Turning Figure Drawing On Its Head.

Abstract

Since the development of proportional drawing techniques, documented initially by Greek scholars, it has been common practice to use the human head as a unit of measurement to develop an understanding of the proportions of a figure. Many scholars propose the head length relates proportionally to the body as one eighth of height, evidenced by drawings from this era, and this is still prevalent in many published figure-drawing texts. Current guidance, offering exercises to draw the figure using head theories, often propose elongation of the height for aesthetic purposes in establishing the heights of key body location and their widths. Analysis of these methods indicate that many fashion figure images are taller, slimmer and often defined as a single ideal shape, not representative of the customer who would later wear the designs and with no consideration of variations in body size or shape.
Recent technological developments using 3D body scanning technology have enabled the collection of large volumes of measurement data and techniques have been explored to establish how real bodies and their proportions compare to those developed using figure drawing techniques. This has been expanded to recognise the different figure proportions for different body shapes, which the current head theory is not equipped to implement.
The available data from the 3D scanner exposes a flaw in the concept of using the head length as a unit from which to determine proportion, particularly when drawing figures of varied sizes. If the 'head' theory was implemented this would result in size ten figures having a smaller head than a size sixteen, opening the debate of which reference dimension on the figure would be a more successful unit. This research proposes other suitable benchmarks for developing drawing theories that would produce more criteria specific figures, which are more representative of real people and take into consideration ratios, that allow for the development of different body shapes.

Keywords: Figure Drawing, Fashion Design, Anthropometrics, Body Scanning, Proportion

1 Introduction

Garment development is reliant upon the application of proportional rules to create figures on which designs can be based (Szkutnicka, 2010; Ireland, 2000) and in the creation of patterns (Kunick, 1984; Aldrich, 2008). However these proportional assertions, which can be traced back to ancient Greek and Egyptian origins (Simons, 1933) have little by way of supporting scientific evidence other than their historical application. Designs created on fashion figures form the initial stages of the conceptual creation of clothing and if the proportions of the figures do not match those of the customer population difficulties will arise when the design needs to be translated and interpreted to actual patterns and then into garments with the aim to achieve the same visual appearance. A figure created from a eight head length is most often suggested (Ireland, 2000; Szkutnicka, 2010), where the major lengths and in some cases circumferences are relative to the head length and the vertex of the head to the chin is said to equal on eighth of height and therefore the set measurement which determines the proportions of the complete figure.

Continued reliance on figure drawing instructions which are based on the head measurement, and without suitable scientific support that they are relevant to the population will result in simplified and idealised figures. As a result these developed figures will provide limited resources for which garment designs can be based upon due to the fact that the figures produced will not be representative of the many varied consumers for which a garment could be designed for and in the end should fit. As a result this will not only be limiting but also create the sense that there is a similarity between people. Analysis of population data collected through body scanning suggests this similarity is not borne out by analysis of dimensions of populations and there is recognition within sizing systems of the difficulties of expecting people to meet proportional requirements (Robinette et al., 1997). Using these figures will present further problems when abstract fashion illustrations are then translated into the pattern and garment for the proportions of a consumer population and the requirement to adjust for shorter lengths and a potentially wider silhouette.

Current methods of figure drawing are explored with particular focus on the use of the head as a measurement, this techniques are then compared to proportions derived from a large dataset of body scans representative of a subset of the UK female population to establish if they are relevant.

2 Literature Review

2.1 Figure drawing and proportion

The proportions of the figure in fashion are given in depth consideration by Simons (1933) and here we see considerable evidence of prescribed proportional relationships from historical influences into current practice. The early inception of figure drawing by proportional techniques, imposed often by social structures, through to modern techniques shows how current concepts have been borne out of historical practice. Whilts some techniques were informed by measurement of the body, it is clear that artistic representation of the body played a larger part in the development of these rules, than did actual scientific exploration, this work also pre dates many of the 20th centuries large scale anthropometric surveys. When considering more recent discussion of proportion in clothing, Kunick (1984) details the development of sizing systems and pattern creation methods with continued usage of proportional techniques, notably the use of the head as a measurement benchmark and the assertion that stature is equal to eight head lengths. It is also clear that many measurements which were difficult to take from the body were often derived proportionally, in some cases with reference to proposed proportional head relationships. Haughton (2004) suggests a constant theme to convey a beautiful body through art, has been the application of the same golden rules of symmetry by different artists. More recent developments in clothing creation also suggest a significance to eight head theory (Tao & Bruniaux, 2013) though have little to support this in terms of current data.

2.2 Head relationships to the body

The relationship of the head to the complete body is central to the creation of fashion figure drawings and whilst there is variation in proposed relationships, the most constant is the use of a head proportions to determine an overall figure height. Whilst the use of head theory is purported to be derived from ancient Greek and Egyptian systems (Kunick, 1984; Drudi & Paci, 2006; Simons, 1933; Ireland, 2000) it still persists in modern techniques. Some authors suggest a theory of eight heads being equal to height (Ireland, 2000; Szkutnicka, 2010), whilst others recognise that actual populations may be shorter, being closet to 7.5 (Drudi & Paci, 2006; Abling, 2012) and still others suggest a greater number of heads to height in some cases up to ten (Abling, 2012; Burke, 2006; Riegelman, 2010; Thames, 1985).

Abling (2012) identifies the difference between 'realism and fashion idealism' when extending the number of heads to create elongation of the 'natural figure'. This shows a clear awareness of the misrepresentation, but does not address the required altering of proportion to then create the garment and maintain the aesthetics of the figure drawing.

Other authors suggest nine heads (Burke, 2006; Riegelman, 2010; Thames, 1985; Ireland, 2000) and often once once feet have been added the overall proportions are further increased. There are suggestions by Szkutnicka (2010) and Drudi & Paci (2006) that the extended figure creates an appealing silhouette and allows the foot to be viewed successfully. The role of altered proportion in the creation of an aesthetic is an important consideration that requires greater recognition in how figure drawing may be interpreted, especially when it is then used to drive product development. Analysis of pattern literature also shows the influence of eight head theory in the derivation of dimensions for the creation of clothing patterns (Kunick, 1984), indicating that this idealisation of the human form is ingrained in the clothing development process.

2.3 Extending and elongating the figure

Drudi & Paci (2006) suggest the difference between the 8 headed figure and 8.5 headed figure is the raised position of the waist, that consequently shortens the upper portion of the torso. Abling (2012) in contrast suggests extension occurs in the legs to add height and also indicates techniques such as lengthening the neck, upper torso and arms. This corresponds with Burkes (2006) suggestion that the extra length is added to the legs to create a more stylised appearance and Rieglman (2006) who discusses the idea that the figures main function is to display the clothing in the most effective manner possible. None though discuss how these changes should be contextualised in the stage of product realsiation.

Abling (2012) further suggests the alteration of head length to achieve three specific fashion figures: Petite (can also include plus-size?); Model – taller and slightly elongated and Elongated – exaggerated and stretched to an extreme 'fantasy' height. Key to this is the suggestion of a relationship between head length and height, an area neglected in research but key to supporting the theories of any head based figure creation system. Importantly within the text these figures are only created to the ankle, so actually the figures total height would be half a head greater and give a total number of ten and a half heads in the elongated figure, the largest suggested in current guidance. There is also a suggestion of free elongation of the figure to larger heights, but no grounding or appreciation of the difficulties of then aligning this to a consumer at the stage of garment creation. Whilst it is clear that elongation and stylisation is the focus of the nine head croquis (figure drawing technique) establishing a good basis to design garments on top of, however accuracy and a realistic perception is not mentioned even though the direct connection of garments to the body is identified.

Riegelmans (2006) systematic theory of creating the figure acknowledges the extensive effect of the figure to the way garments are designed and continues to suggest the nine-headed theory will enable the reader to achieve a 'correct' figure. Drudi & Paci (2006), Ireland (2000) and Szkutnickas (2010) in contrast provides no direction other than the drawn figure without any clear identification of head markers and points on the body. As a result the reader is left to determine the proportions of the figure from analysis of the images.

The idealisation of the figure and influence of artistic interpretation is document by (Simons, 1933) and shown in the depiction of the figure. It is clear artistic representations of the body can be controversial, similarly the use of actual nudes caused an outcry in the nineteen the century (Postle, 2009).

The application of proportion within figure drawing techniques is subject to a great deal of inconsistency between sources. Some suggest the use of head length (vertex to the chin) for

all lengths and widths (Riegelman, 2010) whilst others indicate widths relative to head widths (Burke, 2006; Ireland, 2000) though these are not controlled relative to other dimensions. This coupled with the inconstancies between the written guidance and accompanying figures makes it difficult to understand the legitimacy of these techniques in doing anything other than imposing an author informed aesthetic standard on figure representation. Drudi & Paci (2006) do not divide the figure as specifically as Riegelman (2006); no widths are indicated, however, statements establish direct proportional connections between measurements, the shoulders and pelvis are of equal width and the waist width two-thirds the of them.

2.4 Hands & Feet.

Drudi & Paci (2006) record the hands and feet as 1 head in length, although, neither of these measurements are supported by initial diagrams. Riegelman (2006) advises that the foot and hand is 1 head in length and breaks this down further by dividing the hand in half for the palm and fingers. Dividing the hand equally into two sections is reinforced by Thames (1985) who following on from suggesting a direct connection between the head measurement and hand notes the hand can be equally split by the length of the index finger and the palm. Thames (1985) diagram indicates the feet (pitched) are a head in length and although the hands are shown short of a head measurement it is later commented that an open hand should be able to cover the face. Burke (2006) shows the hands shorter at 0.75 heads but the feet remain consist at 1 head in length. Ireland (2000) fails to remark on the hand and feet measurement, neither does Szkutnicka (2010) however, the diagram shows the hands as approximately 0.5 heads in length. Abling (2012) advises the reader to sleek out the hands and feet.

2.5 Other Figure Types.

Abling (2012) acknowledges the use of petite and fuller figures, suggesting they are both to be drawn within the eight-eight and a half head figure, though no guidance on their achievement is given. Szkutnicka (2010) also discusses the relevance of using a suitable template for a particular market, suggesting figures adapted according as a standard template would be too slim, however, no instruction is provided on creating different sized figures. It is also not suggested how the head measurement aides with establishing a broader or slimmer figure. This highlights how the use of the head can not be used as a consistent unit.

3 Methodology

3.1 Content Analysis of Figure Drawing Literature

Combining a content analysis (Krippendorff, 2013; Neuendof, 2002) and case study approach (Thomas, 2011), this research started by investigating current literature on figure drawing for fashion. This is often the initial starting point for the development of fashion drawings, key texts were identified within the existing stock of a University library where figure drawing is taught as part of clothing product development. Search terms, 'figure drawing'; 'clothing' and 'human proportion', were used to determine the breadth of texts, further literature was determined from reading lists, an internet search using the same terms and by shelfmark within a library stocking books on clothing product development and figure drawing.

Identified texts were analysed, initially by index for terms relating to figure drawing and proportion (Croquis, figure, template, 9 heads and proportion) and each text was visually checked page by page to identify guidance on proportions for the figure. Content was analysed for structured guidance on proportion, primarily from visual sources, though text was checked when it was evidently related to proportion and results structured in an Excel

spreadsheet to enable comparison of proposed figure proportions. Whilst there exists guidance on the creation of a male and female figure, only guides for the female figure were used in this research, as they are more detailed and allow comparison to the large volume of female measurement data accessible to this research.

3.2 Analysis of a sample scan population

A sample population of female body scans was obtained, and filtered into two age categories (18-35 and 56+) these were then classified according to the different body shapes categorised by the FFIT shape system (Lee et al., 2007). The rectangle shape was identified as the one occurring most frequently within both of the age groups and this provided 258 scans of the 18-35 and 142 of the 56+, these 400 scans were then analysed to determine the relative proportions of key heights and widths relative to the head. Further analysis of proportions by different shapes, age categories and other variables would be undertaken in future analysis.

4 Results and Discussion

4.1 Content analysis of figure drawing techniques

The proposed relationships between head length, and height and width were recorded from the selected figure drawing cases. The average proportions recommended show a consistency of approach to many of the proposed dimensions (Table 1).

Table 1 - Proportions proposed in figure drawing literature

Measurement	Average	Mode	Min	Max	Count
Stature	8.54	8.50	7.5	10	12
Shoulder Width	1.67	1.50	1.5	2	3
Bust Width	1.38	--	1.25	1.5	2
Waist Width	1.00	1.00	1	1	4
Hip Width	1.58	--	1.25	2	3
Knees Width	0.71	--	0.5	0.84	3
Calfs Width	1.00	1.00	1	1	2
Ankles Width	0.50	0.50	0.5	0.5	2
Neck Base (sternal notch)	1.35	1.25	1.25	1.5	10
Shoulder Height	1.43	1.50	1.25	1.5	11
Bust height (nipple or most prominent)	2.06	2.00	2	2.3	11
Armhole Height	1.93	2.00	1.75	2	7
Waist height	3.00	3.00	2.66	3.3	11
illiac crest height	3.25	--	3.25	3.25	1
Hip height	3.64	4.00	3.2	4	9
Crotch point	4.04	4.00	4	4.25	12
Head width	0.66	0.66	0.66	0.66	2
Elbow height	2.86	3.00	2.5	3	6
Wrist Height	4.00	4.00	3.75	4.25	8
Hand length	0.73	1.00	0.5	1	9
Knee height	5.90	6.00	5.5	6.5	11
Calf height	6.64	6.50	6.25	7.5	7
Ankle height	7.98	8.00	7	9.25	10

The average head height to stature is eight and a half, but some methods recommend ten and there is even the inclusion of a seven and a half head technique. Heights of each of the key divisions of the body are given more consistently, whilst widths are specified with much less frequency, however some indications of waist width is given in the pictorial representations accompanying the written guidance. There is a great deal of consistency between the sources suggesting a common origin and the possibility of influence between sources.

It is clear that all twelve guides provide details of the key height relationships of height and crotch position in relation to head length, however, fewer provide details on all lengths and even less on key widths. When guidance is not provided in terms of prescriptive measurement or ranges for the figure it is clear that the drawer will impose their own or use

the accompanying images to determine what would be considered appropriate. For those learning to develop figure images it is unlikely they would be confident in creating their own proportions and so the implicit influence of the drawn figures must be suitably considered.

4.2 Comparing age and shape

To allow for suitable comparison it was necessary to alter heights to record distance from the floor to allow clear comparison of height related data.

Table 2 – Comparison of figure drawing with population age and shape

| | Figure Drawing | Population Analysis | | Difference figure and population | |
| | | | | Average Figure and 18-35 Rectangle | Average Figure and 56+ Rectangle |
Measurement	Average	18-35 Rectangle	56+ Rectangle		
Stature	8.54	7.40	7.55	1.15	1.00
Shoulder Width	1.67	1.68	1.72	-0.01	-0.05
Bust Width	1.38	1.37	1.56	0.01	-0.19
Waist Width	1.00	1.22	1.47	-0.22	-0.47
Hip Width	1.58	1.62	1.80	-0.03	-0.22
Shoulder Height	7.11	6.05	6.17	1.06	0.95
Bust height (nipple or most prominent)	6.48	5.36	5.31	1.12	1.17
Waist height	5.55	4.62	4.68	0.93	0.87
Hip height	4.90	3.76	3.89	1.14	1.01
Crotch point	4.50	3.37	3.37	1.13	1.13
Knee height	2.64	2.03	2.09	0.61	0.55
Calf height	1.90	1.50	1.57	0.40	0.33
Ankle height	0.56	0.34	0.36	0.22	0.20

Analysis of the proportions of the two scan populations relative to head length show that the older demographic whilst appearing to be on average taller, are also wider at the key dimensions of bust, waist and hip (Table 2). This suggests a need to create a larger figure relative to head length as a foundation figure for designing clothing for an older demographic. Further to this though they are taller, their bust height is lower, clearly relative to recorded changes in body morphology due to ageing and this marks a clear difficulty with purely applying proportional rules. There is no notable indication of figure adjustments to account for aging in current literature. Both populations are shorter and wider than the average figure created through current figure drawing techniques.

4.3 Comparison of figure drawing techniques and proposed shape proportions

Because there was a sufficiently large scan population for the 18-35 group and this consisted of suitable numbers of scans for the three main shape categories of Hourglass, Bottom Hourglass and Rectangle it was possible to determine their relative proportions (Table 3).

Table 3 - Comparison of proposed proportions from figure drawing and scan data

Measurement	Figure Drawing Average	18-35 Hourglass	18-35 Bottom Hourglass	18-35 Rectangle
Stature	8.54	7.62	7.43	7.40
Shoulder Width	1.67	1.73	1.68	1.68
Bust Width	1.38	1.40	1.32	1.37
Waist Width	1.00	1.18	1.18	1.22
Hip Width	1.58	1.69	1.71	1.62
Shoulder Height	7.11	6.25	6.08	6.05
Bust height (nipple or most prominent)	6.48	5.57	5.37	5.36
Waist height	5.55	4.82	4.67	4.62
Hip height	4.90	3.86	3.74	3.76
Crotch point	4.50	3.48	3.36	3.37
Knee height	2.64	2.09	2.03	2.03
Calf height	1.90	1.54	1.50	1.50
Ankle height	0.56	0.35	0.34	0.34

Although the relative heights may be affected by the possible inclusion of elongated feet on the figures, this is not a consistent practice amongst the techniques. The averages for height clearly indicate that all shapes are shorter for the population than the figure drawing techniques, though hourglass shapes appear to be taller, this increased height may contribute to the better waist definition observed in classifying them as hourglass. Each of the major dimensions of bust waist and hip appear to have significant variation sufficient to create distinct figures for each of the shapes and indicate a possible evolution form the narrow shape categories created through current figure drawing literature.

5 Conclusions

Figure drawing texts whilst being highly prescriptive of head lengths for height have little consistency in terms of clearly indicating firstly the actual head measurement and then as a result other related body proportions and seem to expect the reader to impose their own judgment in the creation of the actual figure. This means that the figure images created by the author become a heavily prescriptive tool in how the reader will create their figure image.

When comparison is made between the figure developed by figure drawing guidance and that suggested from analysis of body scan data both by different shapes and ages, it is clear that elongation occurs to differing degrees in current texts whilst all are reliant on the use the head as the initial measurement.

There is clear evidence using population data that current figures will not provide a suitable foundation for fashion drawing as a basis for product development without some consideration of corrections. Analysis of this population data can suggest variation in proportions due to both age and shape that will allow for the generation of more accurate figures to use as a foundation for fashion illustration. It must be noted that whilst the aesthetic principals of figure elongation are recognised, proportionally correct figures would cause fewer difficulties when creating products that retain the characteristics of the design.

The results of this research question the premise of using the head length as a basis for the creation of the figure template and suggest the need to define more appropriate metrics. Although different proportional or shaped figures can be produced, any change in body size would require a change in height and head length. Whilst head length may have a relationship

to height, that appears to be supported within this work, the width of the body, related to girths, have not been found to correlate to heights in any historical surveys. This suggests a need for a more evolved figure drawing technique that allows more flexible creation of fashion drawing figures that better represent real people and the variation of shape and size within a population. This analysis will provide a clear foundation for more in-depth research and the development of more flexible figures to suit different populations initially in terms of age and shape.

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