK. It varied which age was on the basis of gender division at the chosen size charts, and the reference age started from the one year to 14 years. However, age eight was used the most remarkably (n=9), following at age seven as the second (n=5) (see Figure 6.4). It was found that the ages seven and eight were used by around 40% of the selected brands. The highly used age of the gender division reference point (age eight) corresponded with the same age of 'Fit form' by Alvanon co. Their dress form by Shape GB data started at the age of four which is called 'Toddler 4T', and the unisex range of the 'Boy/Girl' covers age's five to seven.

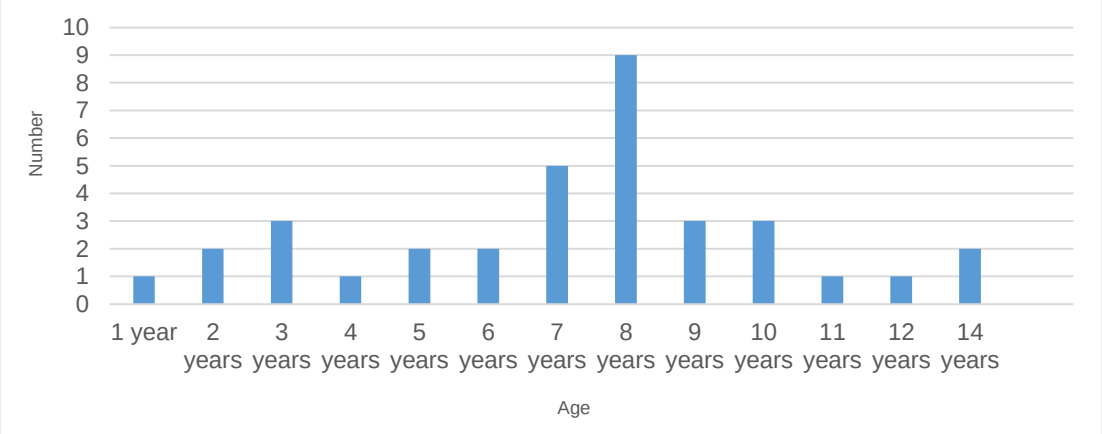


Figure 6.4 Reference age of gender division

Table 6.4 shows the list of all brands with the whole age range and specific reference age of gender division. These brands had different gender size charts and different body measurement according to the same body parts between boys and girls. Their age boundaries where the body size differences varied as mentioned above (see Figure 6.4). The most brands (n=20) in Table 6.4 covered up to the age of 16, and it was found that the brands which had the broad of target market generally provided separate boys and girls size charts regardless of the starting age range.

Four brands (B9, C14, F24, and Z86) provided the gender divided size charts separately. However their size measurements were the same between boys and girls when these dimensions were compared.

Table 6.4 Whole age range and the gender reference age

(m=month, y=year)

No.	Code	Whole age	Division	No.	Code	Whole age	Division
1	A1	NB - 10 y	2 y	19	L50	NB - 16 y	3 y
2	A4	2y - 16y	7 - 8 y	20	M53	P - 16y	8 - 9 y
3	B7	2y - 16y	5 - 6 y	21	M55	3y - 14y	7 - 8 y
4	B9	1y - 16 y	-	22	M56	TB - 16 y	7 y
5	C14	6y - 14y	-	23	M59	3m - 13 y	10 y
6	C16	2 y - 15 y	6 - 7 y	24	N62	P - 16y	8 y
7	D19	TB - 16 y	8 y	25	P66	6 m - 14 y	9 - 10 y
8	D20	1 y - 16 y	11 - 12 y	26	R70	NB - 11y	8 y
9	D21	NB - 16 y	3 y	27	S72	3 y - 16 y	4 y
10	F24	P - 16y	-	28	S73	8 y - 13 y	8 - 9 y
11	F27	1 y - 15 y	6 - 7 y	29	T76	3 y - 16 y	5 y
12	G29	P - 16y	7 - 8 y	30	T77	N - 16y	9 y
13	H32	2y - 16y	8 y	31	T79	12m - 13y	1-2 y
14	H38	NB - 16 y	3 y	32	T80	0 m - 16 y	8 y
15	J40	8y - 16y	13 - 14 y	33	T81	5lb - 16 y	8 y
16	J42	P - 16y	5 y	34	Z86	1 y - 17 y	-
17	L43	6y - 16 y +	7 y	35	Z87	0m - 10y	13 - 14 y
18	L49	0m - 12y	9-10 y				

6.1.3.3 Size chart division by clothing type

Most of the brands only provided their size charts which were divided by age and gender not depending on items (clothing type). However, the ‘B11’ had separated size charts for ‘Kids’ T-shirts’ and ‘Girls dress’ which had the size differences at the chest and length (see Table 6.5). The chest sizes of the ‘Kids T-Shirts’ were bigger than ‘Girl’s Dress’ from 2 cm to 8 cm, and these amounts were increased gradually followed by age. This size difference was shown in the gender differences and clothing type. However the smaller chest for only girls dress can be interpreted that dress for girls did not require plenty of ease or the customers might prefer the fitted clothes for girls’ dress.

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Table 6.5 Chest size of different clothing type

Size / Difference	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years
Kids T-Shirts	54 cm	58 cm	62 cm	64 cm	68 cm
Girls Dress	52 cm	54 cm	56 cm	58 cm	60 cm
Differences	2 cm	4 cm	6 cm	6 cm	8 cm

Table 6.6 shows that brand ‘A5’ size differences of the chest and front body length between a girl’s jersey and knitted dress and a woven dress. Garments made from stretch fabrics such as jersey and knit provide smaller size dimensions of their chest and front body length size charts than garments made with woven fabric. The size difference was from 1 to 1.5 cm at the chest and 3 cm at the front body length.

Table 6.6 Size differences between fabrics

Type/ part / Age	Jersey and Knit		Woven	
	Chest	Front Body Length	Chest	Front Body Length
3 - 4 years	31 cm	56 cm	32 cm	59 cm
5 - 6 years	34 cm	61 cm	35 cm	64 cm
7 - 8 years	36 cm	65 cm	37 cm	68 cm
9 - 10 years	39 cm	68 cm	40.5 cm	71 cm

The brand ‘M53’ had a separate trousers chart having different lengths which are named ‘Standard’, ‘Short’ and ‘Long’ (see Table 6.7). The size

interval from standard into the short and long was equally 4 cm from the age of 3 to 10 but the length became shorter having 6 cm difference from the standard at the age of 11 and 12 when the range of long kept the same amount of 4 cm. However, 5 cm was adapted to lengthen and shorten the size of both ages 13 and 14. At the age of 15, the standard length of trousers was 76 cm while the short-range had 72 cm of which 4 cm was subtracted from the standard and long range was added 6 cm at their length which was 82 cm.

Table 6.7 Size difference between different lengths of trousers chart

(cm)

Age / cm	3	4	5	6	7	8	9	10	11	12	13	14	15
Standard	39	43	48	51	54	57	60	63	67	70	72	75	76
Short	35	39	44	47	50	53	56	59	61	64	67	70	72
Difference	4	4	4	4	4	4	4	4	6	6	5	5	4
Long	43	47	52	55	58	61	64	67	71	74	77	80	82
Difference	4	4	4	4	4	4	4	4	4	4	5	5	6

6.1.3.4 Size chart division by fitting or ease (wider size)

There were three brands (‘B11’, ‘H31’, and ‘B9’) which provided additional size range measurements at the same age sizes and it had a unique name only for denoting that the smaller or bigger size. The brand ‘B11’ provided the ‘Girls Super Skinny’ size which had a smaller chest and the chest size differences are shown in Table 6.8. The difference of chest between ‘Girls Dress’ and ‘Girls Super Skinny’ was 8 cm at the age of 1-2 years, but it decreased gradually until the age of 5-6 years to 2 cm. The girl’s super skinny range might be provided to the infants and children who are not growing at the same speed as the average children.

Table 6.8 Chest size differences in the size chart of ‘B11’

Chest	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years
Girls Dress	52 cm	54 cm	56 cm	58 cm	60 cm
Girls Super Skinny	44 cm	48 cm	50 cm	54 cm	58 cm
Differences	**8 cm**	**6 cm**	**6 cm**	**4 cm**	**2 cm**

The brand ‘H31’ had an additional range which was called ‘Generous Fit’ for both boys and girls and they designated the name ‘X size’ (see Table 6.9). This size was described as ‘the same length but wider’, but the difference of size dimension was only shown at the waist.

The amounts of difference at the waist were 6 cm from the ages of 5-6 to 9-10 but it decreased to 5.5 cm from 10-11 to 14+ years old. The interesting point was that waist was chosen as the grading reference part for increasing the size range even though the primary body parts of children’s wear are height and chest on the British standard.

Table 6.9 Size Differences of ‘H31’

(Height (inch), Chest and Waist (cm))

Age		5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14+
EUR Size		116	122	128	134	140	146	152	158	164	170
Boy/ Girl	Height	46	48	50	53	55	57	60	62	65	68
	Chest	58	61	64	67	70	73	76	79	82	85
	Waist	55	56.5	58	59.5	61-61.5	62.5-63.5	64-65.5	65.5-67.5	67-69.5	68.5-72
Boy/ Girl X	Height	46x	48x	50x	53x	55x	57x	60x	62x	65x	68x
	Waist	61	62.5	64	65.5	67	68.5-69	70-71	71.5-73	73-75	74.5-77.5

Table 6.10 shows the size differences for the brand ‘B9’ between the original size chart and the size chart named ‘Generous Fit’ at the age of seven. The ‘B9’ described their generous fit as ‘garments have more room around the chest, waist, hips and thighs, and is approximately 30% bigger than the standard range’.

Table 6.10 Size Difference between standard and generous size of ‘B9’

Part / Difference	Height	Chest	Waist	Inside Leg	Collar
Boy and Girl	122 cm	61 cm	55 cm	55 cm	29 cm
Boy and Girl Generous	122 cm	76 cm	70 cm	55 cm	31 cm
Difference	-	15 cm	15 cm	-	2 cm

There was only one brand which provided the size charts which had both a smaller and wider waist and hip which were named as ‘Slim-Fit’ and ‘Plus-Fit’ (‘N62’) (see Table 6.11). Boys in their size chart had slim-fit and plus-fit waist’s dimensions, but hip dimensions of 'slim-fit and plus fit were added into the girls’ size charts. The size intervals of ‘slim-fit waist – waist – plus-fit waist’ were 5 cm both boys and girls except for the amount of interval of boys’ plus-fit waist having 6 cm age of 15 and 7 cm age 16. Body measurements intervals according to age were all 2 cm except for the plus-fit waist from the age of 15 to 16 with 3 cm intervals in the boys’ chart. Ages from 10 to 13 had 1 cm increases and decreasing into the plus-fit and slim-fit size range and intervals of the other ages were 2 cm for the girls’ chart.

Table 6.11 Size Difference between the different ranges at the ‘N62’

Years	Older boys			Older girls		
	Waist	Slim-Fit Waist	Plus-Fit Waist	Waist	Slim-Fit Waist	Plus-Fit Waist
8	60 cm	55 cm	65 cm	59 cm	54 cm	64 cm
9	62 cm	57 cm	67 cm	61 cm	56 cm	66 cm
10	64 cm	59 cm	69 cm	62 cm	57 cm	67 cm
11	66 cm	61 cm	71 cm	63 cm	58 cm	68 cm
12	68 cm	63 cm	73 cm	64 cm	59 cm	69 cm
13	70 cm	65 cm	75 cm	65 cm	60 cm	70 cm
14	72 cm	67 cm	77 cm	67 cm	62 cm	72 cm
15	**74 cm**	**69 cm**	**80 cm**	69 cm	64 cm	74 cm
16	**76 cm**	**71 cm**	**83 cm**	71 cm	66 cm	76 cm

In regard to the girls’ hip in the size chart of ‘N62’, the size intervals between items from slim-fit hip to hip and from hip to plus-fit hip were 5 cm with the exception of the age 13 (see Table 6.12). 3 cm was subtracted when the size of hip went to slim-fit hip, and there was 7 cm of growth shown to alter plus-fit hip size at the 13 years old girls’ sizes. However, other intervals based on the age of slim-fit and plus-fit used 3cm for the 8-9 and 10-13 years, 4 cm for 9-10 years, and 2 cm for 14-16 years while the hip size intervals from 13 to 14 years were increased by 6 cm.

Table 6.12 Hip size difference between the different ranges at the older girls of 'N62'

(cm)

Size / Age	8		9		10		11		12		13		14		15		16
Hip	71		74		78		81		84		86		92		94		96
Intervals		3	3	4	4	3	3	3	3	2	2	6	6	2	2	2	
Slim-Fit Hip	66		69		73		76		79		83		87		89		
Intervals		3	3	4	4	3	3	3	3	4	4	4	4	2	2	2	
Plus-Fit Hip	76		79		83		86		89		93		97		99		101
Intervals		3	3	4	4	3	3	3	3	4	4	4	4	2	2	2	

ASTM International, found in 1898 as the American Society of the International Association for Testing and Materials, provides standard tables of body measurements for boys (ASTM D6458-99) and girls (ASTM D6192-07) with 'Regular', 'Slim' and 'Plus' ranges. The slim subjects were described as 'same stature (height), with a slimmer body, and lower body weight than regular subjects'. They also provide the 'Husky' boys' standard tables of body measurements, and the husky body was designated as 'the same stature (height), with a fuller body, and higher body weight than regular subjects as illustrated by measurement charts' ((ASTM D6458 - 99, 1999).

6.1.3.5 Other Information of the size charts

There were some brands which had the letter code on their size charts with the size measurement data. The letter coding is required to use for loose fitted clothes or flexible material's clothes such as knitwear or sport wear from the BS EN 13402-3 and it is based on the chest or bust girth without the height. The letter code of British Standard (BS EN 13402-3) is not addressed that it can be applied to boys, girls and infants only for women and men (see Table 6.13).

Table 6.13 Letter Coding in the British Standard (BS EN 13402-3)
(Reproduced from British Standards Institution, 2013)

Size	XXS	XS	S	M	L	XL	XXL	3XL
Explanation	Extra Extra Small	Extra Small	Small	Medium	Large	Extra Large	Extra Extra Large	Extra Extra Extra Large

There were eight brands that used the letter code from ‘XXS’ size to ‘XXL’ on their size charts among the selected 87 brands even though it is not recommended to adjust into infants’ and children’s garments. However, the letter code at the collected size charts was given as additional information with other size information and dimension data except for ‘F24’. The letter coding size chart of ‘F24’ only used a letter code to designate the size without the other information such as age like other brands.

It was found that there was a broad distinction of age range at each letter code between the brands (see Table 6.14). For example, the same letter code of ‘M’ was used for the age of 7 to 8 at the brand ‘B8’, however ‘J41’ used the size M for the age of 12 to 14 which has a five-year gap when it was compared with the ‘B8’. Only ‘F24’ provided a separate letter coding size chart having gender difference dimension data which girls’ chest was smaller than boys; 1cm - L and 3cm - XL.

It was determined that this apparent age range differences between brands using letter coding are not helpful as an additional guide and give rises to consumer confusions.

Table 6.14 Letter code of children’s wear size charts in the UK

(Age)

Name	**XXS**	**XS**	**S**	**M**	**L**	**XL**	**XXL**
B6		4-5	6-7	8-9	10-11	12-13	14-15
B8	3-4	4-5	6-7	7-8	8-9	10-11	11-12
F24			122 cm (6-7)	140 cm (9-10)	158 cm (13-14)	170 cm (15-16)	
J40		9-10	-	13-14	-	16+	
J41			2-3	4-5 6-7	8-9 10-11	12-13	
M55		3-5	6-7	8-9	10-12	13-14	
R70			6-7	7-8 9-10	10-11		
V83		8-10	10-12	12-14	14-16		

Another additional size chart information was the EUR size which was referred to as European size. Five brands (B8, C17, H31, R71, and Z86) provided EUR size (see Table 6.15). It was found that age ranges almost correspond the size between brands, and the EUR size is referred to height measurements.

Table 6.15 EUR size information in the size charts in the UK

(m=month, y=year)

Brand / Size	B8	C17	H31	R71	Z86
44			0		
50	0 - 1 m		0 - 1m		
56	1 - 3 m		1 - 2 m		
62	3 - 6 m		2 - 4 m		
68	6 - 9 m		4 - 6m		
74	9 - 12 m		6 - 9m		
80	-		9 - 12m		
82	12 - 18 m		-		
86	-		12 - 18m		
90	18 - 24 m		-		
92			18 - 24m		1.5 - 2 y
98			2 - 3 y	2 y	2 - 3 y
104			3 - 4 y	3 - 4 y	3 - 4 y
110			4 - 5 y		4 - 5 y
116		5 - 6 y	5 - 6 y	5 - 6 y	5 - 6 y
122		-	6 - 7y	-	6 - 7 y
128		7 - 8 y	7 - 8 y	7 - 8 y	7 - 8 y
134		-	8 - 9 y	-	8 - 9 y
140		9 - 10 y	9 - 10 y	9 - 10 y	9 - 10 y
146		-	10 - 11 y	-	
152		11 - 12 y	11 - 12 y	-	
158		13 y	-	-	
164			13 - 14 y	32”	
170			14+ y	-	
176				34”	

6.2 Infants and children’s wear size charts in Korea

The size charts from infants and children targeted brands in Korea were considered to be collected with the same collecting method as the UK size charts. A total of 100 brands were collected, but only 77 of the brands were chosen for the comparison. The brands which did not provide any size charts online and the brands which provided the product dimensions were excluded.

The selected size charts’ age in Korea started from ’Premature’ to the age of 19 (see Figure 6.5). The total number of brands for figuring out the age coverage were 73 because four brands (C26, M48, O57, and R65) did not

have age information. The age which was covered the most was the age eight (n=71), and the age seven was significantly followed (n=70).

It was found that the chosen brands from Korea were mostly targeted to the age ranged from seven to eight (see Figure 6.5).

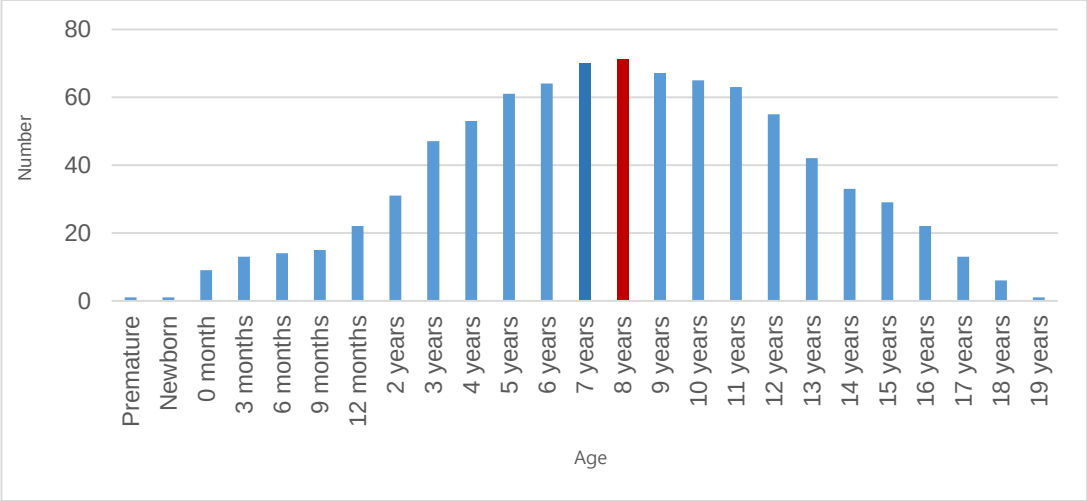

Figure 6.5 Age coverage of selected size charts in Korea

6.2.1 Construction consideration of the size charts

The components of the size charts were targeted age and main body dimensions which were same the as the UK size charts. However, it was found that Korea's size charts provided the additional size designation codes which varied as numeric, letter, and mixed (numeric and letter) coding more than the UK size charts.

Table 6.16 shows the example of the numeric size designation in the Korea size charts. The size of 'D29' designated the size of a particular age group, but the number of sizes was likely to come from the height measurements. A total number which has numeric size with height measurement was 52 among 79 (65.8%). There were two brands (A1 and C19) that used the chest measurement for indicating their size and 'H39' used hip size measurement as their size designation. It was also found that the height measurements were not provided in case the size designation referred to the height measurements in the brands 'M50', 'T72', and 'V73.'

Table 6.16 The size chart of 'D29' in Korea

Size	Age	Height	Chest	Waist	Hip
100	3 years	100cm	54cm	50cm	54cm
110	5 years	110cm	58cm	53cm	59cm
120	7 years	120cm	63cm	56cm	65cm

Another numeric size which referred to the age was found in the 14 brands (17.7%). As Table 6.17 shows, the size code of the brand ‘C23’ represented their age group.

Table 6.17 The size chart of 'C23' in Korea

Size	Age	Height	Chest	Waist	Hip
3	2 - 3 years	100 cm	55 cm	49 cm	58 cm
5	4 - 5 years	110 cm	58 cm	52 cm	62 cm
7	6 - 7 years	120 cm	61 cm	55 cm	66 cm
9	8 - 9 years	130 cm	64 cm	58 cm	70 cm
11	10 - 11 years	145 cm	69 cm	62 cm	72 cm

A total of nine brands used both numeric and letter coding such as ‘135(XS).’ However, the mixed method and letter coding were used additionally with the age and other body measurements not separately.

Korea’s size charts did not have a precise terminology to indicate the single or dual/ double size like the UK size charts. However, the size charts in the Korea also could be classified into four types as the same as the UK; ‘No range age- Single size’, ‘No range – Dual size’, ‘Range age – Single size’, and ‘Range age – Dual size’.

6.2.2 Basic size measurement information of size charts

The dimensions of the body part which were used in Korea’s size charts were height, chest, waist, hip and a few other dimensions. These measurements were used independently or also combined, and all cases of combinations are shown in Figure 6.6 having ten types of the size charts variations.

The highly used combination of dimensions was H-C-W (height-chest-waist) having 30 brands (37.5 %) and the second highest was only presenting height dimension which has 21.3 % with 17 brands. The combination of

‘height-chest-waist-hip’ (H-C-W-H in Figure 6.6) followed next with only 11.3% in the Korea’s size charts.

The other combinations with two dimensions were ‘height-chest’, ‘chest-waist’, ‘height-waist’, and ‘height-hip’ which are shown as ‘H-C’ (n=8), ‘C-W’ (n=6), ‘H-W’ (n=4), and ‘H-H’ (n=1). The three dimension’s combination were also found; ‘chest-waist-hip (C-W-H)’, ‘height-chest-hip (H-C-H)’, and ‘height-waist-hip (H-W-H)’ having three brands and each one brand respectively.

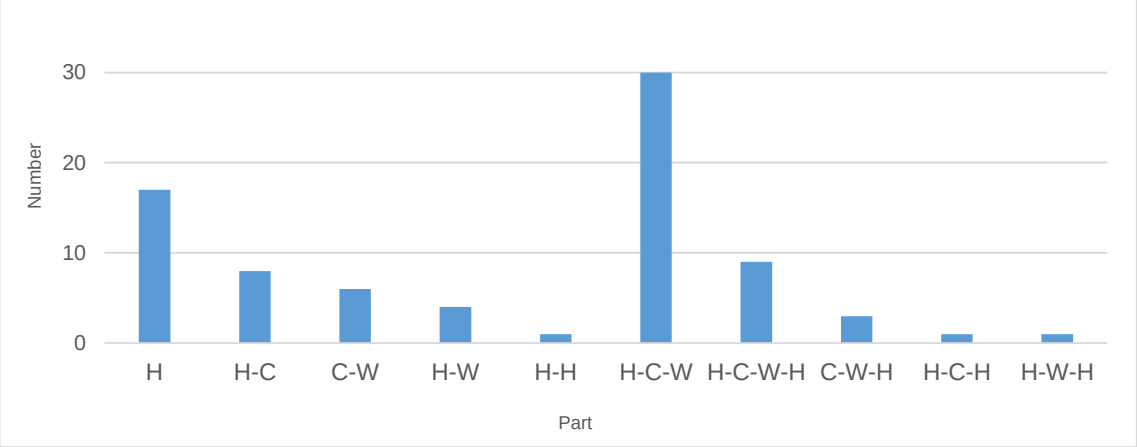

Figure 6.6 Body dimensions in the size charts in Korea (1)

The additional body dimensions expect the cases using height, chest, waist and hip in Korea’s size charts were shoulder width, sleeve length, top (front body) length, bottom length and weight (see Figure 6.7). The weight dimension was recorded significantly (16.3 %), and other dimensions were provided only two or four brands (2.5 % of shoulder width, top (front body) length, bottom length, 5 % of sleeve length). Brand ‘B6’ provided both shoulder width and sleeve length, but ‘S66’ and ‘T72’ only had sleeve length when ‘B10’ only had shoulder width as additional information. ‘S66’ and ‘T72’ also had ‘Top (front body) length’ but ‘S66’ provided ‘Bottom length’ additionally while ‘V76’ only had bottom length.

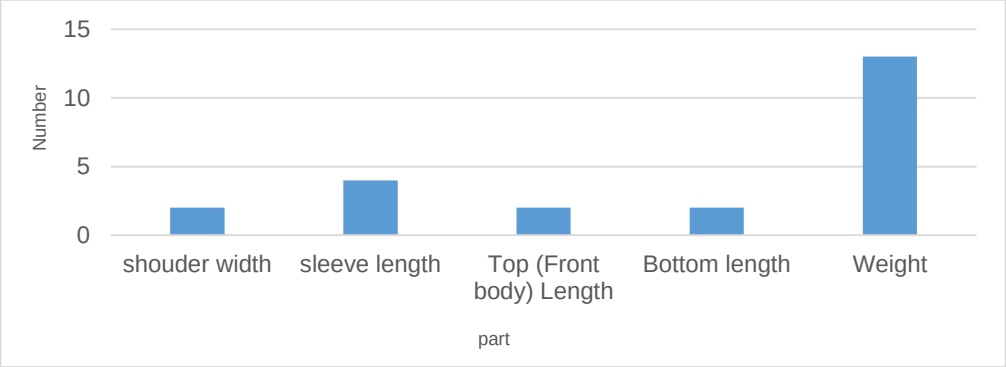

Figure 6.7 Body dimensions in the size charts in Korea (2)

A total of 13 brands provided weight dimensions among 73 brands which were 16.3 % in the Korea (see Table 6.18). A considerable number of brands presented the weight measurements for all targeted age range (N=10) not having certain age range among the whole age range. For example, the size chart's age range of the brand 'C15' was from 0 months to 18 years (light grey shade), but they provided the weight measurement only until age 5 (dark grey shade in Table 6.18). The other brands gave weight information whether the age was growing up or not except 'B8', 'C15', and 'G36'.

Table 6.18 Brands with weight measurements and range in Korea

(m=month, y=year)

No.	Name	Range	Range with Weight	Month							Year															
				P	N	0	3	6	9	12	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	B8	9 m - 14 y	9 m - 5 y																							
2	B11	**4 y - 16y**	**4 y - 16 y**																							
3	C13	**37 m - 10 y**	**37 m - 10 y**																							
4	C15	0 - 18 y	0 - 5 y																							
5	C18	**3 y - 7 y**	**3 y - 7 y**																							
6	C22	**1 y - 8 y**	**1 y - 8 y**																							
7	G36	3 m - 14 y	0-3 m to 18-24 m																							
8	G38	**P - 12 y**	**P - 12 y**																							
9	H40	**3 y - 15 y**	**3 y - 15 y**																							
10	L43	**7 y - 16 y**	**7 y - 16 y**																							
11	M49	**3 m - 14 y**	**3 m - 14 y**																							
12	P57	**0 - 6 y**	**0 - 6 y**																							
13	P61	**1 y - 8 y**	**1 y - 8 y**																							

6.2.3 Type of size charts in Korea

6.2.3.1 Size chart division by age

A total of 11 brands provided age classification with the specific age range of size among the 77 size charts (14.2%) in Korea.

The terminology which was used for age designation were ‘Infant’, ‘Baby’, Toddler’, ‘Kids’, ‘Boys’ ‘Girl’, and ‘Junior’. Infant and baby were used to denoting the age from 0-3 months to 36 months except for ‘B8’ of ‘Toddler’ which was 12-18 months to 18-24 months (see Table 6.19). The highly used terminology for the following age designation terminology was ‘Toddler’ and ‘Kids’ which each has four brands, and ‘Boys’ and ‘Girl’ were also used. The age range of toddler and kids are from minimum 2-3 years to maximum 14-15 years. The final age group which the age was covered from 6-7 years to 15 years was classified as ‘Junior’ (A1, N55, and S66) and ‘Kids’ (M50).

The two age group combinations were found most in eight of brands. The two age group combinations which were started from infant and baby’s age were ‘Baby- Kids’ (D28, P61, and R64), ‘Baby-Toddler’ (M50), ‘Baby-Girl’ (B7) and ‘Baby-Boys’ (C15). Other two brands from the toddler’s age were ‘Toddler-Kids’ (B8), ‘Toddler-Junior’ (N55) but the ‘B8’s toddler age was ’12-18 months ~ 18-24 months’ which were belong to the infant and baby’s classification in other brands.

In short, it was found that the size charts’ age classifications did not correctly match with other brands and the age ranges were also inconsistent.

Table 6.19 Terminology for age group division in Korea

(m=month, y=year)

No.	Name	Whole range	Terminology	Age range	Terminology	Age range	Terminology	Age range	Combinations
1	A1	1 m - 13 y	Infant	1-6 m - 24-36 m	Toddler	4 y - 7 y	Junior	8 y - 12-13 y	Infant-Toddler-Junior
2	B7	0 m - 12 y	Baby	0-6 m - 24-36 m	Girl	4-5 y - 11-12 y	-	-	Baby-Girl
3	B8	12 m - 14 y	Toddler	12-18 m - 18-24 m	Kids	2-3 y - 12 y	-	-	Toddler-Kids
4	C15	0 - 18 y	Baby	0-3 m - 5 y	Boys	4-5 y - 18 y	-	-	Baby-Boys
5	D28	6 m - 15 y	Baby	6-12 m - 4-5 y	Kids	4-5 y - 14-15 y	-	-	Baby-Kids
6	G36	3 m - 14 y	Baby	0-3 m - 18-24 m	Toddler	24 m - 5 y	Kids	6-7 y - 14 y	Baby-Toddler-Kids
7	M50	3 m - 14 y	Baby	3-6 m - 25- 36 m	Toddler	24-36 m - 13-14y	-	-	Baby-Toddler
8	N55	3 y - 16 y	-	-	Toddler	4 y - 7 y	Junior	8 y - 15 y	Toddler-Junior
9	P61	3 m - 12 y	Baby	3 m - 36 m	Kids	3 y - 12 y	-	-	Baby-Kids
10	R64	0 - 9 y	Baby	0-3 m - 36 m	Kids	12-24 m - 12 y	-	-	Baby-Kids
11	S66	0 - 13 y	Baby	0-12m - 24-26 m	Kids	4-5 y - 8-9 y	Junior	8-9 y - 12-13 y	Baby-Kids-Junior

6.2.3.2 Size chart division by gender

13 brands had divided the boys' and girls' size charts among the 77 chosen size charts. As Figure 6.8 shows, the brands with gender divided size chart only occupied 16.8% from all size charts, but it was found that two, three, and seven years were reference age to be classified into boys and girls having all three brands.

The sizes of each body dimensions in the size charts having gender division were different, but the height dimension was correspondent between boys and girls except the brands of 'D29', 'F33' and 'L43'. These three brands used different height which boys were taller than girls in their size charts. All specific reference age to be divided into two genders are listed in Table 6.20.

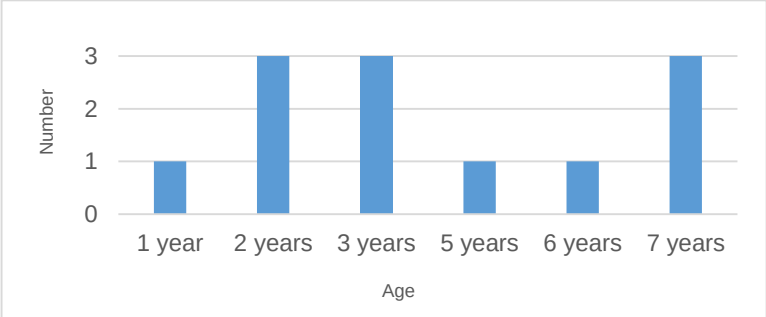

Figure 6.8 Reference age of gender division in Korea

Table 6.20 Brands with gender division and reference age in Korea

No.	Brand	Division	No.	Brand	Division
1	A5	3 years	7	H40	3 years
2	B12	2 - 3 years	8	L43	7 - 8 years
3	C27	2 - 3 years	9	L46	7 - 8 years
4	D29	2 years	10	S66	0 - 12 months
5	F33	3 - 4 years	11	S70	5 years
6	G36	6 - 7 years	12	T72	7 years

6.2.3 3 Other information of the size charts

There were some brands having letter coding as their supplementary information on their size charts with other body dimensions.

The Korean standard (KS K 9402: 2009) allows using a letter code in case the garments do not require proper fitting such as casual tops and bottoms,

knitted tops, pyjamas, training wear. The letter coding for size designation of ranges was listed in Table 6.21 and the range of letter coding starts from ‘S’ to ‘XL’ depending on the physical body condition is developing.

Table 6.21 Letter coding name and definition in the Korean Standard
(Reproduced from Korean Standards Association, 2009b)

Size name	Definition
S	Abbreviation for representing small build, small
M	Abbreviation for representing average build, medium
L	Abbreviation for representing large build, large
XL	Abbreviation for representing very large build, extra large

The letter code gives the size or age range information and basic body dimensions additionally when the specific information of body dimensions are not required. The letter coding classification in Korea is shown in Table 6.22. The size presented with the physical body condition and the designation of height combining by ‘-’ such as ‘M-125’. The range of height is divided by 10 cm of the interval from 110 cm to 170 cm, and the middle of the range is selected for combination with the variations of letter codes. For example, 135 was chosen from the range of height ‘130-140’ and each letter code from ‘S’ to ‘XL’ can be conjoined; S-135, M-135, L-135, XL-135. The range is flexibly combined with the requirement of use and this combination with a letter code, and body dimension was chosen based on the clothing items. These combinations are skipped at the certain body feature and height. Girls’ garments for bottom have a wider range of waist which is ‘L-125’ and ‘XL-135 while the boys’ garments for bottom have a smaller waist of range, ‘S-155’ and ‘M-165’. It is also found that only boys’ top does not have XL-145 (see Table 6.22).

Tops and whole body types had height and chest circumference as a primary dimension and secondary dimensions (N=5) are waist neck circumference, neck circumference, axilla height, biacromial breadth, and arm length for both boys and girls in the Korean standard (KS K 9402: 2009). In regarding the bottoms, KS K 9402 provides the height and waist circumference as the primary dimensions and secondary dimensions are hip circumference, outside leg length, and crotch length for boys and girls. Both tops and bottoms used the dual size of chest and waist circumference

respectively. However, only primary dimension (PD) of boys and girls were selected for the size comparison.

The height which is the primary dimension of both tops and bottom was designated equally to boys and girls (see Table 6.22). However, chest for tops and waist for bottom grow with differences between boys and girls. Regardless of the height measurement, the size difference between boys and girls on their chest were 2-3 cm in ‘S’, 3-4 cm in ‘M’, 4-5 cm in ‘L’, and 5-6 cm in ‘XL’. Boys’ waist differences for the bottom clothing are wider having 6-7 cm in ‘S’, 7-8 cm’ in ‘M’, 8-9 cm in ‘L’, and 9-14 cm in ‘XL’ more than girls.

Table 6.22 Letter code in the Korea Standard
(Reproduced from Korean Standards Association, 2009b)

(cm)

Gender / Size	Boys and Girls	Boys		Girls	
	Height	Chest	Waist	Chest	Waist
S-115	110-120	57-66	51-60	55-63	45-53
S-125	120-130	57-66	51-60	55-63	45-53
M-125		66-75	60-69	63-71	53-61
L-125		-	-	-	61-69
S-135	130-140	57-66	51-60	55-63	45-53
M-135		66-75	60-69	63-71	53-61
L-135		75-84	69-78	71-79	61-69
XL-135		-	-	-	69-72
S-145	140-150	57-66	51-60	55-63	45-53
M-145		66-75	60-69	63-71	53-61
L-145		75-84	69-78	71-79	61-69
XL-145		-	78-86	79-86	69-72
S-155	150-160	-	51-60	-	-
M-155		66-75	60-69	63-71	53-61
L-155		75-84	69-78	71-79	61-69
XL-155		84-92	78-86	79-86	69-72
M-165	160-170	-	60-69	-	-
L-165		75-84	69-78	71-79	61-69
XL-165		84-92	78-86	79-86	-

As an example of brand ‘A2’ in Table 6.23, they use the height of ‘145-155 cm’, chest of ’85-90 cm’ in size ‘M’. The range of dimensions did not correspondently match with the standard when these dimensions were compared with the Korean standard. The height of ‘A2’ should be in the range of 10 cm (ex. 140-150 cm or 150-160 cm) and they used wider size of chest matching with their height. As Table 6.23 shows that their chest size

(85-90 cm) did not belong to the range of the shown range in the Korean standard (S: 57-66 cm, M: 66-75 cm, and L: 75-84 cm).

The size ‘M’ in the brand ‘B10’ suggested 130 cm of height, 58 cm of chest and waist but the corresponding dimensions in the Korean standard, ‘M-135’ had 130-140 cm of height, 66-75 cm of the chest, and 60-69 of waist. The size ‘M’ of chest and waist in ‘B10’ were smaller than the Korean standard and using 58 cm of chest and waist belongs to size ‘S’ not to size ‘M’ which they suggested (see Table 6.23). However, brand ‘G36’ of boys and girls suggested dimensions in their size charts were adapted from the Korean standard affordably. The chest measurement difference between boys and girls in size ‘L’ was 5 cm which has boys of 75 cm and girls of 70 cm. Each of the boys and girls sizes was under the same range as the Korean standard range when their height 145 cm was adjusted. The boys’ chest of 75 cm was in the range of 69-78 cm in the Korean standard when girls’ chest which is 70 cm have 63-71 cm (see Tables 6.23 and 6.24).

Table 6.23 Brands using letter coding in Korea

(cm)

Height	A2	B10	C15	G36 (Boy)	G36 (Girl)	H42	P63
XXS	115-125	100					
XS	125-135	110	124-130			100	
S	135-145	120	130-131	120	120	110	
M	**145-155**	**130**	132-141	130	130	120	
L	155-165	145	142-154	**145**	**145**	130	
XL	165-175	155	155-159	155	155	140	
XXL		165	over 160	165	165		
Chest	A2	B10	C15	G36 (Boy)	G36 (Girl)	H42	P63
XXS	70-75	52					
XS	75-80	54	63			53	
S	80-85	56	66	61	58	56	54
M	**85-90**	**58**	70	66	62	59	58
L	90-95	65	78	**75**	**70**	62	60
XL	95-100	70	84	79	76	65	64
XXL		75	88	83	80		
Waist	A2	B10	C15	G36 (Boy)	G36 (Girl)	H42	P63
XXS	25-26 inch	52					
XS	26-27 inch	54	55			49	
S	27-28 inch	56	57.1	55	54	51	34
M	28-29 inch	**58**	58.4	59	56	53	40
L	29-30 inch	60	64.5	**64**	**65**	56	42
XL	30-31 inch	62	68.6	67	66	59	44
XXL		65	72	71	68		

Table 6.24 Letter code of the size charts in Korea

(y=year)

No.	Name	XXS	XS	S	M	L	XL	XXL (2XL)
1	A2	7 y	8-9 y	10-11 y	12-13 y	14-15 y	16-17 y	
2	B10	2-3 y	4-5 y	6-7 y	8-9 y	10 y	11 y	12 y
3	C15		4-5 y	6-7 y	8 y	10-12 y	14 y	16 y
4	G36			6-7 y	8-9 y	10-11 y	12-13 y	14 y
5	H42		3 y	5 y	7 y	9 y	11 y	
6	N52		8 y	10-12 y	up to 16 y			
7	N55			8-9 y	10-11 y	12-13 y	14-15 y	15-16 y
8	N56		6 y	7 y	8-9 y	10-11 y	12 y	
9	P63			4-5 y	5-6 y	6-7 y	7-8 y	

6.3 Comparison of size charts between the UK and Korea

6.3.1 Size division methods

To promote a common platform for comparison, the age of seven was selected as the researcher's targeted size and its sizing charts were compared. The size charts which include the age of seven were chosen (Age of 6-7 years, 7 years, and 7-8 years). These three divisions of age range were divided into the single and dual size of body dimensions as 'No range age – Single size', 'No range age – Dual size', 'Range age – Single size', 'Range age – Dual size.'

As can be seen in Table 6.25, the collected size charts of the targeted age group were 64 in the UK and 61 in Korea. As to the UK, the usages of a single size (e.g. Height: 122 cm) regardless of age range were recorded 68.3 % while 85.2 % of Korea. The rating of dual sizes (e.g. Height: 120 ~ 125 cm) were 31.7 % in the UK and 13.3 % in Korea (see Figure 6.9).

Overall, the percentage of each single size both no range and range age groups were higher than dual size in all age groups and a significant difference of frequency is not found between the UK and Korea.

Table 6.25 Size division methods between the UK and Korea

n (%)

Age	Size	UK	Korea	Total	t-value	Sig.
6-7 years	Single size	12 (18.8)	19 (31.1)	31 (24.8)	1.185	.238
	Dual size	8 (12.5)	3 (4.9)	11 (8.8)		
7 years	Single size	19 (29.7)	18 (29.5)	37 (29.6)		
	Dual size	3 (4.7)	3 (4.9)	6 (4.8)		
7-8 years	Single size	13 (20.3)	15 (24.6)	28 (22.4)		
	Dual size	9 (14.1)	3 (4.9)	12 (9.6)		
Total		64 (100)	61 (100)	125 (100)		

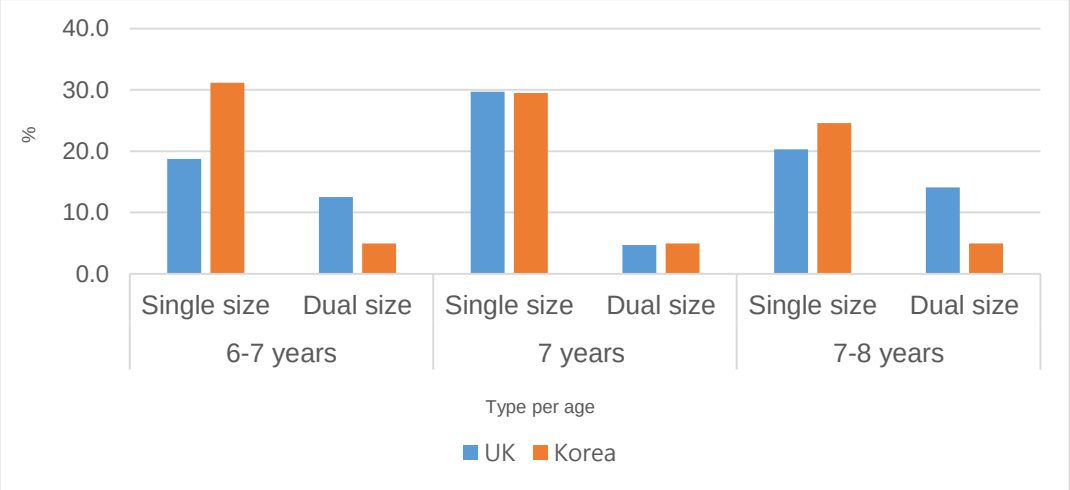

Figure 6.9 Size division methods between the UK and Korea

6.3.2 Body dimension information

The dimensions of the body parts which were used in Korea's size charts were as same as the UK having height, chest, waist, hip and a few other dimensions. These measurements were used independently or also combined and in all cases of combinations in both the UK and Korea. In total, seven types of the size charts variations in the UK were found while Korea size charts had more conjoined combinations having ten types (see Table 6.26 and Figure 6.10).

The highly used combination of dimensions in the UK and Korea was H-C-W (height-chest-waist) having 37.4 % in the UK and 37.5 % in Korea. However, the second highest in the UK was the combination of 'height-chest-waist-hip' (H-C-W-H) with 33 % of brands while Korea had 11.3 % of brands. The second highest combination of dimensions in Korea was using height solely (21.3 %) when the UK had only 7.7 % of the brands.

Korea was only presenting height dimension which has 21.3 % with 17 brands comparing with 7.7% of the UK. The combination of 'height-chest-waist-hip' (H-C-W-H) was followed next with only 11.3% in the Korea's size charts, but this combination was collected as the second largest with 33% in the UK's. The thirdly followed combination of both countries was 'height-chest' (H-C) with 16.6% in the UK and 10.0% in Korea.

Table 6.26 Differences of size chart information

n (%)

Combination	Abbreviation	UK	Korea
Height	**H**	7 (7.7)	**17 (21.3)**
Chest	C	3 (3.3)	-
Height - Chest	**H-C**	**15 (16.5)**	**8 (10.0)**
Chest - Waist	C-W	1 (1.1)	6 (7.5)
Height - Waist	H-W	-	4 (5.0)
Height – Hip	H-H	-	1 (1.3)
Height – Chest – Waist	**H-C-W**	**34 (37.4)**	**30 (37.5)**
Chest – Waist – Hip	C-W-H	2 (2.2)	-
Chest – Waist – Hip	C-W-H	-	3 (3.8)
Height – Chest – Hip	H-C-H	-	1 (1.3)
Height – Waist – Hip	H-W-H	-	1 (1.3)
Height – Chest – Waist - Hip	**H-C-W-H**	**30 (33.0)**	**9 (11.3)**

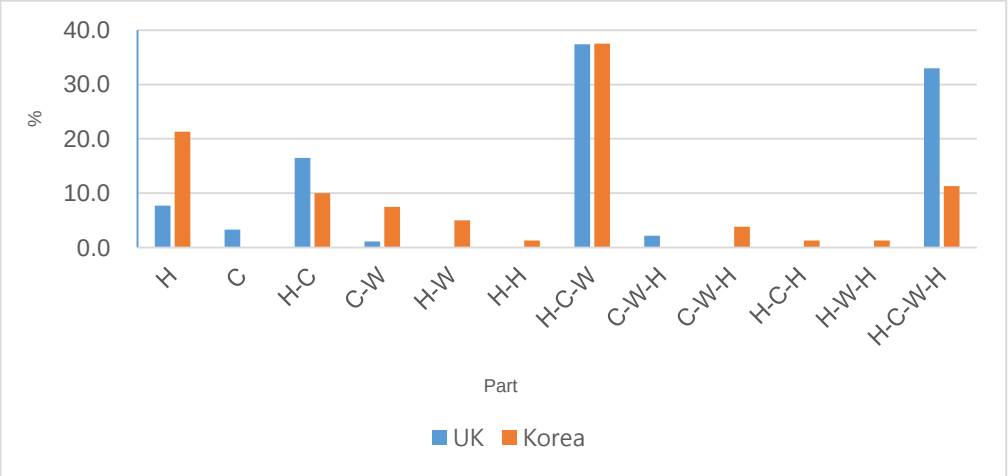

Figure 6.10 Differences of size chart information

As to the additional dimensions comparison between the UK and Korea, the UK provided eight detailed body dimensions while Korean brands gave five additional dimensions (see Table 6.27). The eight additional body parts were

weight, sleeve length, top (front body) length, bottom length, shoulder width, neck point to wrist, seat, collar, inside leg, and out leg in the UK. However, weight, sleeve length, top (front body) length, bottom length, and shoulder width were provided in Korea size charts.

The body measurement of leg was given with 23.1 % of brands only in the UK, and the percentage of weight was followed by 19.8 % in the UK while 16.2 % in Korea. Next, collar size was measured having 6.6 % then lengths of seated and sleeve (2.2 %) and top (front body) length and neck point to wrist (1.1 %) were measured in the UK. Other small numbers of body size information in Korea were sleeve length (5.0 %) then top (front) length, bottom length, and shoulder width (2.5 %) (see Table 6.27 and Figure 6.11).

Overall, the measurement of the inside leg was considerably found in the UK's size charts, and both the UK and Korea gave weight information with substantial percentages.

Table 6.27 Differences of size chart information

n (%)

Part	UK	Korea
Weight	**18 (19.8)**	**13 (16.2)**
Sleeve length	2 (2.2)	4 (5.0)
Top (Front body) Length	1 (1.1)	2 (2.5)
Bottom length	-	2 (2.5)
Shoulder width	-	2 (2.5)
Neck point to Wrist	1 (1.1)	-
Seat	2 (2.2)	-
Collar	6 (6.6)	-
Inside leg	**21 (23.1)**	-
Out leg	4 (4.4)	-

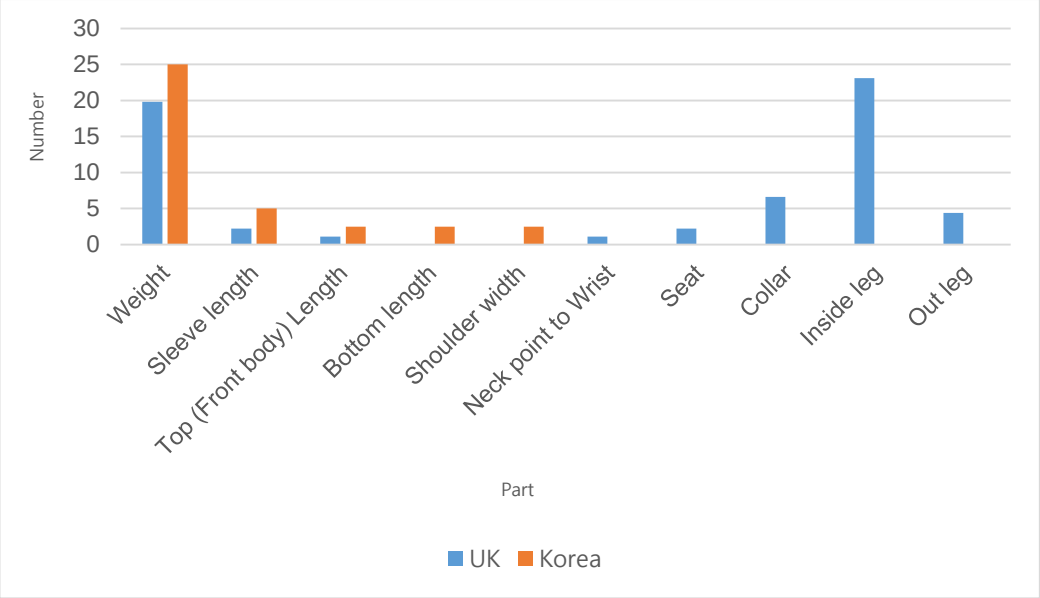

Figure 6.11 Differences of size chart information

6.3.3 Information of body dimensions in the size chart

6.3.3.1 Body dimensions of the size charts in the UK

For the body dimension comparison, the last body dimension of dual size was chosen for the average and standard deviation because of the maximum coverage. For example, the dual size of height ranged from 122 to 125 cm, the greater dimension of 125 cm was chosen for comparison.

Table 6.28 shows key body dimensions of each no range (7 years) and range age (6-7 years and 7-8 years). As to age seven without range, the number of brands which offered a single chart was nine, and the average of each size measurements was 121.9 cm in height, 62.5 cm in the chest, 56.6 cm in the waist, and 65.6 cm in the hip at the single size charts.

Table 6.28 Average of body dimensions in the UK

(mean (SD) (cm))

Age	Range	Height	Chest	Waist	Hip
6-7 years	Single size (n=12)	**122.0** (2.6)	**62.5** (1.8)	**57.7** (1.3)	**67.0** (1.3)
	Dual size (n=8)	**122.0** (0.0)	**63.4** (2.0)	**59.1** (2.2)	**66.0** (1.8)
7 years	Single size (n=19)	**121.9** (1.7)	**62.5** (1.3)	**56.5** (1.5)	**65.6** (2.1)
	Dual size (n=3)	**124.0** (1.7)	**62.7** (2.5)	**58.0** (4.0)	**67.0** (2.8)
7-8 years	Single size (n=13)	**127.5** (3.0)	**66.2** (4.5)	**55.2** (11.4)	**67.9** (1.7)
	Dual size (n=9)	**128.0** (0.0)	**66.1** (4.2)	**58.5** (1.3)	**68.7** (1.2)

As to the comparison between the single and dual size of dimensions in each age range, the differences of dimension were considerably varied (see Table 6.29). The biggest differences were shown in the waist for 7-8 years with 3.3 cm followed by 2.1 cm of difference in no range age of seven's single size. Next, the difference of 6-7 years and 7 years were also measured, and dual sizes were slightly bigger (1.4 cm and 1.5 cm respectively). However, in terms of the hip at 6-7 years and chest at 7-8 years' dual sizes were smaller with each 1 cm and 0.1 cm.

Overall, the dual size of dimensions was bigger than single size except for the difference of hip on 6-7 years and chest of 7-8 years.

Table 6.29 Dimension differences between single and dual size in the UK

(cm)

Age	Size	Height	Chest	Waist	Hip
6-7 years	Single size (n=12)	122.0	62.5	57.7	67.0
	Dual size (n=8)	122.0	63.4	59.1	66.0
	Difference	**0**	**0.9**	**1.4**	**-1**
7 years	Single size (n=19)	121.9	62.5	56.5	65.6
	Dual size (n=3)	124.0	62.7	58.0	67.0
	Difference	**2.1**	**0.2**	**1.5**	**1.4**
7-8 years	Single size (n=13)	127.5	66.2	55.2	67.9
	Dual size (n=9)	128.0	66.1	58.5	68.7
	Difference	**0.5**	**-0.1**	**3.3**	**0.8**

When the difference of no range and range sizes were compared, it is also found that all differences were remarkably varied (see Table 6.30). However, regarding only height and chest, the differences between 7 and 6-7 years were approximately smaller than the differences between 7 and 7-8 years. It is concluded that the size dimensions of 7 years are similarly provided with the dual size 6-7 years, not 7-8 years when only single sizes were compared. Moreover, this conclusion is matched with 'B12' in the UK's sizing information which describes 'Please note that all our clothes are cut generously and will fit up to the greater size of the dual sizing, i.e. 6 years of the 5-6 years'. It is referred that range age and dual size generally provides one size bigger dimension of single age and single size.

Table 6.30 Differences between no range and range age in the UK

(cm)

Size	Age	Height	Chest	Waist	Hip
Single size	7 and 6-7 years	0.1	0	1.2	1.4
	7 and 7-8 years	5.5	3.7	-2.5	0.9
Dual size	7 and 6-7 years	-2	0.7	1.1	-1
	7 and 7-8 years	6	2.7	-0.6	2.7

6.3.3.2 Body dimensions of the size charts in Korea

In order to the comparison, the bigger body dimension of dual size was chosen for the average calculation due to the maximum coverage the same as the UK comparison. However, unprovided information of dual size were not possible to calculate. Table 6.31 shows key body dimensions of each no range (7 years) and range age (6-7 years and 7-8 years) in Korea. Average of each size measurements were 119.3 cm in height, 60.9 cm in the chest, 55.2 cm in the waist, and 67.4 cm in the hip at the single size of age seven without range.

Table 6.31 Average of body dimensions in Korea

(mean (SD) (cm))

Age	Range	Height	Chest	Waist	Hip
6-7 years	Single size (n=19)	**120.2** (5.6)	**63.4** (6.5)	**54.5** (5.9)	**68.7** (4.6)
	Dual size (n=3)	**125.0** (0.0)	**60.5** (0.7)	**56.0** -	**65.0** -
7 years	Single size (n=18)	**119.3** (3.5)	**60.9** (3.9)	**55.2** (1.5)	**67.4** (7.5)
	Dual size (n=3)	**125.0** (0.0)	**66.5** (2.0)	**62.5** (2.2)	**-**
7-8 years	Single size (n=15)	**126.0** (4.7)	**67.3** (7.1)	**55.2** (3.7)	**72.7** (4.6)
	Dual size (n=3)	**130.0** (0.0)	**66.0** (5.3)	**56.0** (2.8)	**70.0** -

As to the comparison between the single and dual size of dimensions in each age range, the differences of dimension were considerably varied (see Table 6.32).

The biggest difference was shown on the hip at 7 years with 7.3 cm followed by the similar difference of height and chest (5.7 cm and 5.6 cm respectively) at the age of seven's single size. In terms of height, the dual size of all aged division which are 6-7 years (4.8 cm), 7 years (5.7 cm), and 7-8 years (4 cm) were bigger than each age of single size. As same as height, waist of dual size were also measured bigger on each aged group which are 1.5 cm in 6-7 years, 7.3 cm in 7 years, and 0.8 cm in 7-8 years. However, chest and hip of dual size in aged 6-7 years and 7-8 years were smaller than single size and a distinctive difference was shown in age 6-7 years (-2.9 cm in chest and -3.7 cm in hip).

Overall, the dual size of dimensions was bigger than single size in 7 years. As to the difference of single and dual size in 6-7 years and 7-8 years, height and waist of dual sizes are bigger while chest and hip were smaller than single size.

Table 6.32 Dimension differences between single and dual size in Korea

(cm)

Age	Size	Height	Chest	Waist	Hip
6-7 years	Single size (n=19)	120.2	63.4	54.5	68.7
	Dual size (n=3)	125.0	60.5	56.0	65.0
	Difference	**4.8**	**-2.9**	**1.5**	**-3.7**
7 years	Single size (n=18)	119.3	60.9	55.2	67.4
	Dual size (n=3)	125.0	66.5	62.5	-
	Difference	**5.7**	**5.6**	**7.3**	**-**
7-8 years	Single size (n=15)	126.0	67.3	55.2	72.7
	Dual size (n=3)	130.0	66.0	56.0	70.0
	Difference	**4**	**-1.3**	**0.8**	**-2.7**

When the difference of no range and range sizes were also compared in Korea, it is found that all differences were varied (see Table 6.33). The height differences between age 7 and 7-8 were found that dual size was bigger than single size and dual size of chest in 7-8 years was measured bigger than 7 years.

Overall, the significant difference between no range and range age in the UK is not found but it is referred that the brand charts use range age at both single and dual sizes were not enough to compare.

Table 6.33 Difference between no range and range age in Korea

(cm)

Size	Age	Height	Chest	Waist	Hip
Single size	7 and 6-7 years	-0.9	-2.5	0.7	-1.3
	7 and 7-8 years	-6.7	-6.4	0	-5.3
Dual size	7 and 6-7 years	4.8	3.1	8	-
	7 and 7-8 years	-5	0.5	6.5	-

6.3.3.3 Body dimensions comparison in the size charts between the UK and Korea

The collected body dimensions in the size charts in the UK and Korea were compared to figure out the size differences. The chosen dimensions were height, chest, waist, and hip due to other dimensions' insufficient amount of numbers for comparison and unprovided parts of each country.

Table 6.34 shows the average value of only age seven of a single size. The collected numbers each part were height and chest (n=40), waist (n=37), and hip (n=19) while Korean number of data were 33 of the height, 38 of the chest, 33 of the waist, and 9 of the hip.

It was found that height and waist have significant differences between the UK and Korea ($p<.05$ and $p<.001$ respectively), and all the UK dimensions except hip were bigger than Korea. The average differences on each dimension were 2.1 cm in height, 0.6 cm in the chest, 2.6 cm in the waist, and -1.4 cm in the hip.

Table 6.34 Body dimensions in the size charts between the UK and Korea

(cm)

	UK	Korea	Difference	t-value	Sig.
Height	122	119.9	2.1	2.597*	.011
Chest	62.7	62.1	0.6	.659	.512
Waist	57.5	54.9	2.6	3.553***	.001
Hip	66.2	67.6	-1.4	-.910	.371

*p < .05. ***p < .001.

Figure 6.12 shows that how much Korean dimensions are different with the UK dimensions on the basis of UK data which were set 100 % of the standard. It is remarkably shown that smaller waist and bigger hip of Korea than the UK.

Overall, it is referred that the Korean size charts provide a generous amount of ease at hip area than the UK size charts. However, height, chest, and waist of the UK sizes were relevantly bigger than Korea.

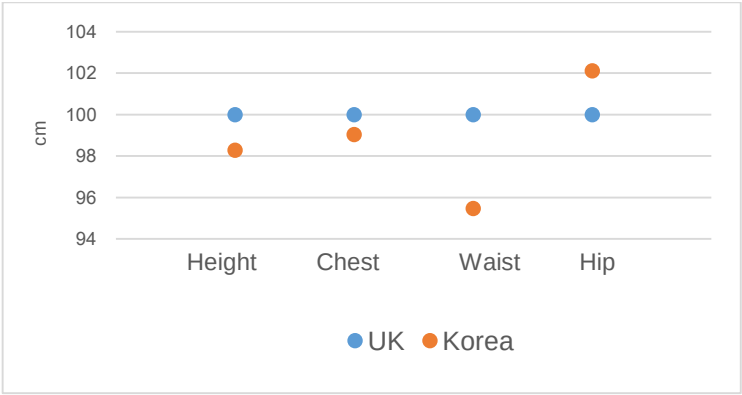

Figure 6.12 Differences of body dimensions between the UK and Korea

The t-test was conducted to figure out the statistical difference rate between the no range and range group (7 years and 6-7 years) in the single and dual sizes (see Table 6.35). With the condition of having the same size indication between 6-7 years and 7 years, all size dimensions of 6-7 years and 7 years in single and dual size charts were compared between the UK and Korea. As same as the results of age 7, there were significant differences at height and waist area between two countries. However, waist of a single size ($p<.001$) was shown considerable difference than dual size ($p<.05$).

Table 6.35 Body dimensions in the size charts between the UK and Korea

(cm)

Size / Part	Single size (7 years)				Dual size (6-7 years)			
	Country	Mean	t-value	Sig.	Country	Mean	t-value	Sig.
Height	UK (N=40)	122.0	2.419**	.020	UK (N=32)	122.0	2.665**	.011
	Korea (N=33)	119.9			Korea (N=31)	119.6		
Chest	UK (N=40)	62.7	.645	.522	UK (N=32)	62.5	.334	.740
	Korea (N=38)	62.1			Korea (N=36)	62.2		
Waist	UK (N=37)	57.5	3.553***	.001	UK (N=29)	57.0	2.743*	.008
	Korea (N=33)	54.9			Korea (N=32)	54.9		
Hip	UK (N=19)	66.2	-.662	.525	UK (N=16)	66.3	-.715	.496
	Korea (N=9)	67.6			Korea (N=8)	67.9		

*p < .05. p** < 0.05, ***p < .001.

6.4 Summary

In this chapter, the collected size charts of infants' and children's clothing brands in the UK and Korea were analysed by comparison based on construction methods, size charts information, and type of size charts individually. In general, both countries used no range with age ranged size charts as the highest. Regarding uses of primary dimensions in the size charts, both the UK and Korea highly used 'Height-Chest-Waist (H-C-W)' combination, then 'Height-Chest-Waist-Hip (H-C-W-H)' in the UK and 'Height (H)' in Korea were found as the second highest. Moreover, weight was significantly used in both countries, and the inside leg was considerably

used in the UK size charts while no size charts used inside leg in Korea. As for the type of size charts, the UK size charts had more classifications in their size charts which were divided by age, gender, clothing type, fitting, and letter code while Korean size charts have classifications of age, gender, and letter code. Finally, when the body measurements of provided body measurements sizes were compared, most of the UK sizes were larger than Korea, but the greater age group and gender of the UK were slightly different with the national sizing survey data of each country.

Chapter 7. Consumer perspectives in the UK and Korea

In chapters four to six, the fundamental differences between the national sizing survey, national size standard, and brand size charts between the UK and Korea were examined. The results of the analysis showed significant differences in body dimensions including application and designation methods in both countries. In this chapter, the investigations of consumers' perspectives in the UK and Korea were considered using survey methods.

7.1 Procedure of survey

Preliminary survey

Before conducting the main survey, a pre-test was organised to figure out any uncertain or misapprehended items in the questionnaires, and to determine any inappropriate questions.

Participants were recruited in Korea using the snowball sampling method, and a total of 30 participants were involved in the preliminary survey. The demographic conditions of the participants for the pre-test were the same as the participant pool in the main survey.

The questionnaire consisted of four parts: (1) Children's clothing purchase tendency, (2) Fitting consideration of children's clothing, (3) Size system and clothing size awareness, (4) Demographic information. Categorical questions such as single choice and multiple choice questions were designed with checkboxes allowing to tick a choice or to type opinions and additional comments by the participants. The variables of some single choice questions were assessed using five-point Likert-scales.

The survey was pretested by email survey. The consent was agreed by the participants at the first page of the questionnaire. The results of the preliminary survey were analysed by frequency analysis and multi-analysis methods. The order and words of some questions were modified and the classification of questions were reorganised by dividing into the new sections for participants' better understanding. The final survey questionnaire including a consent form is shown in Appendix B.2.

Main survey

The samples for main survey were filtered before conducting the survey. The only participants who are females who had children aged three to nine in the UK and Korea could conduct this survey. The stratified random sampling method was used to collect the participants. A total number of the collected survey outcome were 214 in the UK and 213 in Korea. A web-based survey was conducted with the assistance of the online survey service providers in the UK and Korea.

The construction of the questionnaire was changed having five parts: (1) Clothing purchasing information, (2) Sizing system and size awareness (3) Fitting (wearing sensation), (4) Product size and size spec awareness, (5) Demographic information. The questionnaire was designed using both open and closed questions (list question, category question, and Likert (five-point-scale question).

Qualitative data was analysed using a coding, annotating, labelling, selection, and summarisation (Blaxter et al., 2006). Quantitative data was coded using Excel™, and analysed by IBM SPSS Statistics™ version of 23. Descriptive statistics were applied to describe the means, standard deviations, and range of scores and percentages. Inferential statistics (Chi-square and T-test) and multivariate analysis (correlation, factor, and cluster analyses) were also used to analyse the results of the survey. A statistical process was conducted several times to acquire the accurate explanation power. During the analysis of the survey results, five scales of variables were changed into three or four scales due to the possibility to have an inappropriate conclusion. If there are cells less than five the expected frequency cannot reach the Chi-square distribution. Therefore new three or four variables were created by combining two categories which have less than five of expected frequency (CBNU, 2007). Finally, regression and discriminant analyses were conducted to verify the results of the analyses.

7.2 Sample description

The detail of the demographic information of the UK and Korean participants named Q1 in this survey are shown in Table 7.1. The chosen samples which were selected only completed responses contained for 183 the UK and 212 Korean participants.

The average age of the UK participants was 37.8 years, and Korean participants was 34.9 years. Around 45-50 % of the participants from the both countries ranged between 30 and 39 years, but the rate of over 40 years in the UK were higher (37.2 %) than Korea (25.5 %), and the rate of fewer than 30 years in Korea (24.1 %) were higher than the UK (16.9 %). This difference in the range is referred to as the different average age for marriage according to both national statistics data which are ‘Office for National Statistics in England and Wales (34.0 years in 2013) and ‘Korean Statistical Information Service’ in Korea (30.0 years in 2015) (Office for National Statistics, 2013; KOSIS, 2015). The collected samples’ age group were different, but this seems have come from the late marital age in the UK than Korea. Therefore, these two groups in the UK and Korea can be compared relevantly.

The academic background of the UK participants were 15.7 % of secondary school, 69.6 % of higher education or university, and 15.7 % of master or PhD. However, more Korean participants were recorded at the higher education and university (77.8 %) with only 6.6 % of masters or PhD. and 15.6 % of the secondary school. However, around 85 % of the UK and Korean participants were educated over high education level including masters or PhD. Moreover, the official statistical data of the population with tertiary education which refers to the highest education level was recorded correspondingly (41.0 % in the UK and 41.7 % in Korea in 2014) (24/7 Wall St., no date). Therefore, it was found that education level difference between the two countries is accepted for the comparison.

In general, the rate of employed participants both in the UK and Korea were higher than homemakers. The percentage of employed participants in the UK were higher (75.1 %) compared with 61.3 % of Koreans. However, it is explained that the labour force participation rate in the UK is higher than Korea (57.1 % and 51.8 % respectively). Therefore, this difference of female employed rate between the UK and Korea is relevantly acceptable to compare in this survey.

The participants who have two children were ranked as the highest in the UK and Korea having 42.1 % and 57.5 % respectively. Both the UK and Korean participants who had one child were similarly measured around 33 %, but the percentage of the participants with three and over four children in the UK was recorded distinctively higher than Korea (24.6 % and 9.5 % respectively). However, it was inferred that the total fertility rate (births per woman) in the UK was higher (1.89) than Korea (1.25), and mother's mean

age at the first birth in the UK was earlier (28.1) than Korea (31) in 2016 (CIA, no date). In this survey, both countries' participants were informed that only one child among their children could be considered before conducting the survey. Therefore, this demographic difference was not influencing the comparison between the two countries.

Table 7.1 Demographic characteristics analysis of participants

n (%)

Variable \ Country		UK	Korea	Total	X^2	Sig.
Age	Less than 30	31 (16.9)	51 (24.1)	82 (20.8)	7.164*	.028
	30-39	84 (45.9)	107 (50.5)	191 (48.4)		
	Over 40	68 (37.2)	54 (25.5)	122 (30.9)		
	Total	183 (100)	212 (100)	395 (100)		
Education	Secondary school	28 (15.7)	33 (15.6)	61 (15.4)	7.462*	.034
	Higher education or university	127 (69.6)	165 (77.8)	292 (73.9)		
	Master or PhD	28 (15.7)	14 (6.6)	42 (10.6)		
	Total	183 (100)	212 (100)	395 (100)		
Occupation	Housewife	45 (24.9)	82 (38.7)	127 (32.0)	8.523**	.004
	Employees	136 (75.1)	130 (61.3)	266 (67.1)		
	Total	181 (100)	212 (100)	393 (100)		
Number of child	One	61 (33.3)	70 (33.0)	131 (33.2)	22.882***	.000
	Two	77 (42.1)	122 (57.5)	199 (50.4)		
	Three	35 (19.1)	19 (9.0)	54 (13.7)		
	Over four	10 (5.5)	1 (0.5)	11 (2.8)		
	Total	183 (100)	212 (100)	395 (100)		

*p < .05. **p < .01. ***p < .001.

The gender and age distribution of participants' children were similarly measured between the UK and Korea. Table 7.2 shows the results of the Pearson's chi-square test for the gender and age comparison having a frequency and percentage of boys and girls including each age between the UK and Korea. The boys in the UK were 42.9 % comparing with 41.5 % of Korean boys and each percentage of girls in the UK and Korea were 57.1 % and 58.5 %. Each p-value of gender (.787) and age (.388) was shown that the two countries' children who were selected for this survey were appropriate to compare with similarity.

The height and weight in both countries were also compared by t-test, and Table 7.2 shows the mean and standard deviation of each dimension. The average of height in the UK was 113.16 cm compared with 112.67 cm in Korea having .807 of the p-value. In the case of weight, the UK was 22.89 kg and Korea was 21.32 kg with .95 of the p-value. Therefore, height and weight in the between the selected subjects in the UK and Korea were similar in this survey because both height and weight of p-value were over 0.5.

In short, it is concluded that the significant differences of gender, age, height, and weight between the subjects which the children aged from three to nine in the UK and Korea were not found in this survey.

Table 7.2 Demographic characteristics analysis of children

n (%)

Variable \ Country		UK	Korea	Total	X^2/ t	Sig.
Gender	Boy	78 (42.9)	88 (41.5)	166 (42.1)	X^2=.073	.787
	Girl	104 (57.1)	124 (58.5)	228 (57.9)		
Age	Three	38 (20.9)	58 (27.4)	96 (24.4)	X^2= 6.319	.388
	Four	29 (15.9)	33 (15.6)	62 (15.7)		
	Five	21 (11.5)	30 (14.2)	51 (12.9)		
	Six	22 (12.1)	23 (10.8)	45 (11.4)		
	Seven	20 (11.0)	27 (12.7)	47 (11.9)		
	Eight	29 (15.9)	21 (9.9)	50 (12.7)		
	Nine	23 (12.6)	20 (9.4)	43 (10.9)		
Height (cm)		113.16 (16.65)	112.67 (21.79)	112.9 (18.9)	t = -.244	.807
Weight (kg)		22.89 (9.61)	21.32 (8.03)	22.1 (8.7)	t = 1.674	.095

A total number of participants in the UK were 183, and 212 were collected from Korea respondents. However, a total of each variable was different due to the missing variables.

The results of the analysis were provided with the order of questionnaire as below.

Part 1. Clothing purchasing tendency of the children's wear

Part 2. Sizing system and clothing size awareness of the children's wear

Part 3. Fitting (wearing sensation) of children's wear

Part 4. Product size and size spec awareness of children's wear

Overall, frequency analysis was conducted to all results of the questionnaire. Single choice and scale question were analysed by independent sample t-test, and the multiple-choice question was analysed by Chi-square test. The short-answered question was analysed by qualitative analysis of coding and summarising data.

7.3 Clothing purchasing information of the children's wear

The first part of the survey is constructed to investigate the general purchase tendency of children's wear in the UK and Korea. It included the specific time for shopping, preferred shopping place, and shopping information sources. It also asked whether the participants go shopping with their children and how much they reflect children's preference onto the purchase. In addition, favourite brands and reason, exchange experience, the main consideration for purchase, the period which children can wear according to items were also asked.

Q2. When do you go shopping to buy your child's clothes?

Question two was designed to understand when the consumers purchase children's clothes in the UK and Korea. The given eight choices were coded using under-bar for the analysis in this survey as below.

- Q2_1 When current clothes become small
- Q2_2 When current clothes become old
- Q2_3 When current clothes become boring
- Q2_4 When components of clothes are missing
- Q2_5 When parts of clothes are torn
- Q2_6 When a special day is coming
- Q2_7 When children want to have new clothes
- Q2_8 When matching clothes are needed

The Chi-Square for Independence test was conducted as an initial analysis for finding out the frequency. A Chi-Square Test is also called as Pearson's Chi-Square can be applied to two major areas which are the goodness of fit test and test of independence. A Chi-square test is used to indicate whether there is a significant relationship between a dependent and an independent variable and it tests whether one variable is independent of another one. The variable can be adjusted to this test are any types of measurement - nominal, ordinal, interval or ratio, and discrete or continuous. The frequency of one nominal variable is compared with different values of the second nominal variable. The Chi-Square Test is applicable to a cross-classification (contingency table) or cross-tabulation table (crosstabs) when it is used as a test of independence (Statistics Solution, no date).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test were conducted to examine the explanation power of interterm correlation analysis. The value of KMO is between 0 and 1 and values closer to 1 can be interpreted that this test has strong explanation power (see Table 7.3).

Table 7.3 Interpretation of the KMO (Kaiser-Meyer-Olkin Measure)

(Reproduced from the Institute for digital research and education, UCLA)

KMO Value	Degree of Common Variance
0.90 to 1.00	Marvelous
0.80 to 0.89	Meritorious
0.70 to 0.79	Middling
0.60 to 0.69	Mediocre
0.50 to 0.59	Miserable
0.00 to 0.49	Don't Factor

The results of KMO is 0.743, and the degree of common variance among the seven variable is ‘Middling’ (see Table 7.4). It is interpreted that the extracted factors will explain a fair amount of variance when a factor analysis is conducted. As can be seen in Table 7.4, Bartlett's Test of Sphericity evaluates the suitability of analysis model, and the result of this test of p-value verify the factor analysis model ($p<.001$). These tests provide a minimum criterion which is required before a factor analysis is performed.

Table 7.4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.743**
Bartlett's Test of Sphericity	Approx. Chi-Square	716.133
	df	21
	Sig.	**.000**

Principal Component Analysis (PCA) was carried out for investigating the relations of each variable and for helping to examine the patterns by summarising into a few factors. PCA extracted two components using Varimax with Kaiser Normalisation to maximise the sum of variances. Communalities was found out to explain the proportion of each variable's variance and the variable of Q2_6, 'When a special day is coming' was deleted because the variable was less than 0.4 by a table of commonalities.

Therefore, the eight variables were reduced into two factors by principal component analysis having in common and particular loading on the factor with over 0.4 of commonalities value. Table 7.5 shows the examined validity of measurement tool and the results of reliability analysis.

Table 7.5 Validity of measurement tool and result of reliability analysis

Factor	Variable	Principal component analysis			Reliability
		Communalities	Total	% of Variance	Cronbach's Alpha
1	Q2_8	.680	2.628	37.541	.781
	Q2_3	.646			
	Q2_7	.602			
	Q2_4	.462			
	Q2_6	Deleted (Communalities: .382)			
2	Q2_1	.705	1.671	23.874	.608
	Q2_2	.670			
	Q2_5	.534			

The extracted Factor 1 and Factor 2 had 0.781 and 0.608 of Cronbach's alpha value respectively (see Table 7.5). Cronbach's alpha measures the reliability or internal consistency of the set of variables, and the results of α coefficient of reliability are from 0 to 1 having interpretation this overall evaluation of the reliability of measurement (see Table 7.6). Factor 1 is 'Acceptable', and Factor 2 is 'Questionable,' but these two values were

accepted in this study because more than 0.6 is the standard of permission of social science generally (Goforth, 2015).

Table 7.6 Interpretation of Cronbach's alpha

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

The each variable from distinct two featured values of factor loading 2 were listed in Table 7.7. The variables of Factor 1 were ordered as Q2_8, Q2_3, Q2_7, and Q2_4 and Factor 2 were Q2_1, Q2_2, and Q2_5. It was found that these two factors had psychological and practical features respectively. Therefore, these were named as 'Psychological satisfaction and comfort' and 'Decrease of performance and practicality' according to the common characteristics.

Table 7.7 Result of principal component analysis

No.	Variable	Component	
		1	2
Q2_8	When matching clothes are needed	.824	-.056
Q2_3	When current clothes become boring	.800	.053
Q2_7	When children want to have new clothes	.768	.101
Q2_4	When components of clothes are missing	.656	.164
Q2_1	When current clothes become small	-.164	.819
Q2_2	When current clothes become old	.230	.786
Q2_5	When parts of clothes are torn	.457	.576

Next, the variables of each factor was computed following these formula; Factor 1 = [Q2_8 + Q2_3 + Q2_7 + Q2_4] / 4, Factor 2= [Q2_1 + Q2_2 + Q2_5] /3. Independent samples test was conducted to find out the frequency of two countries and the results are shown in Table 7.8.

There was a significant difference between the UK and Korean consumers in the results of the timing for shopping (p<.001). The Korean consumers were influenced by the psychological satisfaction and comfort's factor (3.06) while the UK consumers had 2.49. Moreover, Korean consumers also had more tendency to go shopping when the performance and practicality of garment were decreased (3.73) than the UK having 3.48.

Table 7.8 Sales impacts factors

(mean (std. deviation))

Factor	UK	Korea	t-value	Sig.
Psychological satisfaction and comfort	2.49 (.73)	3.06 (.77)	-7.590	.000
Decrease of performance and practicality	3.48 (.61)	3.73 (.74)	-3.627	.000

***p < .001.

Q3. Where do you mostly buy your child's clothes?

The place where the UK and Korean participants purchase their children's clothing was found and is shown in Table 7.9. It was found that there is a significant difference between the UK and Korea (p<.001).

To compare the preferable place of children's wear shopping between the UK and Korea, a Chi-square test was conducted after conducting the frequency analysis. The choices of online and TV home shopping were merged into one category which is named non-store shopping due to their fewer frequencies (under 5) from the results of the frequency analysis.

It was found that almost half of the UK participants purchased their children's clothing at big chain supermarkets (54.1 %) having the comparison with only 12.3 % of Korean responses (see Table 7.9 and Figure 7.1). Non-store shopping was recorded considerably from the Korean participants (37.7 %) while only 19.3 % was recorded from the UK consumers.

Table 7.9 Purchase location of children's wear

n (%)

Variable \ Country	UK	Korea	X^2	Sig
Non-store	35 (19.3)	80 (37.7)	117.911***	.000
Brand shop	21 (11.6)	15 (7.1)		
Big chain supermarket	98 (54.1)	26 (12.3)		
Department store	21 (11.6)	21 (9.9)		
Outlet store	1 (0.6)	61 (28.8)		
Other	5 (2.8)	9 (4.2)		
Total	181 (100.0)	212 (100.0)		

***p < .001.

The remarkable difference was shown in the outlet store sector having the second largest responses in Korea (28.8 %) compared with only 0.6 % of the UK. Regarding the other answers, the charity shop and boot sales were recorded in the UK and wholesale markets, multi-shopping mall and overseas direct purchasing were replied to in Korea.

Figure 7.1 Purchase location of children's wear

Q4. Where do you get the information of child's clothes?

Question four was designed to investigate the information resources for children's wear shopping. The choices of questions were (1) Newspaper and magazine, (2) TV advertisements, (3) Internet, (4) Celebrities' children, (5) Acquaintances, (6) Other children's outfit, (7) Window display.

Overall, each variable was recorded with a significant difference between the UK and Korea (p<.001). The most preferred resources in the UK and Korea was the internet having a similar rate of responses (45.9 % and 43.9 %

respectively). The window display was chosen as the second preferred informative material in the UK (22.4 %) and Korea (27.8 %). Only 4.4 % of UK participants responded that they had information from their acquaintances while Korean consumers replied having 13.0 %. The next following choices both the UK and Korea were ‘Other children’s outfit,' ‘TV advertisements,' and ‘Newspapers and magazines’ (see Table 7.10 and Figure 7.2). Other UK participants responded that consumers could get the information by browsing stores and looking in-store displays (7.1 %). There was the only one participant both the UK and Korea who did not care about clothing information.

Table 7.10 Resources of purchasing information

n (%)

Country / Variable	UK	Korea	X^2	Sig
Newspapers and magazines	5 (2.7)	3 (1.4)	27.614	.000
TV advertisements	9 (4.9)	3 (1.4)		
Internet	84 (45.9)	93 (43.9)		
Celebrities’ children	1 (0.5)	3 (1.4)		
Acquaintances	8 (4.4)	28 (13.0)		
Other children’s outfit	22 (12.0)	22 (10.4)		
Window display	41 (22.4)	59 (27.8)		
Other	13 (7.1)	1 (0.5)		
Total	183 (100)	212 (100)		

***p < .001.

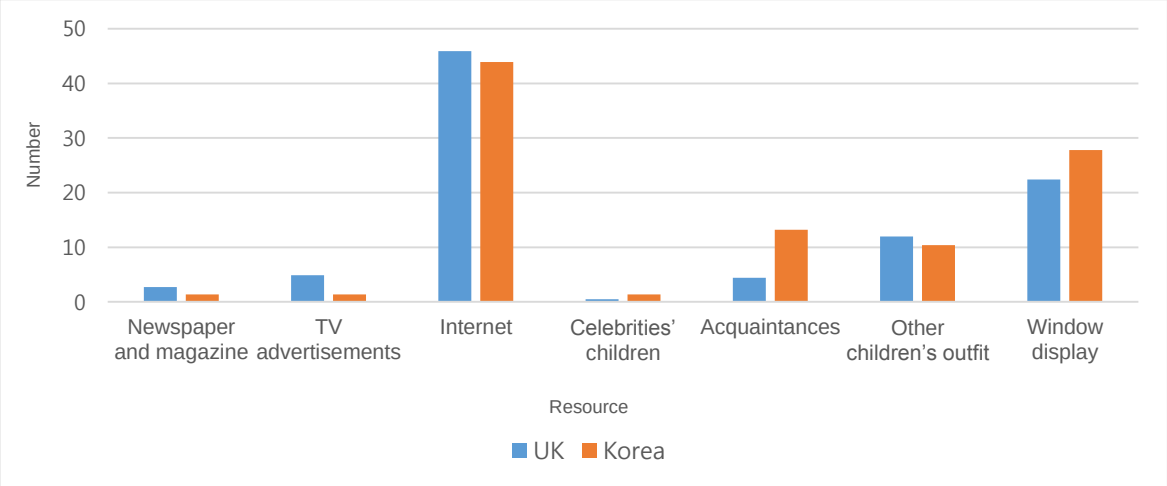

Figure 7.2 Resources of purchasing information in the UK and Korea

Next, the variables were categorised into two groups which were ‘Marketer-oriented’ and ‘Consumer-oriented’ according to their characters even though the results show significant differences because four cells had expected to count less than five and the response rates and tendency were similar between the UK and Korea.

The marketer-oriented information could be listed as newspapers and magazines, TV advertisements, the Internet, and window display and the consumer-oriented information were found in celebrities’ children, acquaintances, and other children’s outfit.

Table 7.11 shows the results of the information sources for purchasing children’s wear is statistically nonsignificant between the UK and Korea. It was found that both the UK and Korean consumers relied on the marketer-oriented rather than consumer-oriented information.

Table 7.11 Resources of purchasing information

n (%)

Country / Variable	UK	Korea	X^2	Sig
Marketer-oriented	139 (81.8)	158 (74.9)	2.595	.107
Consumer-oriented	31(18.2)	53 (25.1)		
Total	170 (100.0)	211 (100.0)		

Q5. Do you usually go shopping with your child when you buy child’s clothes?

The frequency to go shopping with participants’ child is shown in Table 7.12. Both the UK (45.9 %) and Korean (37.7 %) participants sometimes go shopping with their child. The respondent rates of ‘Frequently’ were collected having 39.8 % in the UK and 42.9 % in Korea.

Table 7.12 Frequency to go shopping with children

n (%)

Country / Variable	UK	Korea	X^2	Sig
Rarely	26 (14.4)	41 (19.3)	3.203	.202
Sometimes	83 (45.9)	80 (37.7)		
Frequently	72 (39.8)	91 (42.9)		
Total	181 (100.0)	212 (100.0)		

Q6. How much do you reflect your child's opinions for purchasing the child's clothes?

Table 7.13 shows that how much the UK and Korean participants refer to their children's opinion. The difference of the degree of reflecting children's opinion for children's clothing purchase between the UK and Korea was not found.

It was found that both the UK and Korean consumers purchased the children's clothing according to both parents and children's opinion with 43.2 % in the UK and 50% in the Korea. However, only parents' opinion in the UK and Korea was similarly followed having 42.6 % in the UK and 34.4 % in the Korea.

Table 7.13 Degree of reflecting children's opinion

N (%)

Country / Variable	UK	Korea	X^2	Sig
Parents' opinion	78 (42.6)	73 (34.4)	2.823	.244
Both parents and children	79 (43.2)	106 (50)		
Children's opinion	26 (14.2)	33 (15.6)		
Total	183 (100.0)	212 (100.0)		

Q7. If you have any favourite children's clothing brands, what is the particular reason?

Question seven was designed to investigate the reasons of the UK and Korean participants' favourite brands. The choices of questions were (1) Good fitting, (2) Reasonable price, (3) Design, (4) Brand image, (5) I do not have specific favourite brands, (6) Other.

First, the frequency and percentage of Q 7 were carried out by the Chi-square test. The layered crosstab includes the individual rank from the test of Spearman rank-order correlation coefficient to measure the relation strength between the UK and Korea. The formula of Spearman rho which is noted r_s (or ρ) is shown in Figure 7.3, and the result is constrained following between ± 1. The interpretation of this test is followed the guide describing as 'very weak' (.00-.19), 'weak' (.20-.39), 'moderate' (.40-.59), 'strong' (60-.79), and 'very strong' (.80-1.0) (see Table 7.6).

H_0 of the Spearman's correlation is set 'There is not a significant relation between the UK and Korea. The value of .67 from the Spearman's

correlation in Q7 is strongly accepted H_0 and it is interpreted that the data of the UK and Korea did not have a significant relationship (see Appendix C).

$$\rho = 1 - \frac{6\sum D_i^2}{N(N^2-1)}$$

Figure 7.3 Formula of Spearman's correlation coefficient

As it can be seen in Table 7.14, it was found that the UK participants had preferable brands due to their reasonable price (85.5 %) when Korean participants consider the price as the second reason (55.2 %). Good fitting was influenced to UK participants as the second highest reason (66.7 %) for the brand preference, but Korean consumers chose thirdly having 27.6 %. The third reason of the UK was design (51.5 %) while Korean participants chose the design as the highest reason (62.6 %)

In short, the rank of each country was as follows; Reasonable price – Good fitting – Design – Brand image (UK), Design – Reasonable price – Good fitting – Brand image (Korea).

Overall, it seems that the UK participants are influenced by economic and functional aspects when Korean participants find their reason as aesthetic and psychological aspects.

Table 7.14 Reason of the favourite brand

n (%)

Country / Reason	UK		Korea		r_s
	n (%)	Rank	n (%)	Rank	
Reasonable price	141 (85.5)	1	90 (55.2)	2	
Good fitting	110 (66.7)	2	45 (27.6)	3	
Design	85 (51.5)	3	102 (62.6)	1	.67
Brand image	16 (9.7)	5	33 (20.2)	4	
Other	18 (10.9)	4	4 (2.5)	5	

More various reasons in the UK were found in 'Others' including 11 responses from 'Quality' and eight responses of 'Hardwearing and durability.' Other responses were 'Organic,' 'Environmentally friendly,' 'Ethical manufacturing,' 'Comfort,' 'Cultural heritage,' 'Value for money,' and

‘Reselling value.' The others of Korean consumers chose ‘good fabric quality’ (n=3) and ‘preference of child’ (n=1).

Q8. If you have exchanged your child’s clothes, what were the reasons?

Question eight was asked the UK and Korean participant’s exchange experience about children’s wear. The choices of questions were (1) Poor fitting, (2) Poor quality, (3) Over-priced, (4) Colour and Design, (5) I do not normally exchange clothes, (6) Other.

The results of participants’ exchanging reasons are equally ranked between the UK and Korea (see Table 7.15). The Spearman rank-order correlation is tested to figure out the each country’s rank order after the each frequency was found by Chi-square test. The value of r_s reject the H_0; there is not a significant relationship between the UK and Korea. Therefore, it is interpreted that there is a significant relationship between two countries. The highly responded reason of exchanging children’s wear was poor fitting followed by poor quality, over-priced, colour and design in sequence both the UK and Korea (see Figure 7.4).

Table 7.15 Exchange reasons of children’s wear

n (%)

Country / Reason	UK		Korea		r_s	Sig.
	Rank	n (%)	Rank	n (%)		
Poor fitting	1	92 (83.6)	1	100 (64.3)	1.0***	.00
Poor quality	2	32 (29.1)	2	28 (22.4)		
Over-priced	3	6 (5.5)	3	14 (4.2)		
Colour and Design	4	5 (4.5)	4	40 (3.5)		
Other	5	4 (3.6)	5	3 (2.8)		

***p < .001

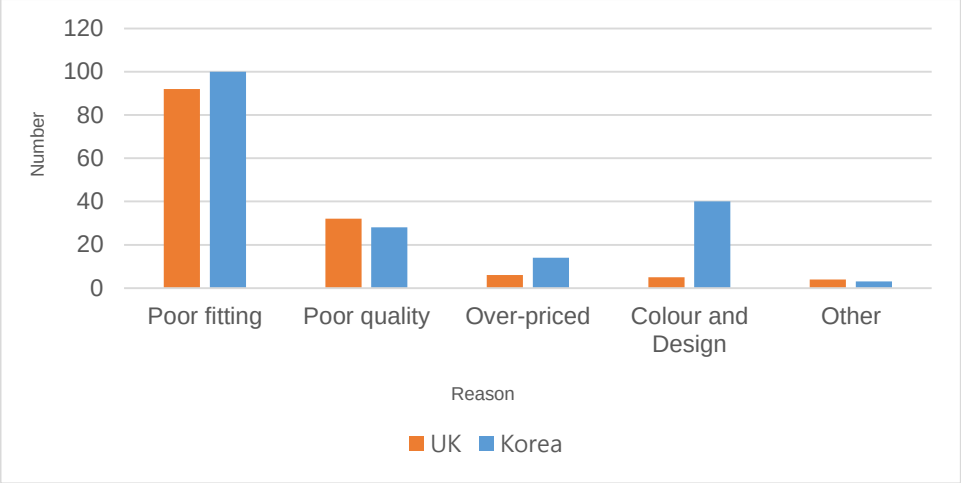

Figure 7.4 Exchange reasons of children's wear

Q9. What is your purchasing factor when you buy your child's clothes?

Question nine was designed to find out what is the UK and Korean participants' purchasing factor and the 15 choices with codes were followed as below.

- Q9_1. Brand name awareness and popularity
- Q9_2. Reasonable price
- Q9_3. Good design
- Q9_4. Nice colour and pattern
- Q9_5. Correspondence with other clothes I have
- Q9_6. Fashionableness
- Q9_7. Child's tastes and preferences
- Q9_8. Well-fitted sensation
- Q9_9. Good quality of fabric
- Q9_10. Sturdy sewing
- Q9_11. Convenience of care and cleaning
- Q9_12. Comfort of wearing and movability
- Q9_13. Easiness to wear and take off
- Q9_14. Worry of getting wrinkled, spotted, and stained
- Q9_15. Degree how long it can be worn for child's growth

First, the initial result was analysed using Chi-square test to figure out the each variable's frequency. Next, KMO and Bartlett's test was performed to provide a minimum criterion before a factor analysis. The results of KMO is 0.840, and the degree of common variance among the variable is 'Meritorious,' and the extracted factors can be explained the appropriate amount of variance when a factor analysis is conducted (see Tables 7.3 and

7.16). The suitability of analysis was evaluated by Bartlett's test of Sphericity, and the p-value of the results can verify the factor analysis model (p<.001).

Table 7.16 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.840**
Bartlett's Test of Sphericity	Approx. Chi-Square	1966.591
	df	91
	Sig.	**.000**

Principal Component Analysis was conducted to investigate variable relationships of purchasing factors. A total of 15 variables were reduced into four factors with particular loading factor with over 0.4 of commonalities value, and the rotation method was Varimax with Kaiser Normalization. The choice of Q9_7 (communalities: .321) was deleted due to under 0.4 of commonality value. The examined validity of measurement tool and the results of reliability analysis is shown in Table 7.17. The results of Cronbach's alpha is explained the reliability of the variables. The extracted Factor 1 is interpreted as 'Good' (.849), the Factor 2 is 'Acceptable' (.708), the Factor 3 is 'Questionable' (.687), and Factor 4 is 'Poor' (.579) (see Table 7.6). The Factor 3 and 4 are accepted in this study because Nunally (1967) mentioned that even modest reliabilities of .60 or .50 might be acceptable.

Table 7.17 Validity of measurement tool and results of reliability analysis

Factor	Variable	Factor analysis			Reliability
		Communalities	Total	% of Variance	Cronbach' Alpha
1	Q9_10	.718	3.458	24.703	.849
	Q9_9	.723			
	Q9_12	.668			
	Q9_11	.639			
	Q9_13	.598			
	Q9_8	.415			
2	Q9_6	.663	2.157	15.410	.708
	Q9_1	.613			
	Q9_5	.639			
3	Q9_4	.724	1.947	13.904	.687
	Q9_3	.720			
	Q9_2	.576			
	Q9_7	Deleted (Communalities: .321)			
4	Q9_15	.737	1.558	11.126	.579
	Q9_14	.686			

The each variable featured by the factor loading four were shown in Table 7.18. These four factors were described depending on the common characteristics and were named as ‘Fit and quality,' ‘Brand and trend,' ‘Design and price’ and ‘Durability.'

Table 7.18 Result of principal component analysis

No.	Variable	Component			
		1	2	3	4
Q9_10	Sturdy sewing	.835	.109	.075	.055
Q9_9	Good quality of fabric	.793	.139	.204	-.183
Q9_12	Comfort of wearing and movability	.759	-.021	.149	.265
Q9_11	Convenience of care and cleaning	.676	.026	.094	.415
Q9_13	Easiness to wear and take off	.653	.095	.046	.400
Q9_8	Well-fitted sensation	.560	.217	.204	.115
Q9_6	Fashionableness	.033	.804	.106	.064
Q9_1	Brand name awareness and popularity	.047	.779	-.015	.062
Q9_5	Correspondence with other clothes	.376	.655	.236	.117
Q9_4	Nice colour and pattern	.101	.192	.816	.111
Q9_3	Good design	.148	.207	.806	-.074
Q9_2	Reasonable price	.247	-.273	.642	.169
Q9_15	Degree how long it can be worn for child’s growth	.141	.070	.152	.830
Q9_14	Worry of getting wrinkled, spotted, and stained	.318	.478	-.084	.591

The variables of each factor was computed, and independent samples test was conducted for finding out the frequency of each country (see Table 7.19).

It was found that there was a significant difference between the UK and Korean participants in the perspective of purchasing consideration (see Table 7.19 and Figure 7.5). Korean participants considered in the factor of ‘Fit and quality,' ‘Brand and trend,' and ‘Durability’ ($p < .001$) but the UK participants examined ‘Design and price’ more than Korean ($p < .05$).

Table 7.19 Results of purchasing consideration

(mean (std. deviation))

Factor	UK (n=181)	Korea (n=212)	t-value	Sig.
Fit and quality	3.96 (.61)	4.27 (.53)	-5.346	.000
Brand and trend	2.90 (.77)	3.55 (.65)	-9.092	.000
Design and price	4.26 (.47)	4.15 (.57)	2.111	.035
Durability	3.22 (.78)	3.98 (.68)	-10.270	.000

*p < .05. ***p < .001.

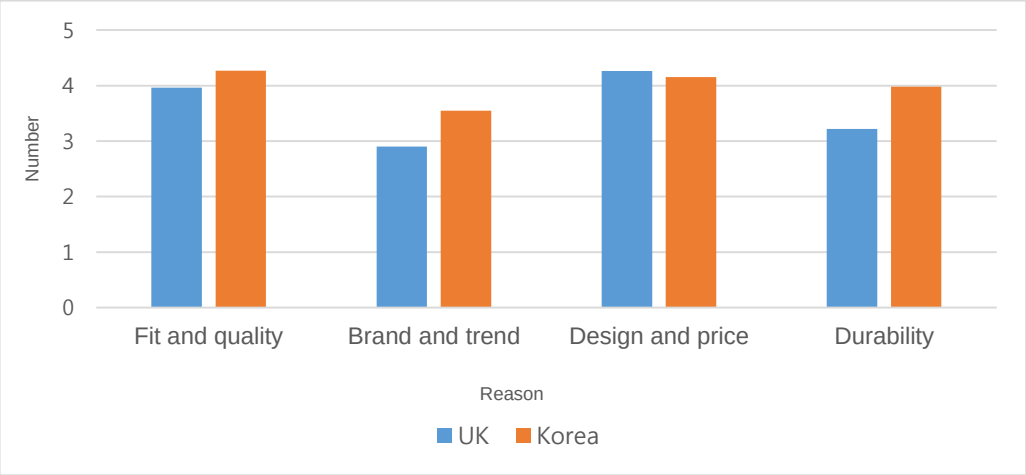

Figure 7.5 Results of purchasing consideration

Q10. How long does your child wear their clothes?

The tendency how long children's wear can be worn according to the item was compared between the UK and Korea. It was found that there were significant differences on the items of the shirt, jacket, coat, trousers, and skirt (p<.001) but the results of T-shirt and dress were similarly collected from two countries (See Table 7.20).

The UK participants responded almost all times except jackets and coats could wear less than one year, and the most response rates were approximately 50%. However, the items that be worn for less than one year for Korean participants were a t-shirt, shirt, and dress. Regarding the period between one year and two years were found in jackets and coats from the UK participants while trousers and skirts were investigated by Korean participants. Only Korean participants choose over two years for wearing jackets and coats having over 50% of responses.

In general, it is concluded that the UK children wear the clothes for a shorter period than Korean children. Moreover, outer items such as jackets and coats were worn much longer by Korean children.

Table 7.20 Wearable periods according to items

n (%)

	Less than one year		Between one year and two years		Over two years		Total		X^2	Sig.
	UK	Korea	UK	Korea	UK	Korea	UK	Korea		
T-shirt	93 (50.8)	93 (43.9)	65 (35.5)	72 (34.0)	25 (13.7)	47 (22.2)	183 (100)	212 (100)	4.978	.083
Shirt	100 (54.6)	84 (39.6)	59 (32.2)	78 (36.8)	24 (13.1)	50 (23.6)	183 (100)	212 (100)	11.092**	.004
Jacket	51 (28.2)	31 (14.6)	81 (44.8)	64 (30.2)	49 (27.1)	117 (55.2)	181 (100)	212 (100)	32.483***	.000
Coat	50 (27.9)	22 (10.4)	65 (36.3)	64 (30.2)	64 (35.8)	126 (59.4)	179 (100)	212 (100)	28.546***	.000
Trousers	102 (56.7)	74 (34.9)	59 (32.8)	86 (40.6)	19 (10.6)	52 (24.5)	180 (100)	212 (100)	22.357***	.000
Dress	54 (41.9)	39 (31.5)	50 (38.8)	52 (41.9)	25 (19.4)	33 (26.6)	129 (100)	124 (100)	3.465	.177
Skirt	48 (45.3)	27 (21.8)	43 (33.6)	57 (46.0)	27 (21.1)	40 (32.3)	128 (100)	124 (100)	15.729***	.000

*p < .05. **p < .01. ***p < .001.

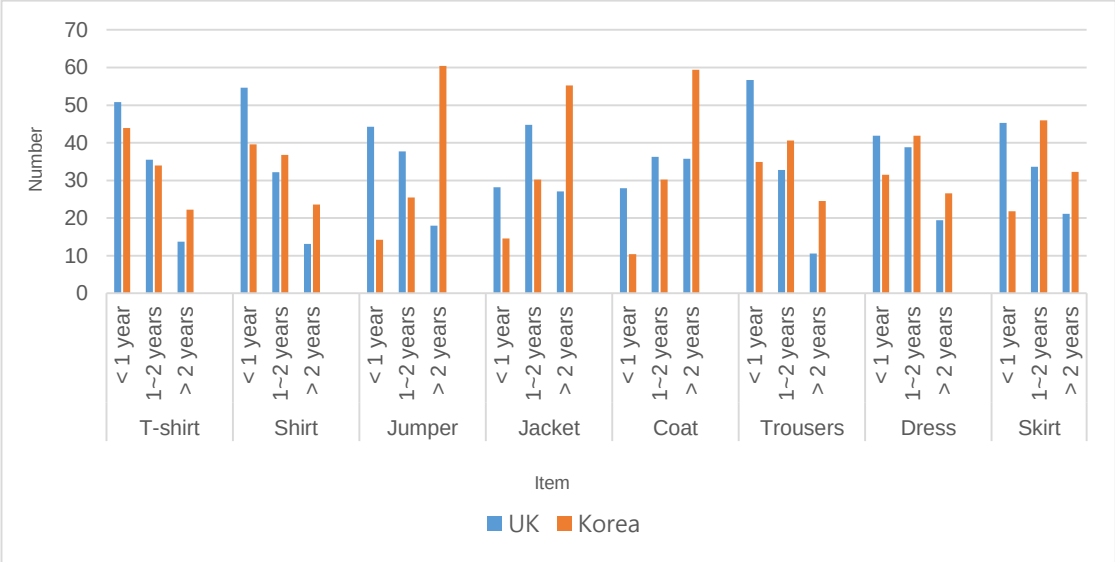

Figure 7.6 Wearable periods according to items

7.4 Sizing system and size awareness of the children's wear

Part two of the survey included the questions to investigate how much the UK and Korean participants are aware of the current children's wear sizing system and how they can choose their children's clothing size. Moreover, the purchasing satisfaction degree based on the size label and their criteria body part for purchasing the children's' clothing.

Q11. Do you know the children's clothing sizing system?

Table 7.21 shows the UK and Korean participants' self-recognition of current children's wear sizing system, and the results of the awareness were similarly found between the two countries. Almost 50% of the UK and Korean participants responded that they know the children's clothing sizing system properly. It was also found that almost 40% of both countries' participants think they know the sizing system moderately. In total, it is concluded that nearly 90% of participants in the UK and Korea think they have appropriate knowledge about the current children's wear sizing system.

Table 7.21 Sizing system awareness

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Poorly	16 (8.8)	9 (4.2)	3.432	.180
Fair	75 (41.2)	90 (42.5)		
Well	91 (50)	113 (53.3)		
Total	182 (100.0)	212 (100.0)		

Q12. How can you choose the size of your child's clothes in store?

When asked about the purchasing tendency in store, the highest recorded method of the UK participants was following the size label (43.0%) comparing with 34.1 % of Korean participants which was the secondly highest responses (see Table 7.22 and Figure 7.7). 44.1 % of Korean participants prefer to let their children try on the clothes after they confirm the size from the label compared with 24.0% of the UK participants. As to the third choice, 32.4% of the UK participants and only 14.2 % of Korean participants responded that they used the previous shopping experiences for selecting clothing size. Asking shop manager is measured with only 0.6% and 7.6% of the UK and Korean participants respectively. Other answers in

the UK were found that they figure out by measuring by eye or by holding the garments onto the body while Korean participants responded that they choose a bigger size than shop assistants' recommendation.

Overall, it is found that there is a significant difference in the store shopping between the UK and Korea (p<.1) and the UK participants are passive about trying on clothes and asking shop assistants rather than Korean participants.

Table 7.22 Children's wear purchasing tendency in store

n (%)

Variable \ Country	UK	Korea	X^2	Sig.
I choose the clothes based on the size label	77 (43.0)	72 (34.1)	11.836**	.003
I let my child try on the clothes after choosing the clothes with the size	43 (24.0)	93 (44.1)		
I choose the size based on previous shopping experiences	58 (32.4)	30 (14.2)		
I ask to give help to choose the size to the shop manager	1 (0.6)	16 (7.6)		
Total	179 (100.0)	211 (100.0)		

**p < .01

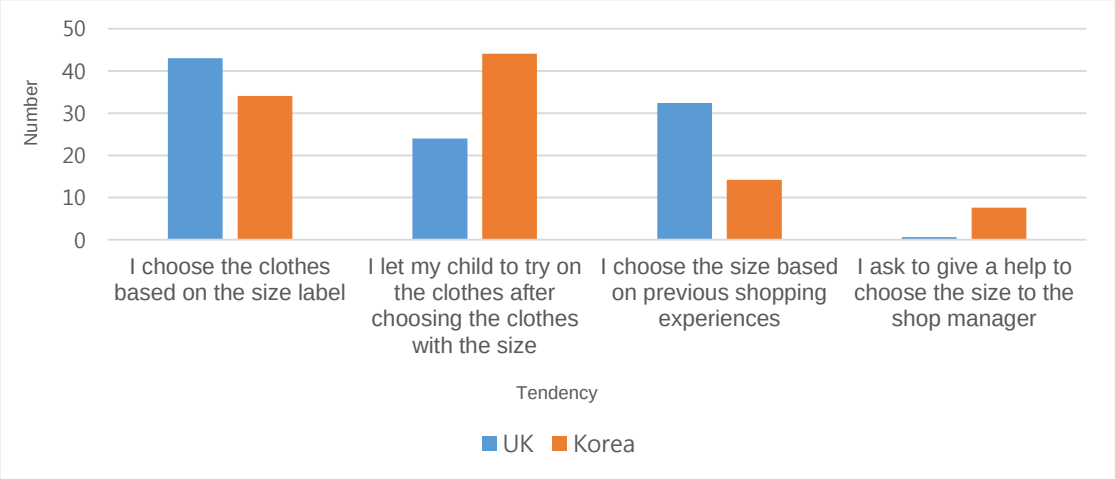

Figure 7.7 Children's wear purchasing tendency in store

Q13. How much the clothes which were chosen by the size with matching the size label fit to your child?

Table 7.23 lists the percentage of fit satisfaction degree according to the clothing size from the size label, and there is a significant difference between the UK and Korea ($p<0.1$). Both the UK and Korea responded 'well' as the highest (45.6% and 54.7% respectively), but the rate of the UK responses was slightly lower. Similarly, the percentage of two countries of respondents around 41% gave their choice to 'fair' as the second highest response. However, more than three times of the UK participants feel poorly fitted than Korean participants (13.7%) (see Table 7.23 and Figure 7.8).

Table 7.23 Fit satisfaction degree of the size label

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Poorly	25 (13.7)	9 (4.2)	11.836**	.003
Fair	74 (40.7)	87 (41.0)		
Well	83 (45.6)	116 (54.7)		
Total	182 (100.0)	212 (100.0)		

**p < .01.

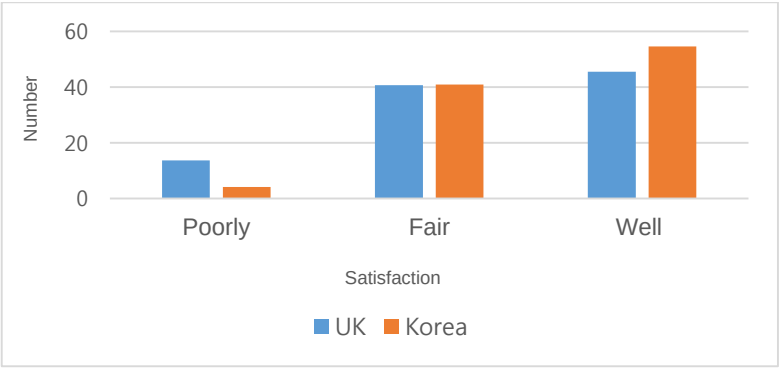

Figure 7.8 Fit satisfaction degree of the size label

Q14 and Q15 Which area can be criteria to choose the size of your child's upper and lower body clothes?

The criteria parts of the body which the UK and Korean participants reflect on purchasing children's wear were measured. The choices of upper clothes were the neck, shoulder, armhole, chest (bust), sleeve, and total length. For the lower parts of clothes, waist, hip, abdomen, crotch, thigh, and total length were given as the choices. The UK and Korean participants chose a single

answer for both top and bottoms and Table 7.24 provides information on the results.

Both the UK and Korean participants considered total length as the highest for purchasing top (69.0 % and 47.1 % respectively), but around 80% of the UK participants also chose total length as their criteria while Korean participants consider waist as the highest for the purchase of bottoms (38.7%).

Table 7.24 Purchase consideration parts of top and bottoms

n (%)

Country	UK		Korea	
Parts / Item	Parts	N (%)	Parts	N (%)
Top	Total length	127 (69.0)	Total length	100 (47.1)
Bottoms	Total length	145 (78.8)	Waist	82 (38.7)

7.5 Fitting (wearing sensation) of children's wear

The part three of the survey is set to understand the UK and Korean participants' satisfaction degree of fitting when it is followed by the sizing system and awareness of the differentness of current sizing system including the information of their satisfactory brand' name and size. Moreover, participants in the UK and Korea were asked their preferable fit and the uncomfortable body parts with fitting degree according to clothing items. Lastly, both countries' participants responded whether they had experiences to alter or mend clothes and where that part was.

Q16. How much you were satisfied with the child's clothes followed the size label's information?

Table 7.25 shows the participants' satisfaction with children's wear size label information in the UK and Korea, and there was a significant difference between two countries ($p<.001$). Over a half of both countries' participants were satisfied with the size label's information having 59.0 % of the UK and 56.6 % of Korean responses. However, the unsatisfactory rate of the UK was almost three times higher than Korea, and neutrally satisfactory rate of the UK (28.9 %) was lower than Korea (39.6 %) (see Figure 7.9).

Table 7.25 Size label information satisfaction level

n (%)

Variable \ Country	UK	Korea	X^2	Sig.
Unsatisfactory	22 (12.0)	8 (3.8)	11.766**	.003
Neutral	53 (28.9)	84 (39.6)		
Satisfactory	108 (59.0)	120 (56.6)		
Total	183 (100.0)	212 (100.0)		

**p < .01

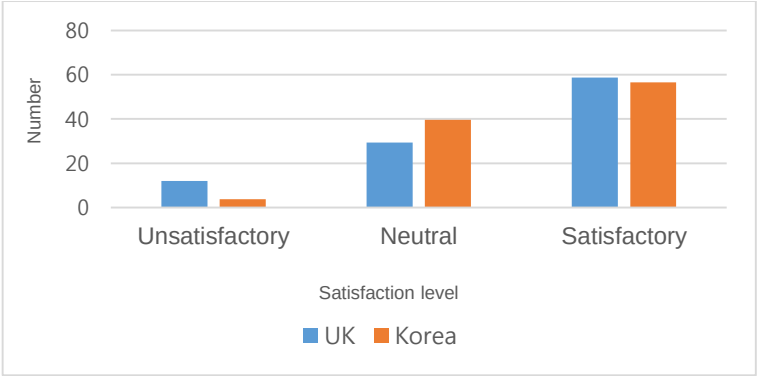

Figure 7.9 Size label information satisfaction level

Q17. Were most of the brands' clothes with same sizes well-fitted to your child regardless of the brands?

The responses of Q17 has a significant difference between the UK and Korea (see Table 7.26). It is found that both the UK and Korean participants responded the clothes with the same sizes in different brands were generally well-fitted with around 40% of responses but a half of Korean participants found the same size of clothes between brands were neutrally fitted while 35.5% of the UK participants responded to the same choice. 23.5% of the UK participants chose 'poorly-fitted' when only 9.9% of Korean participant replied that the same size of clothes was poorly-fitted.

It is concluded that the UK participants have a considerable unsatisfactory fit when they choose the same size of clothes in different brands, and it means they feel the clothing size in brands were not equally designated. In addition, 50% of Korean responses can tell that Korean participants do not figure out the size differences between different brands. However, around 40% of both countries' responses also can say that the clothing sizes were affordably same (see Figure 7.10).

Table 7.26 Clothing size difference awareness

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Poorly-fitted	43 (23.5)	21 (9.9)	15.975***	.000
Neutral	65 (35.5)	106 (50.0)		
Well-fitted	75 (41.0)	85 (40.1)		
Total	183 (100.0)	212 (100.0)		

***p < .001

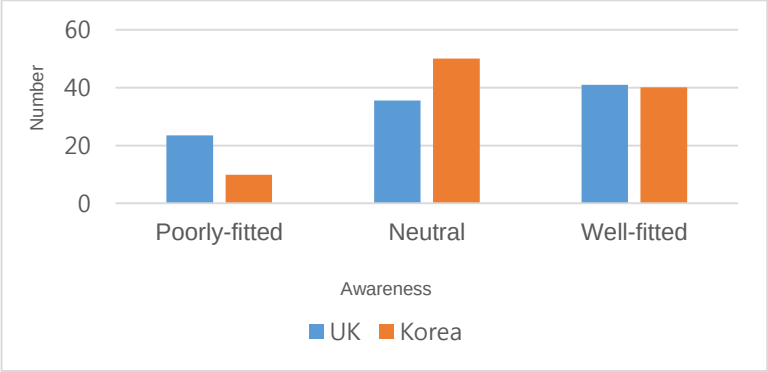

Figure 7.10 Clothing size difference awareness

Q18. If there is a specific brand which is well-fitted to your child, what the brand name and size are?

The short-answer question about the satisfactory brand which was considered clothing fit was conducted to the UK and Korean participants.

A total number of children which are reflected in this question were 134 in the UK and 121 in Korea. The age range was from age three to nine, and a significant difference was not found between the two countries (see Table 7.27 and Figure 7.11). However, age three was found as the highest with 24.4 % of both countries, and there was a tendency that the rate of age was decreased slightly while the chosen children's age was increased.

Table 7.27 Child age distribution in Q18

n (%)

Country / Age	UK	Korea	Total	t-value	Sig.
Three	32 (23.9)	58 (27.4)	96 (24.4)	.338	.736
Four	25 (18.7)	33 (15.6)	62 (15.7)		
Five	15 (11.2)	30 (14.2)	51 (12.9)		
Six	15 (11.2)	23 (10.8)	45 (11.4)		
Seven	15 (11.2)	27 (12.7)	47 (11.9)		
Eight	22 (16.4)	21 (9.9)	50 (12.7)		
Nine	8 (6.0)	20 (9.4)	43 (10.9)		
Total	134 (100)	212 (100)	346 (100)		

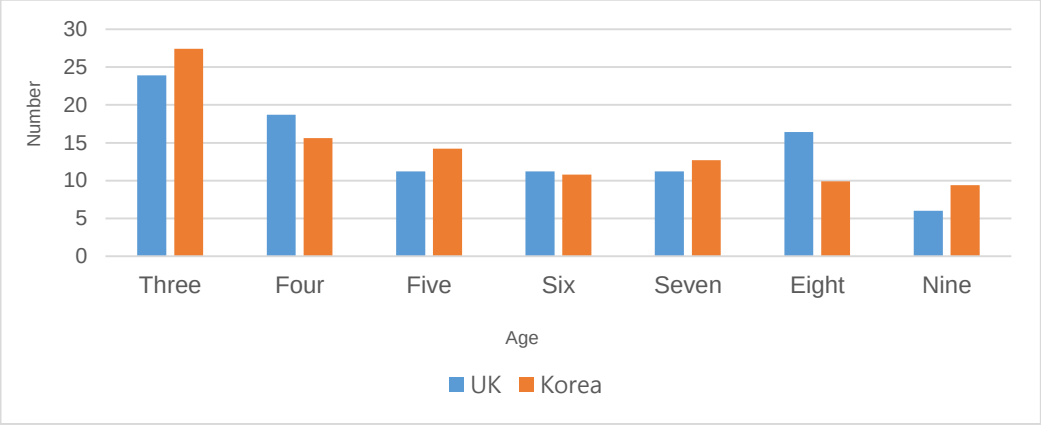

Figure 7.11 Child age distribution in Q18

The only answers which could interpret affordably are selected from all variables. For example, letter coded size such as ‘M’ and ‘don’t remember’ or ‘don’t have’ could not be included. The collected answers were coded into three categories which are ‘smaller size’, ‘same size’, and ‘bigger size’ and all choices in the UK and Korea were divided into each category following their sizing system and children’s height.

First, the difference of clothing size preference between the UK and Korea was found that there is a significant difference between two countries ($p<.001$) (Table 7.28). In general, the UK participants preferred the same size of clothes followed with their children’s size but Korean participants have a tendency to buy a bigger size of clothes (55.2 % and 75.7 % respectively) (see Figure 7.12). It is concluded that Korean participants prefer to buy the more generous size of children’s wear than the UK participants.

Table 7.28 Clothing size preference

n (%)

Country / Size	UK	Korea	Total	X^2	Sig.
Smaller size	21 (16.2)	8 (4.2)	29 (9.1)	-8.929	.000
Same size	73 (56.2)	38 (20.1)	111 (34.8)		
Bigger size	36 (27.7)	143 (75.7)	179 (56.1)		
Total	130 (100)	189 (100)	319 (100)		

***p < .001

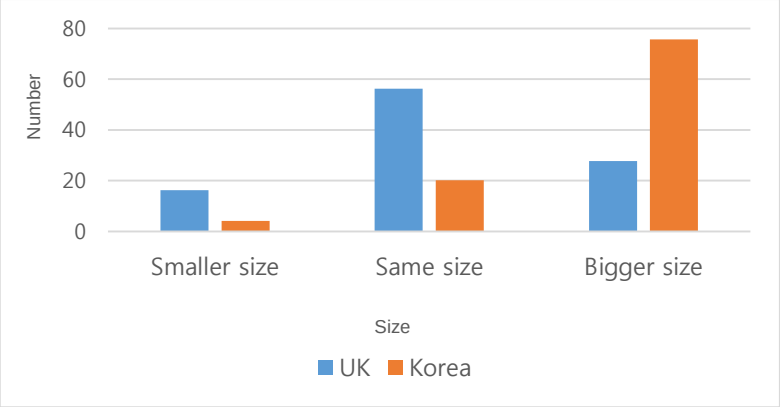

Figure 7.12 Clothing size preference

In addition, the size preference tendency based on age was compared in the UK and Korea and the difference between the two countries was not found (see Table 7.29). Age three in the UK chose the same size of clothes according to their children's size having the highest rate (16.2 %) while Korea has 17.5 %. However, it is inferred that this result has come out due to the majority of the children's distribution at age three (24.4 %) (Figure 7.13).

Table 7.29 Size preference tendency based on age

n (%)

Country / Age	Smaller size		Same size		Bigger size		X^2	Sig.
	UK	Korea	UK	Korea	UK	Korea		
Three	7 (5.4)	2 (1.1)	21 (16.2)	15 (7.9)	5 (3.9)	33 (17.5)	.258	.885
Four	4 (3.0)	1 (0.5)	14 (10.8)	4 (2.1)	5 (3.9)	24 (12.7)		
Five	2 (1.5)	1 (0.5)	8 (6.2)	2 (1.0)	4 (3.1)	24 (12.7)		
Six	1 (0.8)	1 (0.5)	9 (6.9)	5 (2.7)	8 (6.2)	16 (8.5)		
Seven	4 (3.1)	1 (0.5)	2 (1.5)	6 (3.2)	8 (6.2)	15 (7.9)		
Eight	2 (1.5)	2 (1.0)	16 (12.3)	2 (1.0)	4 (3.0)	16 (8.5)		
Nine	1 (0.8)	0 (0.0)	3 (2.31)	4 (2.1)	2 (1.5)	15 (7.9)		
Total	21 (16.2)	8 (4.2)	73 (56.2)	38 (20.1)	36 (27.7)	143 (75.7)		

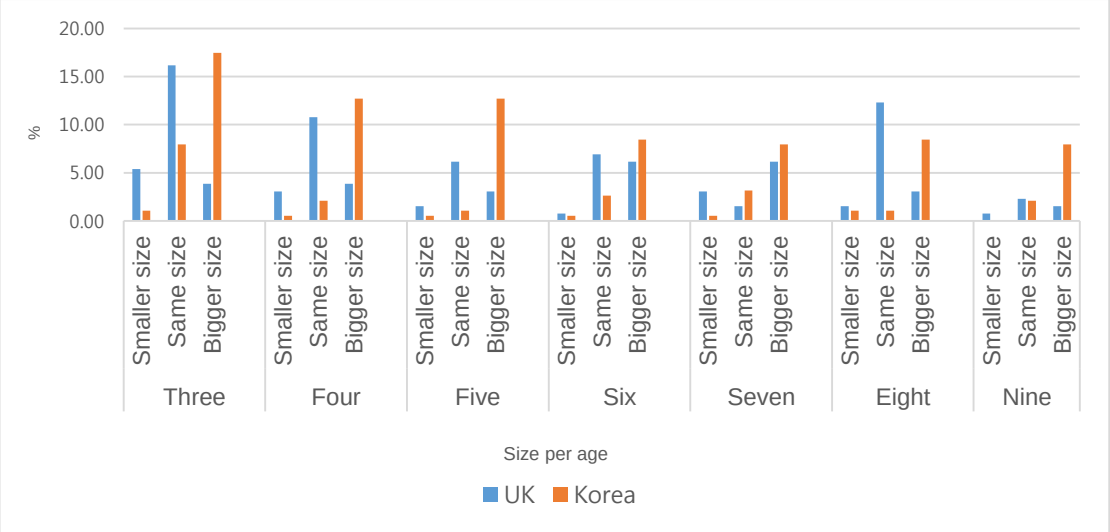

Figure 7.13 Size preference tendency based on age

When asked the difference of the size preference tendency based on gender, the results were measured similarly between the UK and Korea (see Table 7.30 and Figure 7.14). 83.0 % of girls in the UK were chosen the same size of clothes followed by their size comparing 89.0 % of girls in Korea. It was found that both boys and girls in the UK indicated that they wear the same size of clothes (54.7 % and 83.3 % respectively) with each 11.4 % and 22.6 % of smaller size's clothes. However, a considerable number of Korean children both boys and girls wear bigger sizes' clothes (69.6 % and 80.0 % respectively).

Table 7.30 Size preference tendency based on gender

n (%)

Country / Size	Boys		Girls		X^2	Sig.
	UK	Korea	UK	Korea		
Smaller size	9 (11.4)	2 (2.5)	12 (22.6)	6 (5.5)	.005	.992
Same size	29 (54.7)	22 (27.9)	44 (83.0)	16 (14.6)		
Bigger size	15 (28.3)	55 (69.6)	21 (39.6)	88 (80.0)		
Total	53 (100)	79 (100)	77 (100)	110 (100)		

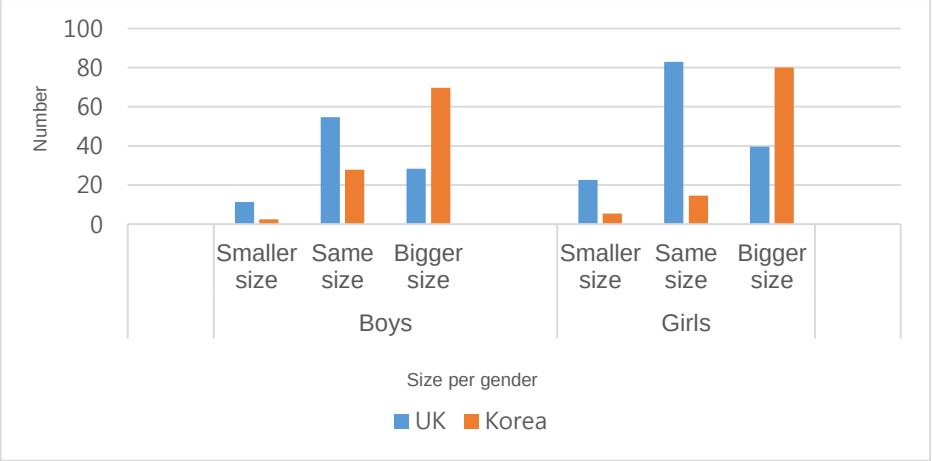

Figure 7.14 Size preference tendency based on gender

The preferred brands' name in the UK and Korea was given (see Table 7.31 and Figure 7.15). As can be seen in Table 7.31, 30.6 % of consumers in the UK were satisfied with the brand 'Next' then 'George' (13.4 %) and 'Tu' (11.9 %) were followed. Other brands which were included at 'Other' were 'Boden', 'Joules', 'Matalan', 'Monsoon' and 'Nutmeg' (each 1.5 %).

Table 7.31 Satisfactory brand according to fit in the UK

N (%)

Name	F & F	Gap	George	H&M	M&S	Next	Tu
Frequency	8 (6.0)	4 (3.0)	18 (13.4)	8 (6.0)	13 (9.7)	41 (30.6)	16 (11.9)
Name	Boden	Joules	Matalan	Monsoon	Nutmeg	Other	Total
Frequency	2 (1.5)					26 (19.4)	134 (100)

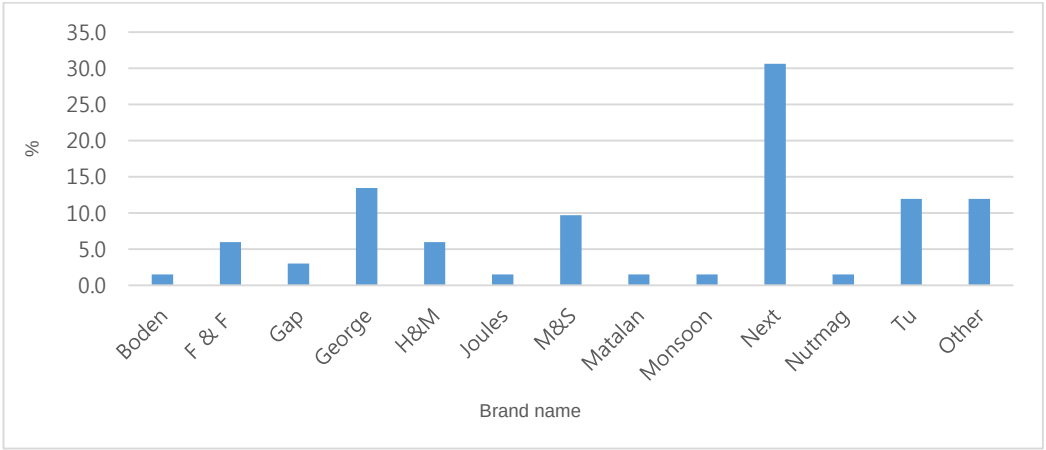

Figure 7.15 Satisfactory brand according to fit in the UK

Compared with the results of the UK, the outstandingly preferred brand was not found in Korea. The highest chosen brand was ‘Blue dog’ with only 6.6 % then ‘Polo’ (4.2 %), ‘Allo & Lugh’ and ‘Curlysue’ (3.3 %) were followed. Next, an equal percentage of ‘Bean pole Kids’ and ‘Twin Kids’ (2.8 %) then ‘Roem girls’ and ‘Agabang’ (2.4 %) were collected.

Q19. How much fit do you prefer to your child’s clothes?

Table 7.32 indicates how much fit the UK and Korean participants prefer and there is no significant difference between two conturies. In general, both the UK and Korean participants preferred the loose and neutral fit. However, Korean participants preferred a loose size of clothes slightly more than the UK (51.4%) comparing the UK responses (46.4%). Almost the same rate of the UK consumers (51.3%) chose a neutral fit while 47.2% of Koreans preferred the same fit. It is found that only a few of participants chose a tight fit with 2.2% of the UK and 1.4% of Korean responses.

Table 7.32 Children’s wear fit preference

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Tight	4 (2.2)	3 (1.4)	1.067	.587
Neutral	94 (51.3)	100 (47.2)		
Loose	85 (46.4)	109 (51.4)		
Total	183 (100)	212 (100)		

Q20. How do you match the size to the item?

The clothing size consideration for purchasing according to items was measured between the UK and Korea (see Table 7.33). There were significant differences between the two countries in the items of shirts, jackets, coats, trousers, and skirts but there was a similar preference at the t-shirt and dress.

As can be seen in Table 7.33, the items which both the UK and Korean participants chose the clothing size as same as the size label were t-shirts, shirts, trousers, and dress with 50 % of responses while trousers and dress were almost 60% were chosen following with the size label information. Regarding jackets and coats, both countries’ participants chose one or two sizes bigger, but there was a distinctive difference of response rate for each

item. Almost 80% of Korean participants chose one or two sizes bigger in jackets and coats compared to around 55% of the UK participants. Moreover, almost 40% of UK participants preferred to purchase their children's jackets and coats the same size of the size label. Even though nearly 60% of two countries' participants chose the clothing size to fit the size label, the considerable different rate of choosing one or two sizes bigger size in trousers was shown (25.1% of the UK and 40.1% of Korean). Lastly, 67.4% of the UK participants purchased the size based on the size label, but 50.8% of Korean participants chose one or two sizes bigger skirts (see Figure 7.16).

Table 7.33 Children's wear size choice tendency

n (%)

	One or two sizes smaller		Size with the size label		One or two sizes bigger		Total		X^2	Sig.
	UK	Korea	UK	Korea	UK	Korea	UK	Korea		
T-shirt	10 (5.4)	7 (3.8)	100 (54.6)	103 (48.6)	73 (39.8)	102 (48.1)	183 (100)	212 (100)	4.978	.083
Shirt	8 (4.4)	3 (1.4)	107 (58.5)	111 (52.4)	68 (37.2)	98 (46.2)	183 (100)	212 (100)	11.092**	.004
Jacket	7 (3.8)	5 (2.4)	74 (40.4)	33 (15.6)	102 (55.7)	174 (82.1)	183 (100)	212 (100)	32.483***	.000
Coat	6 (3.3)	4 (1.9)	77 (41.8)	32 (15.1)	101 (54.9)	176 (83.0)	179 (100)	212 (100)	28.546***	.000
Trousers	25 (13.7)	6 (2.8)	110 (60.4)	121 (57.1)	47 (25.8)	85 (40.1)	182 (100)	212 (100)	22.357***	.000
Dress	6 (4.6)	4 (3.2)	79 (60.3)	71 (57.3)	46 (35.1)	49 (39.5)	131 (100)	124 (100)	3.465	.177
Skirt	8 (6.2)	2 (1.6)	87 (67.4)	59 (47.6)	34 (26.4)	63 (50.8)	129 (100)	124 (100)	15.729***	.000

**p < .01. ***p < .001.

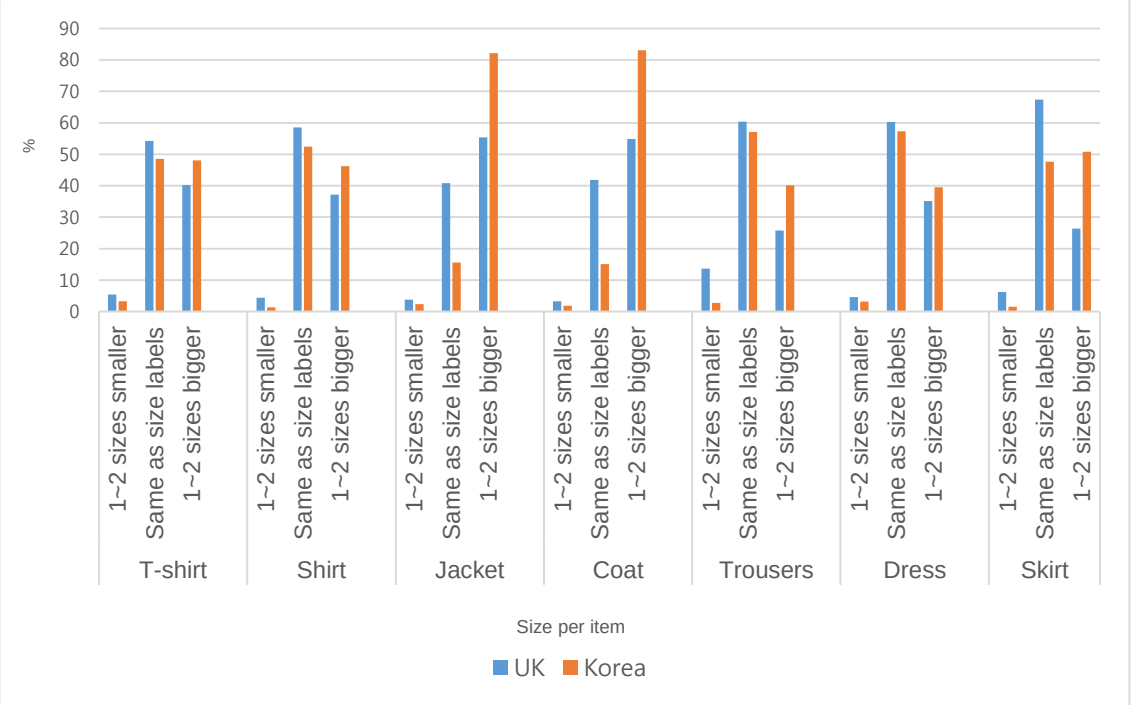

Figure 7.16 Children's wear size choice tendency

When the results of clothing size preference were compared with the duration of wearing which were found from the previous question 10, it was found that there are differences between the UK and Korea (see Table 7.34). The UK and Korean participants purchased the same size of t-shirts, shirts and dresses following the size label and these clothing items can be worn less than one year. However, the Korean participants responded their children could wear jackets between one year and two years while the UK children can wear more than two years when the participants of two countries purchase one or two sizes bigger jackets and coats than the size label was informed. Regarding trousers, both countries' participants purchase the same size of trousers according to the size label, Korean children can wear longer than the UK children.

Overall, the indicated size on the label relatively fits into their targeted size except for trousers. It is inferred that trousers in Korea have a generous fit because the purchased clothes based on the size label which is supposed fit their children can wear in one year, and outer and skirt which are purchased one or two sizes bigger can be worn between one year and two years more.

Table 7.34 Size preference and wearing duration

Item	Country	Size preference (Q20)	Wearing duration (Q10)
T-shirt, shirt, dress	UK	Size with the size label	Less than one year
	Korea		
Jacket, coat	UK	One or two sizes bigger	Between one year and two years
	Korea		Over two years
Trousers	UK	Size with the size label	Less than one year
	Korea		Between one year and two years
Skirt	UK	Size with the size label	Less than one year
	Korea	One or two sizes bigger	Between one year and two years

Q21. (1) Which areas were poorly-fitted and uncomfortable and how much those were fitted *at upper body clothes* (e.g. T-shirt, Shirts, and Jacket)?

The comfort degree of tops according to body parts was measured, and there is a significant difference between the UK and Korea. The chosen body parts for measuring were the neck, shoulder, armhole, and as Table 7.35 demonstrates the majority of parts were found relatively fitted. However the response rates of tight and loose were distinctively different between the two countries ($p < .01$ and $p < .001$).

As can be seen in Table 35, most of the body parts were responded as almost fitted having the rate of around 65% to 85% in the UK and Korea respectively. However, it was found that the UK participants feel most of the body parts except for neck are tight or short, and these percentages were around two to five times higher than with the Korean participants. In comparison, Korean participants responded that same parts which the UK participants feel tight were loose and long. Overall, each percentage of ‘Tight (Short)’ from the UK and ‘Loose (Long)’ from Korea are considerably different even though these rates do not occupy the high proportion (see Figure 7.17).

Table 7.35 Clothing comfort according to body parts at top

n (%)

Part \ Fit	Tight (Short)		Fitted		Loose (Long)		Total		X^2	Sig.
	UK	Korea	UK	Korea	UK	Korea	UK	Korea		
Neck	28 (15.6)	13 (6.1)	136 (76.0)	180 (84.9)	15 (8.4)	19 (9.0)	179 (100)	212 (100)	9.367**	.009
Shoulder	18 (10.1)	8 (3.8)	148 (82.7)	162 (76.4)	13 (7.3)	42 (19.8)	179 (100)	212 (100)	17.106***	.000
Armhole	26 (14.5)	5 (2.4)	140 (78.2)	169 (79.7)	13 (7.3)	38 (17.9)	179 (100)	212 (100)	26.607***	.000
Chest (Bust)	26 (14.5)	9 (4.2)	137 (76.5)	153 (72.2)	16 (8.9)	50 (23.6)	179 (100)	212 (100)	24.041***	.000
Sleeve	32 (18.2)	8 (3.8)	117 (66.5)	146 (68.9)	27 (15.3)	58 (27.4)	176 (100)	212 (100)	25.785***	.000
Total length	38 (21.2)	9 (4.2)	118 (65.9)	145 (68.4)	23 (12.8)	58 (27.4)	179 (100)	212 (100)	33.241***	.000

**p < .01. ***p < .001.

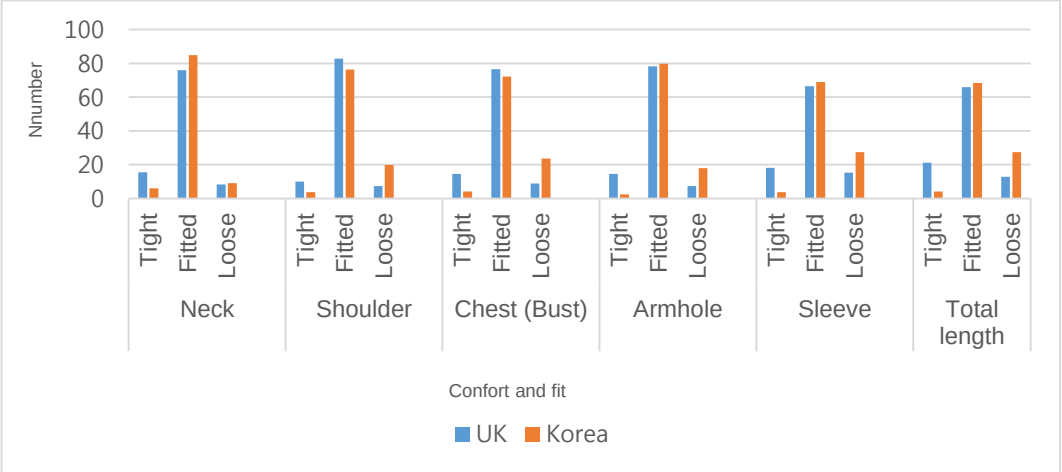

Figure 7.17 Clothing comfort and fit according to body parts at tops

<u>Q22. (2) Which areas were poorly-fitted and uncomfortable and how much those were fitted at *lower body clothes*</u> (e.g. Trousers and skirt)?

Table 7.36 indicates which body parts are unsatisfactory considering fit and comfort in bottoms. Waist, hip, abdomen, crotch, thigh, and total length are chosen as choices, and there is a significant difference between the UK and Korea (p<.001). Interestingly, it was found that Korean participants feel given all parts of the body are affordably comfortable having over approximate 65% to 80% of response rates. However, only abdomen and total length were judged as well-fitted from the UK participants. Regarding waist and hip,

the UK participants feel loose while crotch and thigh are measured as ‘Tight’ (see Figure 7.18).

Table 7.36 Clothing comfort according to body parts at bottoms

n (%)

Fit / Parts	Tight (Short)		Fitted		Loose (Long)		Total		X^2	Sig.
	UK	Korea	UK	Korea	UK	Korea	UK	Korea		
Waist	27 (25.7)	19 (9.0)	37 (35.2)	148 (69.8)	41 (39.0)	45 (21.2)	105 (100)	212 (100)	36.183***	.000
Hip	20 (28.2)	24 (11.3)	23 (32.4)	144 (67.9)	28 (39.4)	44 (20.8)	71 (100)	212 (100)	28.385***	.000
Abdomen	20 (32.8)	26 (12.3)	21 (34.4)	145 (68.4)	20 (32.8)	41 (19.3)	61 (100)	212 (100)	24.664***	.000
Crotch	23 (41.8)	13 (6.1)	16 (29.1)	165 (77.8)	16 (29.1)	34 (16.0)	55 (100)	212 (100)	60.524***	.000
Thigh	26 (49.1)	22 (10.4)	12 (22.6)	150 (70.8)	15 (28.3)	40 (18.9)	176 (100)	212 (100)	52.895***	.000
Total length	38 (34.5)	12 (5.7)	44 (40.0)	137 (64.6)	28 (25.5)	63 (29.7)	110 (100)	212 (100)	47.191***	.000

***p < .001

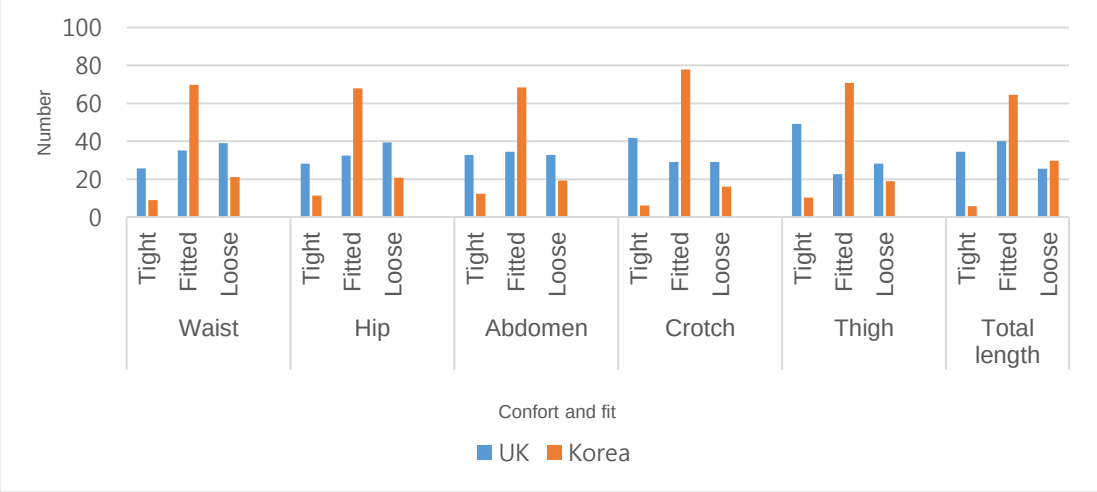

Figure 7.18 Clothing comfort and fit according to body parts at bottoms

Q23. Do you think the size between brands is different?

When asked about the sizing system difference awareness, there is a significant difference between the UK and Korea (p<.001) even though the UK and Korean participants gave the same choice of ‘Different’ as the highest (60.3% and 70.8% respectively) (see Table 7.37 and Figure 7.19). Looking at the ‘Neutral,' the rate of Korean participants were higher (27.4%) comparing with 17.9% as the lowest rates of the UK participants. However, a

considerable number of the UK participants choose ‘Similar’ (21.7 %) while only 1.9% of Korean respond at the same choice.

Table 7.37 Sizing system difference awareness

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Similar	40 (21.7)	4 (1.9)	40.372***	.000
Neutral	33 (17.9)	58 (27.4)		
Different	111 (60.3)	150 (70.8)		
Total	184 (100.0)	212 (100.0)		

***p < .001.

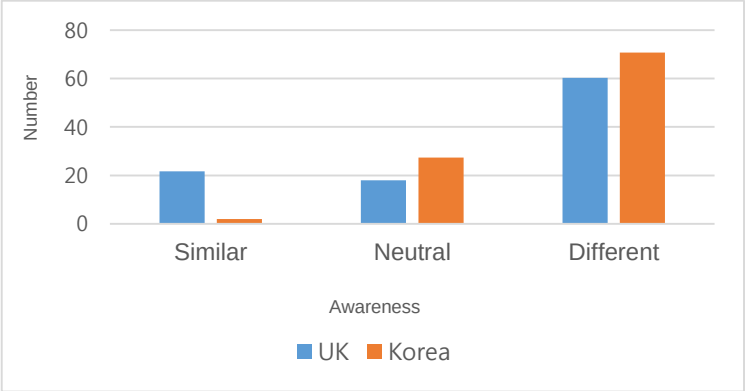

Figure 7.19 Sizing system difference awareness

Q24. Have you altered or mended clothes to fit your children?

Table 7.38 shows the experience of alteration or repairing children’s wear in the UK and Korea, and the result is found that both the UK and Korean participants have a similar experience. Overall, almost equal percentages, around 71% of both countries’ participants altered or mended their children’s clothes.

Table 7.38 Experiences of alteration or repairing clothes

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Yes	53 (28.9)	60 (28.3)	.021	.885
No	130 (71.0)	152 (71.7)		
Total	183 (100)	212 (100)		

Q25. If you answered 'Yes' to the question above, please answer which area was altered or mended?

The short-answer question was asked to figure out which part of clothes were altered or amended according to an item in the UK and Korea. Both frequencies and descriptive analysis are carried out for calculating mean variables then independent t-test is undertaken to investigate the relationship between the UK and Korea responses.

The total participants for the responses are almost 30% of the UK and Korea (33 % and 28.3 % respectively), and there is a significant difference between the two countries ($p < .01$).

As can be seen in Table 7.39, both the UK and Korean participants alter their children's trousers having the highest response (77.4 % in total). The percentage of the length of trouser is measured 58.2 % in the UK and 53.3 % in Korea then alteration of the waist on trousers was followed in both countries which the UK was 20.0 %, and Korea was 22.3 %. Both respondents described that they make trousers length shorter to fit their children's height and also when wider at the waist was altered to be fitted. It is inferred that both the UK and Korean participants buy trousers using one part of clothes as their guideline if their children are taller or well-developed than the average clothing size. For example, if they want to buy larger waist size of trousers, they need to choose one size bigger trousers, and it might have a longer length of trousers which need to be shortened.

The other parts except trousers are not distinctively responded by both countries, but a total 9.5 % of participants including in the UK, and Korean chose dresses. However, regarding dresses, a total 9.1 % of the UK participants fixed the shoulder straps, but Korean participants altered bust and waist, total length, and wrist (see Table 7.39).

In terms of the UK participants, waist of skirt and sleeve length of the top (5.5 %) and neck of the top (1.7 %) are followed. Comparing 10 % of alteration experience from Korean participants, no answer was recorded for the jackets and coats in the UK. The part for alteration of jacket and coats for Korean are total length, chest (bust), and sleeve length.

It is concluded that around 30 % (n=115) of the UK (n=55) and Korean (n=60) participants altered their children's clothes and trousers were found as the highest. It is inferred that a subdivided sizing system to fit different body shapes and development levels of children is considered.

Table 7.39 Clothing type and part with alteration

n (%)

Country / Variable	Part	UK	Korea	Total	t-value	Sig.
Trousers	Waist	11 (20.0)	14 (22.3)	25 (21.7)	-1.092**	.012
	Leg length	32 (58.2)	32 (53.3)	64 (55.7)		
Dress	Straps	5 (9.1)	0 (0)	5 (4.3)		
	Total length	0 (0)	2 (3.3)	2 (1.7)		
	Bust or waist		3 (5.0)	3 (2.6)		
	Wrist		1 (1.7)	1 (0.9)		
Skirt	Waist	3 (5.5)	0 (0)	3 (2.6)		
Shirt or top	Sleeve length	3 (5.5)	1 (1.7)	4 (3.5)		
	Neck	1 (1.8)	1 (1.7)	2 (1.7)		
Jacket or coat	Chest (bust)	0 (0)	2 (3.3)	2 (1.7)		
	Total length		3 (5.0)	3 (2.6)		
	Sleeve length		1 (1.7)	1 (0.9)		
Total		55 (100)	60 (100)	115 (100)		

7.6 Product size and size spec awareness of children's wear

The final part four in the survey consists of questions about the general opinion with the specific clothing items and body parts for the detailed children's wear size charts development in the UK and Korea. Moreover, the preference of denoting a sizing system and the requirements for indicating the specific sizes according to items. Lastly, the general idea about an efficient sizing system and improvement points of the current children's wear sizing system was also asked.

Q26. Do you agree that more specified size spec which is adopting body shape of children is required?

When opinions about detailed size spec considered body shape were asked, there is a substantial difference in the results of opinion for specified sizes necessity according to body shapes in the UK and Korea (p=.000) (see Table 7.40). Both the UK and Korean participants disagreed with subdivided size spec based on body shapes having a similar percentage (58% and

59.4% respectively). However, the greatest difference was shown in ‘agree,' where the response rate was three times higher in the UK than Korea (15.5% vs. only 3.8%). The rest of the participants respond to ‘neutral, ’ and the UK was 26.5% while Korea was 36.8%.

Overall, around half of the UK and Korean participants show disagreement for the specified size spec applied body shape differences, and almost 30% of both countries’ participants show neutral opinion (see Figure 7.20).

Table 7.40 Specified size spec requirement

n (%)

Country / Variable	UK	Korea	X^2	Sig
Agree	28 (15.5)	8 (3.8)	17.829***	.000
Neutral	48 (26.5)	78 (36.8)		
Disagree	105 (58.0)	126 (59.4)		
Total	181 (100.0)	212 (100.0)		

***p < .001.

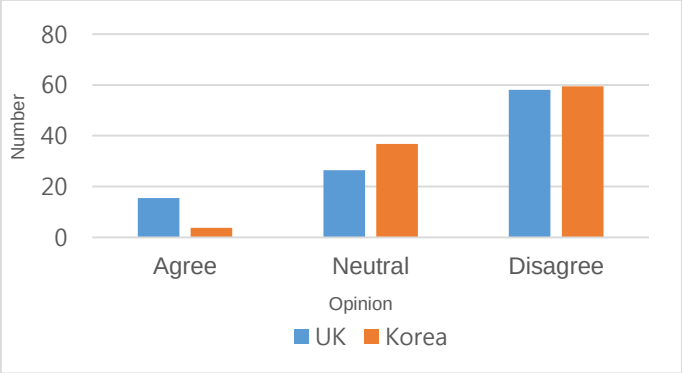

Figure 7.20 Specified size spec requirement

Q27. Which item of clothes are more required if you think that more specified size spec are required?

To understand the requirement of the specified size spec according to items, various clothing items were measured (t-shirt, shirt or blouse, jacket or coat, dress, trousers, and skirt) in the UK and Korea.

The frequency and percentage of choices are carried out by Chi-square test. The individual rank is found from the test of Spearman rank-order correlation to measure the relation strength between the UK and Korea as same as other multiple choice questions in this survey. It is interpreted the results of

the UK and Korea have a significant relationship because the value of r_s (.71) is in 'strong' (.60 -.79) at the guide rejecting the H_0 (see Table 7.9).

As can be seen in Table 7.41, it is apparent that a considerable number of the UK participants required specified size spec of trousers (73.9%) as same as Korean participants (68.5%). The second highest items of both countries were jackets and coats with 17.4% of the UK and 39.7% of Korean response rate. With respect to the UK's following items, shirts or blouses were ranked as third then dresses, t-shirts, and skirts were ranked in order. However, the thirdly ranked item in Korea was t-shirts then shirts or blouses, skirts, and dresses were followed in sequence.

Overall, it seems that the UK and Korean participants require more specified body shape's size spec of trousers considerably followed by jackets or coats (see Figure 7.21).

Table 7.41 Requirement of specified size spec according to items

Country / Item	UK		Korea		r_s
	Rank	n (%)	Rank	n (%)	
Trousers	1	136 (73.9)	1	126 (68.5)	.71
Jacket or Coat	2	32 (17.4)	2	73 (39.7)	
Shirt or Blouse	3	31 (16.8)	4	57 (31.0)	
Dress	4	28 (15.2)	6	48 (26.1)	
T-shirt	5	22 (12.0)	3	69 (37.5)	
Skirt	6	16 (8.7)	5	27 (14.7)	

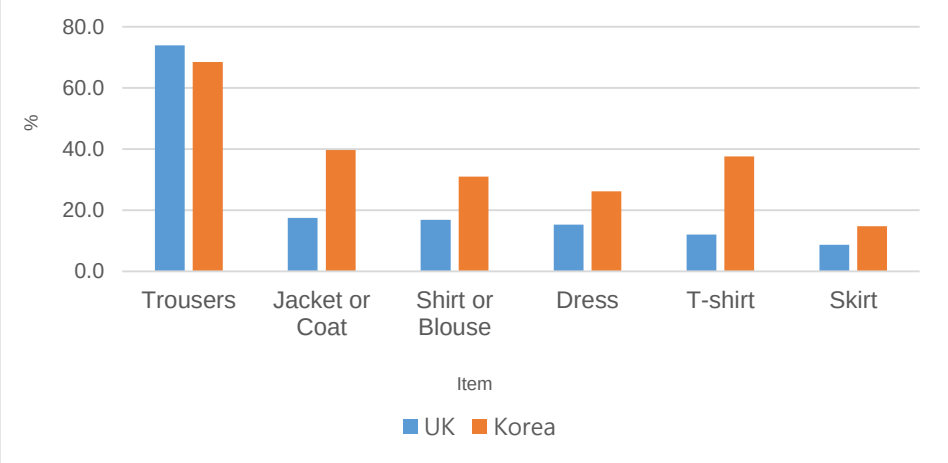

Figure 7.21 Requirement of specified size spec according to items

Q28. (1) Which parts should vary, if you think that more specified size spec is required for *upper body clothes*?

Following question Q27 is which body parts are required if there is a necessity to be applied more specified size spec in the UK and Korea and the results did not have a significant difference. In terms of top, the choices were height or total length, chest (bust), waist or hip.

Both the UK and Korean participants responded that the specific height or total length of information was required (48.6 % and 41.7 % respectively) (see Table 7.42). Chest (bust) was secondly recorded, and waist or hip was followed lastly. However, the only one UK participant and four Korean participants gave their choice to 'hip' among the participants who choose 'waist or hip' in the UK and Korea. In addition, the percentage of waist or hip from the UK participants (19.2 %) was relatively higher than Korea (2.1 %) (see Figure 7.22).

Table 7.42 Required body part for the specified size spec at top

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Height or Total length	71 (48.6)	83 (41.7)	1.639	.441
Chest (Bust)	47 (32.2)	72 (36.2)		
Waist or Hip	28 (19.2)	40 (2.1)		
Total	146 (100)	199 (100)		

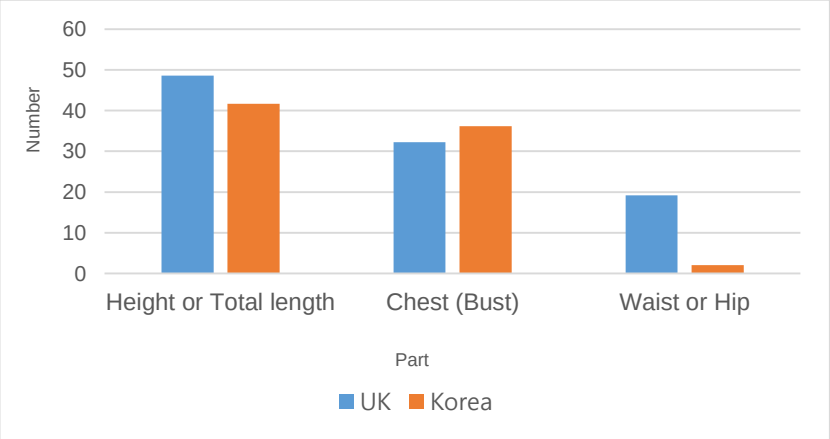

Figure 7.22 Required body part for the specified size spec at top

Q28. (2) Which parts should vary if you think that more specified size spec is required for *lower body clothes*?

Compared with the upper clothes, there is a significant difference for the opinion about specified size spec requirement in bottoms in the UK and Korea ($p < .05$).

As can be seen in Table 7.43, the UK participants responded the height or total length the most (46.5 %) while Korean participants required waist as the highly chosen part (51.3 %). However, waist which was the secondly required part of the UK participant was almost similarly recorded as the greatest choice, height or total length (43.9 %). In addition, almost one-third of Korean participants chose height or total length followed by hip (15.7 %) while 9.6 % in the UK (see Figure 7.23).

In summary, height or total length and waist are considerably required for the size spec to the UK and Korean participants.

Table 7.43 Required body part for the specified size spec at bottoms

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Height or Total length	73 (46.5)	65 (33.0)	7.630*	.022
Waist	69 (43.9)	101 (51.3)		
Hip	15 (9.6)	31 (15.7)		
Total	157 (100)	197 (100)		

*p < .05.

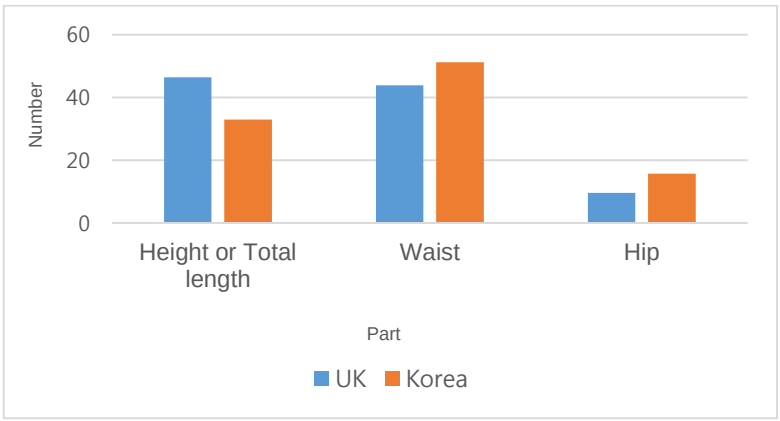

Figure 7.23 Required body part for the specified size spec at bottoms

Q29. Which can be an appropriate sizing system for children clothing?

When asked an opinion about the suitable sizing system for children's wear to the UK and Korean participants, there is a significant difference between the two countries ($p < .001$).

As can be seen in Table 7.44, the UK participants chose age as the most proper method (44.1 %) compared with only 19.9 % Korean participants of responses. Almost half of the Korean participants thought using height is the most appropriate for the children's wear sizing system (51.2 %). The combination of chest and height (e.g. 64-130) was almost equally recorded between the two countries (19.6 % in the UK and 18.5 % in Korea). Next, letter code was followed by 7.8 % in the UK and 6.2 % in Korea and the remaining in both countries was size code (4.5 % and 4.3 % respectively).

In short, the UK participants prefer the children's wear sizing system according to age while Korean participants chose height but both countries' participants consider height (UK) and age (Korea) as a suitable system secondly (see Figure 7.24).

Table 7.44 Opinion about appropriate sizing system

n (%)

Country / Variable	UK	Korea	X^2	Sig.
Height	43 (24.0)	**108 (51.2)**	37.231***	.000
Age	**79 (44.1)**	42 (19.9)		
Letter code	14 (7.8)	13 (6.2)		
Chest and Height	35 (19.6)	39 (18.5)		
Size code	8 (4.5)	9 (4.3)		
Total	179 (100.0)	211 (100.0)		

***p < .001.

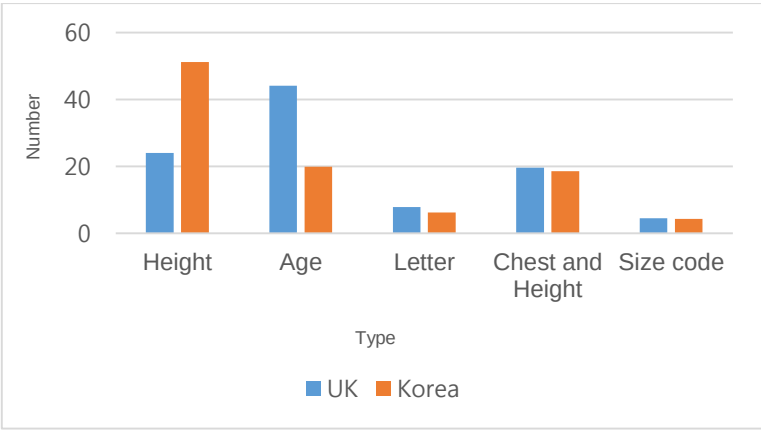

Figure 7.24 Opinion about appropriate sizing system

Q30. (1) What should be noted for the size label at *upper body clothes*?

The UK and Korean participants measured which part of the body should be indicated on the size label. As with the other multiple choice questions, the frequency and percentage of each variable were calculated using Chi-square test then the test of Spearman rank-order correlation coefficient was conducted. There was a weak relation (r_s= 0.2), and it is concluded that there is not a significant relation between the UK and Korea (see Table 7.9) but the ranking of each country's results is different.

In terms of top, age statement was ranked as the most preferred method for the UK participant having 57.1 %, and height, chest (bust), total length, weight, and waist were followed in sequence. However, 76.1 % of Korean participants preferred to have height information as the highest method then weight, total length, chest (bust), age, and waist was followed (see Table 7.45).

Compared with current brands' sizing system which was analysed in previous Chapter 6, interestingly, the frequently used information of weight in the UK was ranked only 11.4 %. However, the weight which is not often used in Korea is secondly ranked (48.9 %).

Overall, the result of sizing method preference of top tells the same preference of an appropriate sizing system from the previous question 29 (age in the UK and height in Korea). In addition, it is inferred that weight information which is commonly used in the UK is less interested while Korean participants require weight information due to their less usage in the current sizing system.

Table 7.45 Sizing method preference of top

n (%)

Country / Item	UK		Korea		r_s
	Rank	n (%)	Rank	n (%)	
Age	1	105 (57.1)	5	66 (35.9)	0.2
Height	2	83 (45.1)	1	140 (76.1)	
Chest (Bust)	3	61 (33.2)	4	68 (37.0)	
Total length	4	46 (25.0)	3	79 (42.9)	
Weight	5	21 (11.4)	2	90 (48.9)	
Waist	6	11 (6.0)	6	40 (21.7)	

Q31. (2) What should be noted for the size label at *lower body clothes*?

After conducting frequency and Chi-square test, the value of r_s (0.6) from the Spearman rank-order correlation coefficient was accepted H_0. It is interpreted that there is no significant relationship between the UK and Korea (see Table 7.46).

When preference of bottoms' sizing method was measured, the greatest variable in the UK and Korea was height (44.0 % and 65.2 % respectively), but 'age' in the UK was followed substantially (43.5 %). In respect to the waist in Korea, 60.9 % of participants required compared with 38 % of the UK participants. Total length was also considerably measured from Korean participants (53.8 %) while 34.2 % of the UK participants require the same variable. The Rest of choices in the sequence were total length – weight - hip in the UK and weight - hip - age in Korea.

Table 7.46 Sizing method preference of bottoms

Countries / Item	UK		Korea		r_s
	Rank	N (%)	Rank	N (%)	
Height	1	81 (44.0)	1	120 (65.2)	0.6
Age	2	80 (43.5)	5	54 (29.3)	
Waist	3	70 (38.0)	2	112 (60.9)	
Total length	4	63 (34.2)	3	99 (53.8)	
Weight	5	38 (20.7)	4	84 (45.7)	
Hip	6	21 (11.4)	6	48 (26.1)	

Q32. Pease leave any opinion and improvement points of current children's clothing sizing system

The final short-answer question which was designed as an open-end question was asked to acquire any opinion or suggestion about current children's wear sizing system.

Total 211 participants left their opinion at the end of the survey, but only 22.9 % of the UK participant responded while 99.5% of the response rate of Korean participants from the total participants conducted open question.

The demographic information of children shows in Tables 7.47 and 7.48. As the same as the total number of chosen children's distribution which is shown in Table 7.2 previously, age three was highly measured among the

total of UK and Korea, but age four in the UK (28.6 %) was occupied as the highest while Korea was three (25.1 %).

Table 7.47 Age distribution of Q32

n (%)

Country / Age	UK	Korea	Total	t-value	Sig.
Three	8 (19.0)	45 (26.6)	53 (25.1)	.265	.791
Four	12 (28.6)	28 (16.6)	40 (19.0)		
Five	5 (11.9)	27 (16.0)	32 (15.2)		
Six	3 (7.1)	19 (11.2)	22 (10.4)		
Seven	5 (11.9)	20 (11.8)	25 (11.8)		
Eight	6 (14.3)	16 (9.5)	22 (10.4)		
Nine	3 (7.1)	14 (8.3)	17 (8.1)		
Total	42 (100)	169 (100)	211 (100)		

As can be seen in Table 7.48, the percentage of the girls was measured more than boys in both the UK and Korea (61.9 % and 60.4 % respectively).

Table 7.48 Gender distribution of children in Q32

n (%)

Country / Size	UK	Korea	Total	t-value	Sig.
Boys	16 (38.1)	67 (39.6)	83 (39.3)	.005	.992
Girls	26 (61.9)	102 (60.4)	128 (60.7)		
Total	42 (100)	169 (100)	211 (100)		

All the collected answers were analysed using a qualitative analysing method which was each line of the finding was categorised with coding by their common characters. A total of eight categories were found including other opinions' category which could not be classified or not related with the sizing system (see Table 7.49).

In terms of the UK results, 33.3 % of the UK participants requested the improved sizing system which is considered specific body size and shape. Some participants responded as below.

“My child is tall, and we have trouble getting clothes that have long enough sleeves and legs but which also fit around the waist. We buy up to two clothes sizes larger (age sizes), and then I adjust them to fit (take in at the waist) if necessary.”

“Trousers seem to be longer than needed for the size of the child sometimes.”

As some of the UK participants described above, one targeted part of the body such as trousers’ length influences other parts’ poor-fit. Some UK participants also needed to buy a bigger size, but the waist of trousers was not fit to the children. With the same sense, the larger size of the waist of clothes are required when the children’s abdomen are more protruding than average, but the sleeves of that garments are longer.

Korean participants also responded that their children’s body shapes and size do not fit into the current sizing system. Some requests which are taller and smaller height of children including larger and smaller waist were measured. It was found that the Korean participants also have the same unsatisfactory experience which for certain part of clothes is fit or unfit (10.7 %).

The secondly chosen suggestion was a request of the standardised sizing system in the UK 23.8 % compared with 34.3 % of Korean participants which was the highest requests. One of the UK participants said that *“Different shops clothes fit differently, some are tighter, and some are looser.”* and one of the Korean participants said that *“It is confusing that brands have their own sizing system which is different with other brands.”* It is concluded that un-uniformity of the sizing system between the brands make customers have difficulty for choosing appropriate clothing size. Some Korean participants described that various sizing system based on age, height, and letter code in Korea are also confusing.

21.9 % of Korean participants measured subdivided sizing system as the secondly highest request. Some requests of the sizing system in Korea were described as below.

“When I choose the suggested size on size label, that is too tight but one size bigger is too big, and it does not fit well.”

“The size interval of 10 in height is too big. I want to buy the size in between such as 95 or 105.”

“The subdivided ‘S,' ‘M’ and ‘L’ on waist or hip will be useful at the same height of size.”

It is found that a considerable number of Korean participants think the current sizing system is too generous between the size and they required more subdivided size onto the body size. As the same as the Korean participants, the UK participants also requested more diverse sizing system with an example of responses as below.

“Trousers should be categorised by age and by long, normal and short”.

Next, 20.1 % of Koreans requested specific body size denoting system. Some opinion about various body size information from Korean participants are as follow:

"Each part of size should be informed in the size label. I think the length of clothes is necessary including chest, total length, waist, and hip.”

“The sizing system should show chest size which is adapted different development stages of children."

“Other body sizes which currently do not use such as hip or sleeve length are required.”

“The clothing size based on body type such as smaller or bigger than average is required not using only age. The body part of size should be recognised according to various height and weight.”

"The size of the unit should tell exact height and chest size.”

As previous Chapter 6 found that 37.5 % of brands in Korea provide height, chest, waist sizes on their sizing system. However, it is found that the majority of Korean customers still require more specific size information.

Each 4.8 % and 4.1 % of fit consideration request were shown in the UK and Korea respectively. Some the UK participants responded as below.

“I think sizes are ok and mainly fit in my child’s size. I get a larger size if I am unsure and try to find a good one until it fits.”

“Current sizing system needs urgent attention on fit because almost trousers is difficult to buy due to their fit!”

Some Korean participants also complained about poor fit of trousers such as tight fit around thigh area and overall tight fit. It is inferred that current sizing system on trousers is not adapted physical development of Korean children or various size for developed children is required in Korea.

In addition, Korean participants suggested that diverse fitting models' pictures on online shopping systems would be helpful to choose appropriate sizes. It is also found that some Korean participants prefer to estimate the clothing size by observing the fitting model's looks rather than understanding sizing system even though specific body sizes tell the size.

9.5 % of the UK participants pointed out the current inconsistent the sizing system and both 2.4 % of the UK and Korean participants responded that current sizing system is confusing and difficult. Moreover, common opinion from the UK and Korea which was found in the category 'Other' was the necessity of shop assistant's accurate guide.

Table 7.49 Suggestion about current children's wear sizing system

n (%)

Comment	UK	Korea	Total	t-value	Sig.
Body shape and size consideration	14 (33.3)	18 (10.7)	32 (15.2)	-1.881**	.061
Standardised sizing system	10 (23.8)	58 (34.3)	68 (32.2)		
Consistent sizing system	4 (9.5)	0 (0.0)	4 (1.9)		
Denoting specific body size	4 (9.5)	34 (20.1)	38 (18.0)		
Subdivided sizing system	4 (9.5)	37 (21.9)	41 (19.4)		
Clothing fit and fitting model consideration	2 (4.8)	7 (4.1)	9 (4.3)		
Current specific and difficult system	1 (2.4)	4 (2.4)	5 (2.4)		
Other	3 (7.1)	11 (6.5)	14 (6.6)		
Total	42 (100)	169 (100)	211 (100)		

**p < .01.

Overall, it is concluded that the unified and standardised sizing system which is adapted diverse body shape and size is suggested including detailed body size information in the UK and Korea.

7.7 Verification of total explanation power of survey

Total explanation power of this survey was measured by discriminant and logistic regression analysis to verify each variable was classified correctly. These two analyses distinguish that each grouping variable is categorised as predicted with less error. The function of the discriminant and logistic regression are similar, and both can test the same research questions. However, discriminant analysis has more power than logistic regression if assumptions of discriminant analysis are met and it tests more accurately with small sample sizes. In this survey, both discriminant and logistic regression are tested to figure out the power of explanation.

7.7.1 Discriminant analysis

As can be seen in Table 7.50, the eigenvalue is interpreted the discriminating abilities of function and 1.458 of large enough eigenvalue tells a strong function. The Wilk's lambda is used to test the significance of the discriminant functions which is ranged from 0 to 1. The value of lambda is small, and the discriminant function is significant. Therefore, it is indicated that group means are different. The Wilks' Lambda of .404 has a significant value (Sig. = .000), and it is interpreted that the difference between group means is significant.

Table 7.50 Eigenvalue and Wilks' Lambda

Test of Function	Eigenvalue	Wilks' Lambda	Chi-square	Sig.
1	**1.458**	**.404**	256.777	**.000**

Classification results summarise the classification accuracy of number and percent of cases. Overall, 89.8% of original grouped cases correctly classified with the cut value of .500 and it was found that the correct classification in the UK was 84.6 % and Korea was 93.1 % (see Table 7.51).

Table 7.51 Classification results of survey

n (%)	Country	Predicted Group Membership		Total
		UK	Korea	
Count	UK	110	20	130
	Korea	14	190	204
%	UK	**84.6**	15.4	100.0
	Korea	6.9	**93.1**	100.0
Overall percentage		**89.8**		

7.7.2 Logistic regression analysis

The variables in the equation in Table 7.52 shows the coefficient for the constant. The significance level of this model is statistically significant to have predictive power and have sufficient large enough effect size ($p<.001$).

Table 7.52 Variables in the Equation

		B	S.E.	Wald	df	**Sig.**	Exp (B)
Step 0	Constant	-.451	.112	16.121	1	**.000**	.637

Table 7.53 shows the classification table based on the model including the explanatory variables with a cut value of .500. The full model is classified with the overall percentage of 91.0%. In detail, it is found that 112 cases of the UK (86.2 %) and the 192 cases of the Korea (94.1 %) were classified appropriately.

7.8 Summary of survey analysis between the UK and Korea

The results of all questionnaires were already described in the previous section, but the salient points were represented and summarised in this section.

The survey has been divided into four sections (from Part 1 to Part 4) including asking participants' demographic data (Part 5) (see Table 7.54). Participants' background included the age, education, employment status, and numbers of children with their physical information. The demographic differences between the UK and Korea were accepted to analyse by the relevant statistical evidence. Part 1 to part 4 consisted the questions how the

UK and Korean participants considered the current infants' and children's clothing. The results of the questionnaire were analysed individually and also compared each other using qualitative and quantitative analysis methods.

Overall, the number of all questions were 31 in this survey. The results of 22 questions were found significantly different, and the rest of nine responses were found without differences between the UK and Korea.

Table 7.53 Detail of questions

Part	Question	Detail
Part 1	Q2 – Q10	Clothing purchasing information
Part 2	Q11 – Q15	Sizing system and size awareness
Part 3	Q16 – Q25	Fitting (wearing sensation)
Part 4	Q26 – Q32	Product size and size spec awareness
Demographic data	Q33 – Q41	General background

7.8.1 Clothing purchasing information of the children's wear

Table 7.55 shows the overall ranges of all questions' differentiate degree.

Firstly, the responses of time and places of children's garment shopping were recorded differently between the UK and Korea. It was found that Korean customers were more influenced by psychological satisfaction and comfort as well as a decrease in performance and practicality of clothes than the UK customers (Q2). The UK customers usually purchased their children's clothes in the big chain supermarket while Korean's preferred to buy in non-store markets (Q3), and both countries' customers got their information of shopping from market-oriented sources (Q4) with the similar tendency of their children's opinion adaption onto purchase (Q5 and Q6). The UK participants responded that the reason of the favourite brands was reasonable price while Korean participants chose a design (Q7). A good fit was found as the second highest in the UK and the third highest in Korea. However, poor fitting was both countries' highest responses for the reason of exchange garments (Q8). As to the perspective of purchasing consideration, the UK participants considered 'Design and price' more than Korea, but the other elements which were 'Fit and quality,' 'Brand and trend,' and 'Durability' were given more consideration by Korean participants (Q9). Finally, it was found that the UK children generally wear the clothes for a

shorter period than Korean children, and Korean children wear the outer items much longer than the UK children (Q10).

Table 7.54 Differences of Part 1

No.	Question	Statistical result
Q2	When do you go shopping to buy your children's clothes?	Different
Q3	Where do you mostly buy your children's clothes?	Different
Q4	Where do you get the information of children's clothes at the most?	Similar
Q5	Do you usually go shopping with your child when you buy child's clothes?	Similar
Q6	How much do you reflect your child's opinions for purchasing the child's clothes?	Similar
Q7	If do you have some favourite children's clothing brands, what are the reasons?	Different
Q8	If you have exchanged your children's clothes, what were the reasons?	Similar
Q9	How much you concern those key buying factors whey you buy your children's clothes?	Different
Q10	How long your child wear the clothes according to items?	Different

7.8.2 Sizing system and size awareness of the children's wear

As to part 2 of the questionnaires (see Table 7.56), almost 50% of both the UK and Korean participants responded that they had a considerable understanding degree of the current sizing system (Q11). The UK customers generally purchased clothes based on size label, but Korean customers preferred to try on the clothes after they chose the sizes (Q12). Therefore, it was referred that the UK satisfaction degree's responses of poorly-fitted were measured almost three times higher than Korean even though roughly half of both participants responded that clothes followed size label were well-fitted (Q13). Finally, both the UK and Korean participants considered total length as the highest for the top, but the UK participants chose total length while Korean responded waist as the highest for bottoms (Q14 and 15).

Table 7.55 Differences of Part 2

No.	Question	Statistical result
Q11	Do you know the children's clothes sizing system?	Similar
Q12	How can you choose the size of your children's clothes?	Different
Q13	How much the clothes which were chosen by the size with matching the size label fit to your child?	Different
Q14	Which area can be criteria to choose the size of your child's clothes? – Top	Similar
Q15	Which area can be criteria to choose the size of your child's clothes? - Bottom	Different

7.8.3 Fitting (wearing sensation) of children's wear

Clothing fit issues were asked to the UK and Korean participants in part three, and all responses were significantly different except for the questions of fit preference and clothing alteration experience (see Table 7.57).

When participants followed the size label information, the unsatisfactory level of the UK participants was recorded three times higher than Korea even though almost 60% of both participants responded satisfactory (Q16). With the same sense of Q16, the UK participants had a substantial unsatisfactory fit which was more than twice of Korean participants when they chose the same size labels in different brands, but almost 40% of both participants thought the degree of clothing fit between brands were affordably the same (Q17). The fit preference was also measured using the short-answered question which asked their satisfactory brands and the size of clothing. These details were compared with the demographic and physical data of children. In general, the UK participants preferred the same size of clothing while Korean chose the bigger size of clothing regardless of age and gender (Q18). Both the UK and Korean participants preferred the neutral and loose fit of clothes having almost 50% of responses respectively (Q19). However, it was found that there were remarkable differences of fit preferences on clothing items and uncomfortable parts of clothes between the UK and Korea. Both the UK and Korea had similar fit preferences of t-shirts, shirts, trousers, and dresses with the same size followed by size labels, and both countries preferred one or two sizes bigger jackets and coats having a much considerable preference of Korean responses (Q20). When poorly-fitted and uncomfortable parts according to clothing fit degree were measured, both the UK and Korean participants responded that neck, shoulder, armhole, chest, sleeve, and the total length of upper clothes was

relatively fitted. However, there were distinctive different choices with the higher responses of the tight (short) in the UK and loose (long) in Korea (Q21). As to lower clothes, waist and hip were considered loose (long), and crotch and thigh were tight (short) in the UK while Korean participants responded that these areas were fitted (Q22). When the opinion of size consistency between brands was asked, both the UK (60.3%) and Korean participants (70.8%) thought the clothing sizes between brands were different, but 20% of the UK participants chose 'Similar' comparing only 1.9% of Korean participants (Q23). Around 70% of two countries' participants had experiences of clothing alterations, and leg length of trousers was chosen as the greatest in the UK and Korea (Q24 and Q25).

Table 7.56 Differences of Part 2

No.	Question	Statistical result
Q16	How much did you satisfy the child's clothes which were followed the size label's information?	Different
Q17	Are most of the brands' clothes with same sizes well-fitted to your child regardless of the brands?	Different
Q18	If there is a specific brand which is well-fitted to your child, what is the brand name and what is that size?	Different
Q19	How much fit do you prefer to your child's clothes?	Similar
Q20	How can you choose the size based on the items?	Different
Q21	Which areas were poorly-fitted and uncomfortable and how much those were fitted? - Top	Different
Q22	Which areas were poorly-fitted and uncomfortable and how much those were fitted? - Bottom	Different
Q23	How much do you think the size between brands is different?	Different
Q24	Have you experienced to alter or mend clothes to fit your children?	Similar
Q25	If you answered 'Yes' to the question above, please explain which area was altered or mended?	Similar

7.8.4 Product size and size spec awareness of children's wear

The UK and Korean participants answered how they considered current children's wear size charts, and most responses to part four in the UK and Korea were also significantly different (see Table 7.58). With respect to the opinion about the specified size spec necessity, similar rates of 'disagree' (around 60%) were found in both the UK and Korea, but almost four times

more of the UK in ‘Agree’ was recorded than Korea (Q26). Both the UK and Korean participants responded that jackets and coats required a more specified size spec, but the other items were measured differently (Q27). The UK customers responded that height or total length should be various for the upper and lower clothes, but the Korean participants chose the height or total length for upper clothes and waist for lower clothes (Q28 (1) and (2)). As to the opinion about an appropriate sizing system, age was chosen by the UK participants while height was considered as the highest in Korea. However, height in the UK and age in Korea were the secondly chosen method (Q29). When the preferable sizing method was asked, the age in the UK was chosen as the highest for both top and bottoms, while the height of top and age of bottoms were selected in Korea (Q30 and Q31). Regarding the short answer question about opinions of sizing system’s improvement point, the UK participants requested more consideration of body shape and size while Korean participants required standardised sizing system (Q32).

Table 7.57 Differences of Part 4

No.	Question	Result
Q26	Do you agree that more specified size spec considered the body shape of children is required?	Different
Q27	Which item of clothes is more required if you think that more specified size spec are required?	Different
Q28 (1)	Which parts should be more various if you think that more specified size spec is required for upper clothes?	Similar
Q28 (2)	Which parts should be more various if you think that more specified size spec is required for lower clothes?	Different
Q29	Which can be an appropriate sizing system for children clothing?	Different
Q30	Which areas of size should be noted for the size label? - Top	Different
Q31	Which areas of size should be noted for the size label? - Bottom	Different
Q32	Pease leaves any opinion and improvement points of current children’s clothing sizing system	Different

7.9 Summary

This chapter described the differences between the UK and Korean customers who purchase infants' and children's wear. It illustrated the general difference in purchasing information, and how the UK and Korean participants were aware of relevant sizing systems, clothing size, and clothing fit. The results of analysis were apparently significant to understand both countries' customers. The next chapter will discuss the overall conclusion of this research providing major findings as well as limitations and suggestions.

Chapter 8. Conclusion

This chapter presents the overall findings of this research demonstrating how the aim and objectives have been addressed. The research findings are summarised, and the overall contribution to the knowledge is addressed. Finally, limitations of the research and suggestions for future work are also provided.

8.1 Objectives and summary

As presented in the introduction, the overall aim of this research is to compare the body and garment size of infants' and children's wear in the UK and Korea with investigations and critical analysis. This aim was achieved through research objectives which were represented in the introduction. In order to develop a methodology for comparison between the UK and Korea, investigations were made into the following; national size survey, national sizing standards, brand size charts, and a consumer survey. The research studies in this study are described below.

Objective 1: To provide understanding infants' and children's clothing

(a) To critically review the literature of size and fit issues

(b) To better understand the physical characteristics of infants and children

(c) To define the main features of infants' and children's body shapes and sizes

The literature review focused on objective 1 through the investigation of the general background of infants' and children's clothing. Firstly, the unsolved issue of size and fit was considered, and how much it is essential in clothing manufacturing process was found in Section 2.1. Following reviews were knowledge related to size and fit including anthropometry study, sizing survey, size standards, sizing system, size charts and labelling, and clothing comfort in Section 2.2. An understanding of infants and children's body and clothing size was followed in Section 2.3. Determination of distinctive and various children's physical characters was apparently important to accommodate the clothing market due to the variety in shape and physical type of children having the potential of a growing clothing market.

Objective 2. To investigate the body and clothing sizes of infants' and children's clothing

(a) To examine the latest infants' and children's national sizing surveys
(b) To determine infants' and children's clothing national sizing systems
(c) To investigate recent infants' and children's clothing brand size charts
(d) To establish current infants' and children's clothing purchase parameters

Objective 2 was achieved in Chapters 4, 5, 6, and 7 by the chosen methodology in Chapter 3. Comparative and mixed methods were applied to conduct four studies in each Chapter from 4 to 7 to establish subdivided objectives numbered (1) ~ (4). The UK and Korea were selected as comparative countries, and the illustrative comparison was focused on infants' and children's clothing. Chapter 4 examined the national sizing surveys (Shape GB in the UK and 6th SizeKorea in Korea), and Chapter 5 determined the national sizing systems (British Standards in the UK and Korean Industrial Standards in Korea). Next, the infants' and children's clothing brand size charts were investigated to compare each county's characteristics and informative size data. Finally, the identification of target markets in the UK and Korea was followed using a customer survey.

Objective 3. To undertake the accurate data analysis of infants' and children's clothing

(a) To provide reliable technical information for the garment designers
(b) To present efficient and informative size guidelines for the garments makers
(c) To identify differences by comparing targeted countries
(d) To suggest improvements to the analysis results for future studies

Objective 3 was presented through each comparison section at the end of Chapters 4, 5, 6, and 7. The analyses of each chapter were based on qualitative and quantitative analysis methods, and the results were represented by a summary of description, tables and figures. The results of each study showed how much the targeted two countries were different and similar, and presented data relevantly informative to garment developers.

8.2 Major findings and contribution

This research addressed the current situation of infants' and children's clothing market in the UK and Korea by comparative analysis focused on body and garment size. The following are the major findings in this research.

Literature review

The continually changing and internationally different anthropometry data was found to be the main factor influencing the efficient sizing systems and comfortable clothes. Also, different adoption levels of national and official sizing surveys and standards in clothing industries are still a cause of confusion for consumers. Finally, it is revealed that distinctive different physical characteristics of children require investigation.

National sizing surveys in the UK and Korea

In general, the survey process and data analysis method in the UK and Korea were found similar without substantial differences. Both countries used a 3D body scanning system to acquire anthropometric data, and statistical analyses were conducted for data analysis even though the total subject numbers in Korea were more than in the UK. However, the effective influence to industry was found at the SizeKorea data more than the SizeUK and ShapeGB due to their accessibility. The opened data of SizeKorea which is more governmental managed project allow to provide practical information, and it shows the possibility to be adapted into the other countries' sizing surveys as well as international marketing parameters.

The provided body measurements' designation and methods in the UK and Korea did not correspond significantly, and it is implicated that both countries are required to follow the united system. The body measurements data of national sizing survey in the UK and Korea were distinctively different according to gender and age range, and it is concluded that this different anthropometric data should be concerned with the global clothing market.

National sizing standards in the UK and Korea

There were common and different characteristics in the British and Korean Standards. As the same for the national sizing survey, the designation of body parts and measurement methods were affordably complementary, but

Korean Standards provided more data which were divided by subdivided age groups' standards and clothing type classification than the British Standards. The provided body measurement data in the UK were ranged having specified interval to allow covering body type diversities, but an age denoting system was not used. While comparing to the British Standards, Korean Standards provided around five times more body dimensions than the UK providing all body dimensions with dimensions' distribution. It is concluded that the British Standards are not correspondence with Korea standards appropriately, and this comparison is inferred that the understanding of this contrasting standards between countries should be considered to explore the other countries' market. Therefore, it is no doubt that following unified standards is vital for global brands which provide garments for various international consumers.

Brand size charts in the UK and Korea

The comparison study of infants' and children's brand size charts allowed to identify the current actual usage in the UK and Korea. The construction method of size chart was the same having the age and size ranges. It was found that single size was preferred in both countries, but the specific rate of a certain range was different. The provided body dimension data was also different, but the combination of height-chest-waist was found as the highest in both the UK and Korea. However, the other provided dimensions were provided differently, and it is inferred that body measurements are critical values for each country's consumers. When the primary dimensions (height, chest, waist, and hip) were compared between the UK and Korea, it was found that height and waist had significant differences having the bigger UK dimensions. However, interestingly, chest and hip in Korean size charts were found greater than the UK, and it is referred that Korean consumers preferred generous chest and hip sizes' in their clothes because the body dimensions in these areas generally increase with a similar growth tendency.

Customer perspectives in the UK and Korea

The investigation of consumers who purchase children's clothing provided the information of different consumption tendency between the UK and Korea. As to the general purchasing information, the place and time for shopping, reasons of favourite brands, criteria of purchase, the period for wearing clothes were considerably different between the UK and Korea.

However, purchasing information sources and degree of applying children's opinion were found similarly. Generally, the awareness of the sizing system and clothing size in the UK and Korea were considerably different. Also, clothing fit consideration is different between two countries, but the alteration experience and parts were identical. The results of the product size and size spec awareness also showed different tendency between the UK and Korea, and the expected degree of the specified size spec and parts were significantly different. Moreover, the opinion about an appropriate sizing system and necessary parts on the size label were also found to be different. Finally, the open question was analysed that the UK participants had more concerns about body shape and size consideration while Korean participants consider the standardised sizing system.

It is concluded that this comparison research between the UK and Korea allows having the potential to develop the optimised sizing system of each country, and it gives an impact to enhance the international corresponding sizing system.

8.3 Recommendation for future work

This section proposes some recommendations for future work, which have emerged from the research study. Due to the time limitation across the PhD period, some applied studies using this research analyses which could not be conducted in this research were suggested including further potential studies.

Practical adjustments developments

This research is a fundamental research which explores the current infants' and children's clothing market. The summarised analysis data itself is also valuable having a critical comparison between the UK and Korea, but the application of the analysis is suggested. There is potential to develop optimised pattern blocks, grading interval, and ease amount even though the anthropometric comparison was conducted using average data. This development will be a practical guide to being adapted in the clothing industry.

Broaden the scope of research

Selected sample of countries can widen into different countries and different specific groups. As the same sense of European Standards, there is a possibility to develop an ‘Asian Standards’ which have Asian countries’ body size and sizing system having similar physical characteristics more than European according to clothing. Also, exploration research of European countries’ body size and standards can be followed because their unification level is still low even though they have European standards. The scope of the targeted group also can be extended. Growing obesity rate is a crucial consideration in the clothing market, and using the average measurements is not the right answer anymore. Demands of the physically underdeveloped population cannot be underestimated for the clothing industry.

Specified market research

The investigation into subdivided clothing markets according to their characteristics are recommended such as range of department store, big chain grocery market, and non-store (the internet and mobile purchase) market. It is apparent that rapid internet propagation has influenced the e-commerce and digital marketing. With respect to globalised clothing market, the various considerations of a marketing tool should be considered.

Vitalisation method of size guideline

A number of research studies related to body size and standards including academic suggestions exist. However, such research could not reach to the clothing industry due to the industries’ tendency to maintain the problem of the trial-and-error system as well as the academic’s insufficient advertisement. The substantive education materials development with a practical guideline for clothing industry are required. Also, the efficient method development with the help of governmental and official advertisements to adapt unified standard size, and following size standards are also suggested.

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Appendix A Brand codes and names in brand size charts

No	UK		Korea	
	Code	Name	Code	Name
1	A1	Adams	A1	Adidas Kids
2	A2	Adore Baby	A2	Airwalk Junior
3	A3	Amplified	A3	Anold Palmer
4	A4	Animal	A4	Armani Junior
5	A5	Aquascutum	A5	Ask Junior
6	B6	Babour	B6	Bambino
7	B7	Bench	B7	Barbie Kids
8	B8	Benetton	B8	Basic Icon
9	B9	BHS	B9	BEEN
10	B10	Billie Blush	B10	Benetton Kids
11	B11	Bob & Blossom	B11	Black yak Kids
12	B12	Boden	B12	Bluedog
13	B13	Bonnie Baby	C13	Cankids
14	C14	Canterbury	C14	Carnaby Kids
15	C15	Childs play clothing	C15	Carter's
16	C16	Converse	C16	Celden
17	C17	Crag hoppers	C17	Cheek
18	D18	Darcy brown	C18	Chichikaka
19	D19	Debenhams	C19	ChummyChummy
20	D20	Desigual	C20	Chunwoo
21	D21	DKNY	C21	Cindy Kids
22	D22	Donna Wilson	C22	Cocorita
23	E23	Emile et Rose	C23	Codes-combine Kids
24	F24	F&F (Tesco)	C24	Commencer
25	F25	Fabric Flavours	C25	Converse Kids
26	F26	Fred Perry	C26	Crocs for Kids
27	F27	French Connection Junior	C27	Curlysue
28	G28	Gant	D28	Daiz Kids
29	G29	George (ASDA)	D29	Daks Kids
30	G30	GF Ferre	E30	E.land Junior
31	H31	H&M kids	E31	Ecolier
32	H32	Harrods	F32	Fam Fam
33	H33	Hackett	F33	FILA Kids
34	H34	Helly Hansen Kids	F34	Four lads
35	H35	Heritage	F35	French Cat
36	H36	Howick Junior	G36	GAP Kids
37	H37	Hucklebones	G37	Guess Kids
38	H38	HUGO BOSS	G38	Gymboree
39	I39	I love gorgeous	H39	Happy n co
40	J40	JB	H40	Hazzys Kids
41	J41	Jigsaw Junior	H41	Hello Kitty
42	J42	John Lewis	H42	Holl Haus Kids
43	L43	La Redoute	L43	Land's end Kids
44	L44	Ladybird	L44	Levi's KIDS
45	L45	Lilly & Sid	L45	Little Bang Bang

46	L46	Little Criminal	L46	Little Brenn
47	L47	Little Dickens & Jones	M47	Meli melo
48	L48	Little Green Radicals	M48	Miki House
49	L49	Little Joule	M49	Moda Carina
50	L50	Little MARC JACOBS	M50	Moonyamoonya
51	L51	Little Misdress	M51	Mother Care
52	L52	Lyle and Scott	N52	Nautica Kids
53	M53	M&S	N53	Nepa Kids
54	M54	Mamas & Papas	N54	New Balance Kids
55	M55	Mango kids	N55	Nike SB Kids
56	M56	Matalan	N56	NorthFACE Kids
57	M57	Mayoral	O57	OHOO
58	M58	Mini Zzz	P58	Paco Rabanne Baby
59	M59	Monsoon	P59	PAW IN PAW
60	M60	Mother Care	P60	Perimitz
61	N61	Name it	P61	Petit Bateau
62	N62	NEXT kids	P62	Ppippilong
63	N63	Nike SB Kids	P63	PPONE KIDS
64	O64	Original Penguin	R64	R.Robot
65	P65	P3 (Pual Smith Junior)	R65	Roem Girls
66	P66	Platypus Australia	S66	Sfit
67	P67	Polarn O. Pyret	S67	Skarbarn
68	P68	Pumpkin Patch	S68	Soie
69	R69	Raging Bull	S69	Staff Kids
70	R70	Ralph Lauren	S70	Sunjaehyang
71	R71	Regatta	T71	Tiffany Junior
72	S72	Scotch & Soda	T72	Tobebury
73	S73	Sovenreign	T73	Tomkid
74	S74	Stella McCartney	T74	Trissi
75	S75	Sunuva	U75	Usall Junior
76	T76	Tammy	V76	VOVO
77	T77	Timberland Kids	W77	Wish Kids
78	T78	Toby Tiger		
79	T79	TOG 24		
80	T80	Tommy Hilfiger		
81	T81	TU (Sainsbury's)		
82	U82	Uttam		
83	V83	Vanilla Park		
84	V84	Very		
85	Y85	Yumi Girls		
86	Z86	Zalando		
87	Z87	Zara		

Appendix B Main survey questionnaire

B.1 Information

UNIVERSITY OF LEEDS

School of Design, University of Leeds

"Comparative analysis of sizing in children's wear between the UK and Korea"

You are being invited to take part in a research project. Before you decide it is important for you to understand why the research is being done and what it will involve.

Research Aims
This research aim is to understand the consumers' clothing sizes and sizing system awareness in the UK.

The participant will be able to indicate whether or not they are interested in taking part in more in-depth interviews to further clarify their thoughts and ideas.

Right to Withdraw
Respondents will be reminded that they are under no obligation to take part, and that they can withdraw during or after the questionnaire and/or interview.

Confidentiality and Anonymity
Any information given was to be treated in strict confidence and that the raw data including transcripts would not be made available for any other persons or purposes.

Informed Consent
Following the information provided above, the participant acknowledges to sufficiently understand the aims of the research and the modalities of their participation there in.

Thank you for taking the time to read this information. For any questions or comments, please contact the researcher.

Research Contact Details:

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Supervisors:
Professor Tom Cassidy and Dr Tracy Cassidy

B.2 Consent form

UNIVERSITY OF LEEDS
School of Design, University of Leeds

Consent to take part in survey about

"Comparative analysis of sizing in children's wear between the UK and Korea"

	Add your initials next to the statements you agree with
I confirm that I have read and understand the information sheet explaining the above research project and I have had the opportunity to ask questions about the project.	
I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.	
I agree with the data collected from me to be used in relevant future research.	
I give permission for members of the research team to have access to my responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or report that result from the research	
I agree to take part in the above research project and will inform the lead researcher should my contact details change to research team.	

Name of participant	
Signature of participant	
Date	
Name of lead researcher	
Signature of lead researcher	
Date*	

*To be signed and dated in the presence of the participant

B.3 Questionnaire

Instructions: Please tick the appropriate box or fill in the blank.

Part 1. Clothing purchasing tendency of the children's wear

1. When do you go shopping to buy your child's clothes?

	Very rarely	Rarely	Sometimes	Frequently	All the time
When current clothes become small	☐	☐	☐	☐	☐
When current clothes become old	☐	☐	☐	☐	☐
When current clothes become bored	☐	☐	☐	☐	☐
When components of clothes are missing	☐	☐	☐	☐	☐
When parts of clothes are torn	☐	☐	☐	☐	☐
When a special day is coming	☐	☐	☐	☐	☐
When children want to have new clothes	☐	☐	☐	☐	☐
When matching clothes are needed	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

2. Where do you mostly buy your child's clothes?

☐ Internet
☐ Brand shop
☐ Market
☐ Outlet store
☐ TV home shopping
☐ Big chain supermarket
☐ Department store
☐ Other .....

3. Where do you get the information of child's clothes?

☐ Newspaper and magazine
☐ Internet
☐ Acquaintances
☐ Window display
☐ TV advertisements
☐ Celebrities' children
☐ Other children's outfit
☐ Other .....

4. Do you usually go shopping with your child when you buy child's clothes?

☐ Very rarely ☐ Rarely ☐ Sometimes ☐ Frequently ☐ All the time

5. How much do you reflect your child's opinions for purchasing the child's clothes?

☐ All of parents' ☐ Some of parents' ☐ Half and half ☐ Some of child's ☐ All of child's

6. If you have some favourite children's clothing brands, what is the particular reason?

(You can choose one or more answers)

☐	Good-fitting	☐	Reasonable price
☐	Design	☐	Brand image
☐	I don't have specific favourite brands	☐	Other .....

7. If you have exchanged your child's clothes, what were the reasons?

(You can choose one or more answers)

☐	Poor fitting	☐	Poor quality
☐	Colour and design	☐	Over-price
☐	I don't usually exchange clothes	☐	Other .....

8. If you have exchanged your child's clothes, what were the reasons?? Please rate overall feeling how much you concern of each factor and tick on the appropriate box.

	Very rarely	Rarely	Sometimes	Frequently	All the time
Brand name awareness and popularity	☐	☐	☐	☐	☐
Reasonable price	☐	☐	☐	☐	☐
Good design	☐	☐	☐	☐	☐
Nice colour and pattern	☐	☐	☐	☐	☐
Correspondence with other clothes I have	☐	☐	☐	☐	☐
fashionableness	☐	☐	☐	☐	☐
Child's tastes and preferences	☐	☐	☐	☐	☐
Well-fitted sensation	☐	☐	☐	☐	☐
Good quality of fabric	☐	☐	☐	☐	☐
Sturdy sewing	☐	☐	☐	☐	☐
Convenience of care and cleaning	☐	☐	☐	☐	☐
Comfort of Wearing and movability	☐	☐	☐	☐	☐
Easiness to wear and take off	☐	☐	☐	☐	☐
Worry of getting wrinkled, spotted, and stained	☐	☐	☐	☐	☐
Degree how long it can be worn	☐	☐	☐	☐	☐

9. How long your child wear the clothes? Please tick the appropriate box.

	Less than 6 months	6 months – 1 year	1 year – 1.5 years	1.5 year – 2 years	More than 2 years
T-Shirt	☐	☐	☐	☐	☐
Shirt	☐	☐	☐	☐	☐
Sweater	☐	☐	☐	☐	☐
Jumper	☐	☐	☐	☐	☐
Jacket	☐	☐	☐	☐	☐
Coat	☐	☐	☐	☐	☐
Dress	☐	☐	☐	☐	☐
Trousers	☐	☐	☐	☐	☐
Skirt	☐	☐	☐	☐	☐

Part 2. Sizing system and size awareness of the children's wear

1. Do you know the children's clothes sizing system?

☐ Very poorly ☐ Poorly ☐ Neutral ☐ Well ☐ Very well

2. How can you choose the size of your children's clothes in store?

☐ I choose the clothes based on the size label
☐ I let my child try on the clothes after choosing the clothes with the size
☐ I choose the size based on previous shopping experiences
☐ I ask to give help to choose the size to the shop manager
☐ Other .....

3. How much the clothes which were chosen by the size with matching the size label fit to your child?

☐ Very poorly-fitted ☐ Poorly-fitted ☐ Neutral ☐ Well-fitted ☐ Very well-fitted

4. Which area can be criteria to choose the size of your child's clothes?

(1) Top (e.g. T-shirt, Shirts, Sweater, Jacket, and Coat)

☐ Neck ☐ Shoulder ☐ Armhole
☐ Chest (Bust) ☐ Sleeve ☐ Total length
☐ Other .....

(2) Bottom (e.g. Trousers, Skirt)

☐ Waist ☐ Hip ☐ Abdomen
☐ Crotch ☐ Thigh ☐ Total length
☐ Other .....

Part 3. Fitting (wearing sensation) of children's wear

1. How much were you satisfied with the child's clothes followed the size label's information?

☐ Very unsatisfactory ☐ Unsatisfactory ☐ Neutral ☐ Satisfactory ☐ Very satisfactory

2. Were most of the brands' clothes with same sizes well-fitted to your child regardless of the brands?

☐ Very poorly-fitted ☐ Poorly-fitted ☐ Neutral ☐ Well-fitted ☐ Very well-fitted

3. If there is a specific brand which is well-fitted to your child, what is the brand name and what is that size?

Brand name: ..... Size: .....

4. How much fit do you prefer to your child's clothes?

☐ Very tight ☐ Tight ☐ Neutral ☐ loose ☐ Very loose

5. How do you match the size to the item? Please tick the appropriate box. (If your child is a girl, please check at 'Dress' and 'Skirt' as well.)

	Two sizes smaller	One size smaller	Size matched with the size label	One size bigger	Two sizes bigger
T-Shirt	☐	☐	☐	☐	☐
Shirt	☐	☐	☐	☐	☐
Sweater	☐	☐	☐	☐	☐
Jumper	☐	☐	☐	☐	☐
Jacket	☐	☐	☐	☐	☐
Coat	☐	☐	☐	☐	☐
Trousers	☐	☐	☐	☐	☐
Dress	☐	☐	☐	☐	☐
Skirt	☐	☐	☐	☐	☐

6. Which areas were poorly-fitted and uncomfortable and how much those were fitted? Please tick the appropriate box both top and bottom sections.

(1) Top (e.g. T-shirt, Shirts, Sweater, Jacket, and Coat)

	Too tight (Too short)	Tight (Short)	Relatively fitted	Loose (Long)	Too loose (Too long)
Neck	☐	☐	☐	☐	☐
Shoulder	☐	☐	☐	☐	☐
Armhole	☐	☐	☐	☐	☐
Chest (Bust)	☐	☐	☐	☐	☐
Sleeve	☐	☐	☐	☐	☐
Total length	☐	☐	☐	☐	☐

(2) Bottom (e.g. Trousers, Skirt)

	Too tight (Too short)	Tight (Short)	Relatively fitted	Loose (Long)	Too loose (Too long)
Waist	☐	☐	☐	☐	☐
Hip	☐	☐	☐	☐	☐
Abdomen	☐	☐	☐	☐	☐
Crotch	☐	☐	☐	☐	☐
Tight	☐	☐	☐	☐	☐
Total length	☐	☐	☐	☐	☐

7. Do you think the size between brands is different?

☐ Very Similar ☐ Similar ☐ Neutral ☐ Rather different ☐ Very different

8. Have you altered or mended clothes to fit your children?

☐ Yes ☐ No

9. If you answered ‘Yes’ to the question above, please explain which area was altered or mended?

Item: ..... Area: .....

Part 4. Product size and size spec awareness of children's wear

1. Do you agree that more specified size spec which is adopting body shape of children is required?

☐ Strongly do not agree ☐ Do not agree ☐ Neutral ☐ Agree ☐ Strongly agree

2. If you think that more specified size spec are required,

(1) Which item of clothes is more required? (You can choose one or more answers)

☐ T-Shirt ☐ Shirt or Blouse ☐ Jacket or Coat
☐ Dress ☐ Trousers ☐ Skirt

(2) Which parts should vary? Please tick the appropriate box.

	Height/ Total length	Chest / Bust	Waist	Hip	Etc.
Top	☐	☐	☐	☐	☐
Bottom	☐	☐	☐	☐	☐

3. Which can be an appropriate sizing system for children clothing?

☐ Height (e.g. 120, 130, 140…) ☐ Age (e.g. Age 7, Age 9, Age 11…)
☐ Letter (e.g. XS, S, M, L…) ☐ Chest and Height (e.g. 64-130 …)
☐ Size Code (e.g. 7, 9, 11…) ☐ Other .....

4. What should be noted for the size label? (You can choose one or more answers)

(1) Top (e.g. T-shirt, Shirts, Sweater, Jacket, Coat)

☐ Age ☐ Height ☐ Weight
☐ Chest (Bust) ☐ Waist ☐ Total length

(2) Bottom (e.g. Trousers, Skirts)

☐ Age ☐ Height ☐ Weight
☐ Waist ☐ Hip ☐ Total length

5. Pease leaves any opinion and improvement points of current children's clothing sizing system

5. General Background

1. What are your child's **gender** and **age**?

Gender: _____ Age: _____

2. What are your child's **height** and **weight**?

Height: _____ Weight: _____

3. How many child do you have?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ More than 5

4. What is your age?

☐ Less than 20 ☐ 20-29 ☐ 30-39
☐ 40-49 ☐ Over 50

5. What is the highest level of education you have completed?

☐ Primary school ☐ Secondary school ☐ Further education
☐ University ☐ Master or PhD

6. What is your occupation? .....

7. What ranges most closely represents your total monthly household income?

☐ Less than £1,000 ☐ Over £1,000 - Less than £2,000 ☐ Over £2,000 - Less than£3,000
☐ Over £3,000 - Less than £4,000 ☐ More than £4,000

8. How much did you spend for purchasing your children's clothes in last one year?

☐ Less than £300 ☐ Over £300 - Less than £500 ☐ Over £500 - Less than £1000
☐ Over £1,000 - Less than £1,500 ☐ More than £1,500

9. What is your current marital status?

☐ Married ☐ Separated/ divorced ☐ Widow
☐ With partner ☐ Single

Appendix C Critical Values of the Spearman's Ranked Correlation Coefficient (r_s)

(Reproduced from Shippensburg University, no date, cited in Zar, 1984 Table B.19)

α(2):	0.50	0.20	0.10	0.05	0.02	0.01	0.005	0.002	0.001
α(1):	0.25	0.10	0.05	0.025	0.01	0.005	0.0025	0.001	0.0005
n									
4	0.600	1.000	1.000						
5	0.500	0.800	0.900	1.000	1.000				
6	0.371	0.657	0.829	0.886	0.943	1.000	1.000	1.000	1.000
7	0.321	0.571	0.714	0.786	0.893	0.929	0.964	0.952	0.976
8	0.310	0.524	0.643	0.738	0.833	0.881	0.905	0.952	0.933
9	0.267	0.483	0.600	0.700	0.783	0.833	0.867	0.917	0.903
10	0.248	0.455	0.564	0.648	0.745	0.794	0.830	0.879	
11	0.236	0.427	0.536	0.618	0.709	0.755	0.800	0.845	0.873
12	0.217	0.406	0.503	0.587	0.678	0.727	0.769	0.818	0.846
13	0.209	0.385	0.484	0.560	0.648	0.703	0.747	0.791	0.824
14	0.200	0.367	0.464	0.538	0.626	0.679	0.723	0.771	0.802
15	0.189	0.354	0.446	0.521	0.604	0.654	0.700	0.750	0.779
16	0.182	0.341	0.429	0.503	0.582	0.635	0.679	0.729	0.762
17	0.176	0.328	0.414	0.485	0.566	0.615	0.662	0.713	0.748
18	0.170	0.317	0.401	0.472	0.550	0.600	0.643	0.695	0.728
19	0.165	0.309	0.391	0.460	0.535	0.584	0.628	0.677	0.712
20	0.161	0.299	0.380	0.447	0.520	0.570	0.612	0.662	0.696
21	0.156	0.292	0.370	0.435	0.508	0.556	0.599	0.648	0.681
22	0.152	0.284	0.361	0.425	0.496	0.544	0.586	0.634	0.667
23	0.148	0.278	0.353	0.415	0.486	0.532	0.573	0.622	0.654
24	0.144	0.271	0.344	0.406	0.476	0.521	0.562	0.610	0.642
25	0.142	0.265	0.337	0.398	0.466	0.511	0.551	0.598	0.630
26	0.138	0.259	0.331	0.390	0.457	0.501	0.541	0.587	0.619
27	0.136	0.255	0.324	0.382	0.448	0.491	0.531	0.577	0.608
28	0.133	0.250	0.317	0.375	0.440	0.483	0.522	0.567	0.598
29	0.130	0.245	0.312	0.368	0.433	0.475	0.513	0.558	0.589
30	0.128	0.240	0.306	0.362	0.425	0.467	0.504	0.549	0.580
31	0.126	0.236	0.301	0.356	0.418	0.459	0.496	0.541	0.571
32	0.124	0.232	0.296	0.350	0.412	0.452	0.489	0.533	0.563
33	0.121	0.229	0.291	0.345	0.405	0.446	0.482	0.525	0.554
34	0.120	0.225	0.287	0.340	0.399	0.439	0.475	0.517	0.547
35	0.118	0.222	0.283	0.335	0.394	0.433	0.468	0.510	0.539
36	0.116	0.219	0.279	0.330	0.388	0.427	0.462	0.504	0.533
37	0.114	0.216	0.275	0.325	0.383	0.421	0.456	0.497	0.526
38	0.113	0.212	0.271	0.321	0.378	0.415	0.450	0.491	0.519
39	0.111	0.210	0.267	0.317	0.373	0.410	0.444	0.485	0.513
40	0.110	0.207	0.264	0.313	0.368	0.405	0.439	0.479	0.507
41	0.108	0.204	0.261	0.309	0.364	0.400	0.433	0.473	0.501
42	0.107	0.202	0.257	0.305	0.359	0.395	0.428	0.468	0.495
43	0.105	0.199	0.254	0.301	0.355	0.391	0.423	0.463	0.490
44	0.104	0.197	0.251	0.298	0.351	0.386	0.419	0.458	0.484
45	0.103	0.194	0.248	0.294	0.347	0.382	0.414	0.453	0.479
46	0.102	0.192	0.246	0.291	0.343	0.378	0.410	0.448	0.474
47	0.101	0.190	0.243	0.288	0.340	0.374	0.405	0.443	0.469
48	0.100	0.188	0.240	0.285	0.336	0.370	0.401	0.439	0.465
49	0.098	0.186	0.238	0.282	0.333	0.366	0.397	0.434	0.460
50	0.097	0.184	0.235	0.279	0.329	0.363	0.393	0.430	0.456
51	0.096	0.182	0.233	0.276	0.326	0.359	0.390	0.426	0.451
52	0.095	0.180	0.231	0.274	0.323	0.356	0.386	0.422	0.447
53	0.095	0.179	0.228	0.271	0.320	0.352	0.382	0.418	0.443
54	0.094	0.177	0.226	0.268	0.317	0.349	0.379	0.414	0.439
55	0.093	0.175	0.224	0.266	0.314	0.346	0.375	0.411	0.435
56	0.092	0.174	0.222	0.264	0.311	0.343	0.372	0.407	0.432
57	0.091	0.172	0.220	0.261	0.308	0.340	0.369	0.404	0.428
58	0.090	0.171	0.218	0.259	0.306	0.337	0.366	0.400	0.424
59	0.089	0.169	0.216	0.257	0.303	0.334	0.363	0.397	0.421
60	0.089	0.168	0.214	0.255	0.300	0.331	0.360	0.394	0.418
61	0.088	0.166	0.213	0.252	0.298	0.329	0.357	0.391	0.414
62	0.087	0.165	0.211	0.250	0.296	0.326	0.354	0.388	0.411
63	0.086	0.163	0.209	0.248	0.293	0.323	0.351	0.385	0.408
64	0.086	0.162	0.207	0.246	0.291	0.321	0.348	0.382	0.405
65	0.085	0.161	0.206	0.244	0.289	0.318	0.346	0.379	0.402
66	0.084	0.160	0.204	0.243	0.287	0.316	0.343	0.376	0.399
67	0.084	0.158	0.203	0.241	0.284	0.314	0.341	0.373	0.396
68	0.083	0.157	0.201	0.239	0.282	0.311	0.338	0.370	0.393
69	0.082	0.156	0.200	0.237	0.280	0.309	0.336	0.368	0.390
70	0.082	0.155	0.198	0.235	0.278	0.307	0.333	0.365	0.388
71	0.081	0.154	0.197	0.234	0.276	0.305	0.331	0.363	0.385
72	0.081	0.153	0.195	0.232	0.274	0.303	0.329	0.360	0.382
73	0.080	0.152	0.194	0.230	0.272	0.301	0.327	0.358	0.380
74	0.080	0.151	0.193	0.229	0.271	0.299	0.324	0.355	0.377
75	0.079	0.150	0.191	0.227	0.269	0.297	0.322	0.353	0.375
76	0.078	0.149	0.190	0.226	0.267	0.295	0.320	0.351	0.372
77	0.078	0.148	0.189	0.224	0.265	0.293	0.318	0.349	0.370
78	0.077	0.147	0.188	0.223	0.264	0.291	0.316	0.346	0.368
79	0.077	0.146	0.186	0.221	0.262	0.289	0.314	0.344	0.365
80	0.076	0.145	0.185	0.220	0.260	0.287	0.312	0.342	0.363
81	0.076	0.144	0.184	0.219	0.259	0.285	0.310	0.340	0.361
82	0.075	0.143	0.183	0.217	0.257	0.284	0.308	0.338	0.359
83	0.075	0.142	0.182	0.216	0.255	0.282	0.306	0.336	0.357
84	0.074	0.141	0.181	0.215	0.254	0.280	0.305	0.334	0.355
85	0.074	0.140	0.180	0.213	0.252	0.279	0.303	0.332	0.353
86	0.074	0.139	0.179	0.212	0.251	0.277	0.301	0.330	0.351
87	0.073	0.139	0.177	0.211	0.250	0.276	0.299	0.328	0.349
88	0.073	0.138	0.176	0.210	0.248	0.274	0.298	0.327	0.347
89	0.072	0.137	0.175	0.209	0.247	0.272	0.296	0.325	0.345
90	0.072	0.136	0.174	0.207	0.245	0.271	0.294	0.323	0.343
91	0.072	0.135	0.173	0.206	0.244	0.269	0.293	0.321	0.341
92	0.071	0.135	0.173	0.205	0.243	0.268	0.291	0.319	0.339
93	0.071	0.134	0.172	0.204	0.241	0.267	0.290	0.318	0.338
94	0.071	0.134	0.171	0.203	0.240	0.265	0.288	0.316	0.336
95	0.070	0.133	0.170	0.202	0.239	0.264	0.287	0.314	0.334
96	0.070	0.132	0.169	0.201	0.238	0.262	0.285	0.313	0.332
97	0.069	0.131	0.168	0.200	0.236	0.261	0.284	0.311	0.331
98	0.069	0.130	0.167	0.199	0.235	0.260	0.282	0.310	0.329
99	0.068	0.130	0.166	0.198	0.234	0.258	0.281	0.308	0.327
100	0.068	0.129	0.165	0.197	0.233	0.257	0.279	0.307	0.326