User judgements of the online world: Factors influencing website appeal and user decision-making

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ABSTRACT

Websites are an integral part of everyday life but we rarely think about how their visual appeal shapes our responses to them. To understand this relationship, research has outlined a number of visual characteristics that may determine appeal. However, previous studies have often used small stimulus sets or made experimental assumptions about critical website characteristics without careful control, making findings difficult to interpret and generalise. Experiment 1 addressed this through creating a corpus of 480 website stimuli containing normative ratings of key characteristics responsible for website appeal. Subsequent studies employed this corpus, providing stimuli that were well controlled but still represented the wider domain.

Experiment 2 examined the timescale of appeal judgements and the impact of verbal brand framing messages on these judgements. As expected, participants made rapid, reliable, judgements even when given only 500ms. However, exposure to positive brand framing had a negative effect on appeal ratings. A possible explanation is discussed in terms of brand placement prominence on consumer attitudes.

In Experiment 3 participants evaluated the appeal of embedded website advertising in order to examine the impact of visual framing on appeal judgements. Advertisements were deemed more appealing when they appeared on appealing websites, although brand familiarity had a mediating role. Eye movements revealed a complex relationship between website and advertisement appeal and familiarity in determining where participants attended.

In Experiment 4, website appeal judgements were compared between typical participants and participants with autism in order to examine the role of individual differences. Interestingly, despite careful manipulations few differences emerged.

However, eye tracking data revealed ASD participants attended to detailed content more than their typical counterparts.

The implications of this work are discussed and a revision to the model of aesthetic judgement (Leder et al., 2004) is proposed in order to account for the current findings. An information-processing model of website evaluations is presented which outlines the processes involved from making initial judgements of appeal through to later, long-term evaluations of a website.

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CHAPTER 1

1.1 Introduction

The online world is expanding at a faster rate than ever before: 90% of households now have access to the Internet and over 39 million people in the UK go online on a daily basis (Office for National Statistics, 2018). Inevitably, this has led to an increase in research exploring the factors that affect the way in which individuals use and make judgements about the online content they are viewing. Research to date indicates that the visual or aesthetic appeal[1] of a website is directly linked to both subjective judgements of usability (Sonderegger & Sauer, 2010; Tractinsky, Katz & Ikar, 2000) and objective measures of performance (Reppa & McDougall, 2015). This suggests that appealing websites lead not only to a more positive user experience but can actually improve the speed and efficacy with which a user interacts with the website. Despite the considerable research examining website appeal (see Moshagen & Thielsch, 2010; Thielsch & Hirschfeld, 2018, for reviews) there are a number of lacunae in the literature which the work reported here attempts to address. These are as follows:

(i) Appropriate control of experimental stimuli

(ii) The timescale of decision-making

(iii) Framing decision-making

(iv) Individual differences in cognitive processing.

This thesis presents four studies which address these gaps in the research. Experiment 1 examines the need for appropriate measurement and control of website stimuli and how this can be maintained whilst still using varied and representative

[1] 'Appeal' is a term that will be used throughout this thesis to refer to the visual appeal of a stimulus. It refers to the extent to which individuals perceive appeal either upon first, later or longer encounters with a stimulus. While it encompasses what is typically referred to as aesthetic appeal it does not necessarily encompass consideration of artistic or design merit.

stimulus sets. Experiment 2 examines the time taken to make website appeal decisions and how perceptions of appeal are framed by prior information about the brand represented on the website. Experiment 3 expands the notion of framing, examining the influence of 'visual framing' on appeal judgements. This experiment investigates how the visual characteristics of a website affect users' judgements of appeal towards online display advertisements embedded alongside the website. Furthermore, through tracking eye movements, the interplay between both website and advertisement characteristics in shaping where users' attend is also examined. Finally, Experiment 4 examines the role of individual differences in making judgements of website appeal, with a particular focus on autism. Given how the literature that each experiment draws upon differs substantially, the relevant literature is reviewed in the introduction to each experiment rather than in the current chapter which explains the rationale underpinning each study.

1.1.1 Appropriate control of experimental stimuli

In an attempt to identify key characteristics determining website appeal, researchers have typically focused on individual aspects and characteristics of website design which may determine appeal. These characteristics have included visual complexity, colour, craftsmanship and professionalism (Cyr, Head & Larios, 2010; de Angeli, Sutliffe & Hartmann, 2006; Hassenzahl, 2004; Harrison, Reinecke & Chang, 2015; Lavie & Tractinsky, 2004; Reinecke et al., 2013), diversity (Pandir & Knight, 2006; Tuch et al., 2009), regularity and uniformity (Ngo, Leo & Byrne, 2003; Tarasewich, Daniel & Griffin, 2001), along with visual effects and symmetry (Rau, Gao & Liu et, 2007; Sutcliffe & de Angeli, 2005; Tarasewich et al., 2001), grouping, structure and order (Bauerly and Liu, 2006, 2008; Ling and van Schaik, 2002; Schmidt, Liu & Laugwitz, 2009; Schrepp, Held & Laugwitz, 2006; Schenkman & Jönsson, 2000; Seckler, Opwis & Tuch, 2015), simplicity and density

(Ngo et al., 2000, 2003) and creativity, novelty, and inventiveness (Haig & Whitfield, 2001; Lavie & Tractinsky, 2004; Pandir & Knight, 2006), to name but a few. These studies have, however, often used very small sets of websites, often specifically designed for the purpose of the experiment (e.g., Hartmann, Sutcliffe and de Angeli, 2008; van Schaik & Ling, 2008). For example, van Schaik and Ling examined the effects of screen design and information organisation on users' aesthetic experience but only used four specifically designed websites. Given the limited stimulus set and the fact that they may not be representative of other websites this begs the question as to whether the findings from these studies can generalise to the wider website domain. While this issue has been clearly identified and debated in psycholinguistic research (i.e. the language as a fixed-effect fallacy, Clark, 1973; Raaijmakers, 2003; Brysbaert, 2007), there has been very little recognition that this is in an issue for websites.

Experiment 1 was designed to resolve the issues of appropriate experimental control and stimulus variation. A large study involving seven hundred participants was carried out and ratings of key website characteristics of 480 websites were obtained (see Chapter 2). These websites were chosen to ensure a varied and representative sample of the website 'population' as a whole. Following a review of the literature examining website appeal, four of the primary characteristics thought to affect website appeal were rated by participants; simplicity, diversity, colourfulness and craftsmanship. An overall measure of website appeal was also obtained along with measures of website brand familiarity (familiarity with the brand represented on the website), website familiarity (whether individuals have visited the website before) and informativeness. Ratings of familiarity were obtained to examine the extent to which perceptions of website appeal were determined simply by familiarity with a brand or product and whether or not appeal increased

systematically as familiarity increased (Alter & Oppenheimer, 2009; Reber, Schwarz & Winkielman, 2004). Ratings of website informativeness were obtained because this typically requires participants to evaluate the content, rather than the appeal, of the website and so may be uncorrelated with these ratings (Chakraborty, Lala & Warren, 2002; Thielsch et al., 2014). The website ratings obtained in Experiment 1 were used to create appropriate well-controlled stimuli in the studies which were subsequently conducted providing similar experimental control to that typically employed in psycholinguistic and icon research (e.g. Bestgen & Vincze, 2012; Snodgrass & Yuditsky, 1996; Marchewka, Żurawski, Jednoróg, & Grabowska, 2014; Prada, Rodrigues, Silva & Garrido, 2015; McDougall, Curry & Bruijn, 1999).

1.1.2 The timescale of decision-making

Despite the importance of the internet, little is known about how decision-making occurs in website appeal evaluations or about how evaluations form, and are changed, from the moment of initial perception through to later habitual experience with websites. Research has typically been fragmented examining initial fast and often unconscious website judgements (e.g. Lindgaard et al. 2006) *or* more detailed models which include slower conscious decision-making (e.g., Leder, Belke, Oeberst & Augustin, 2004) and it is rare for both to be considered together. Early classic research has shown that participants can make reliable fast initial judgements about websites in the first 50 milliseconds of viewing them (Lindgaard et al.). A large body of literature has subsequently supported the assumption that reliable initial judgements of appeal can be made when website presentation times are very short indeed (e.g. Tractinsky, Cokhavi & Kirschenbaum, 2006; van Schaik and Ling, 2009; Tuch et al., 2012). When examining the processes involved in making aesthetic judgements of appeal, Leder and colleagues have proposed a model of aesthetic processing including both an ‘automatic’ unconscious stage and a

'deliberative', more thoughtful stage of processing (Leder et al., 2004; Leder, Ring & Dressler, 2013, see Figure 4, p.63). The later deliberative stages of Leder et al.'s model rely more on higher cognitive processes and are influenced by the context in which stimuli are viewed or an individuals' prior knowledge.

While Leder et al.'s theory has the advantage of encapsulating both forms of processing, it does not address when the switch from automatic to deliberate processing occurs and how this affects judgements of appeal, with little of the current research literature addressing this issue either. Perhaps, when individuals are given longer to process a website these later processes may start to take effect, influencing users' judgements of appeal. If initial rapid judgements of appeal inform later judgements, as research to date suggests (Lindgaard, Fernandes, Dudek & Brown, 2006; Lindgaard, Dudek, Sen, Sumegi & Noonan, 2011; Tractinsky et al., 2006; Tuch et al., 2012), then evaluations made after longer presentation times should be consistent with those made after rapid exposures to website stimuli even though higher cognitive processes, as described in Leder et al.'s model, may begin to take effect. However, if the heuristics underpinning evaluations change over time, despite initial evaluations, then different judgements of appeal may emerge when individuals are given longer to evaluate the websites. Experiment 2 (see Chapter 3) explored this possibility, examining potential differences in participants' initial (after 500ms) and later (after 6 seconds *or* after unlimited, self-paced evaluation time) judgements of appeal.

1.1.3 Framing decision-making

Message framing refers to contextual information which produces a cognitive bias influencing the decision-making process and the judgements that participants subsequently make (Tversky & Kahneman, 1981; Levin, Schneider & Gaeth, 1998). Indeed, consumer research recognises the importance of building a brand to change

perceptions in order to shape positive consumer choices (see Alvarez & Fournier, 2016; Keller & Lehmann, 2006; Schmidt, 2006; Sprott & Liu, 2016, for reviews). The key to brand perceptions is thought to lie with the construction of positive brand memories which shape consumer attitudes (Herz & Brunk, 2017; van Reijmersdal, 2009). Research to date suggests that the nature of the information an individual has about the brand represented on a website (i.e. positive or negative information) may also play a determining role in how appealing they find that website (e.g., Hartmann, de Angeli & Sutcliffe, 2008; Cho & Oh, 2012; Park & Lennon, 2009). However, no research has yet examined how the use of brand framing messages impacts users' evaluations of website appeal. In addition to examining the timescale of decision-making, Experiment 2 also examined the influence framing brand information may have in determining evaluations of appeal. By investigating the influence of positive and negative framing at different time points (i.e. 500ms, 6s and unlimited, self-paced exposure), it was possible to examine the extent to which framing affected initial rapid evaluations of website appeal and whether or not framing creates longer lasting effects.

Norman (2004) argued that *'halo effects'* were created from positive initial impressions and that, once formed, they may last for some time (see also Lindgaard et al.). Halo effects are now recognised as an important determinant of brand attitudes (Beckwith, Kassarjian & Lehmann, 1978; Kardes, Pogacar, Hassey & Wu, 2017; Leuthesser, Kohli & Harich, 1995). What is not yet known is whether or not positive brand framing can create halo effects which impact on appeal evaluations and whether or not these last beyond the first impressions of the website. This possibility was examined in Experiment 2.

1.1.4 The concept of visual framing

Whilst Experiment 2 focused very much on framing in the traditional sense, employing verbal messages to frame users' decisions of website appeal, Experiment 3 (see Chapter 4) adopted a more subtle approach to decision framing. Introducing the concept of visual framing Experiment 3 examined how the appeal of a website may influence, or frame, evaluations of advertisement appeal. Despite the ubiquity of online advertising, little consideration is given to how the appeal of the websites on which they appear could be an important factor in determining the perceived appeal and efficacy of embedded advertising. This possibility was examined in Experiment 3 by systematically varying the appeal of the websites presented (high vs low appeal) as well as the appeal of the embedded advertising (high vs low appeal).

The effect of the familiarity of the brands associated with both the website and the advertisement appearing alongside it were also examined in Experiment 3. This was because research has shown that our familiarity with a brand affects the efficacy of online advertising (see Goldfarb, 2014; Ha, 2008; 2012; McCoy, Everard, Polak & Galletta, 2007, for reviews) with many of these factors also associated with website appeal (see Chiou, Lin & Perng, 2010; Moshagen & Thielsch, 2010; Thielsch et al., 2014). Of particular interest was the effects of brand familiarity which appear to have a similar impact on both websites and advertisements (see Alvarez & Fournier, 2016; Keller & Lehmann, 2006, for reviews). Certainly, advertisements from familiar brands are perceived more positively (Campbell & Keller, 2002), also having a greater influence on purchase behaviour (Sun & Wang, 2010) whilst increasing the amount individuals say they are prepared to pay (Kim, Kaufmann & Stegemann, 2014; Kim, Natter & Spann, 2009). This was examined in Experiment 3 by orthogonally varying the brand familiarity of both website and advertising.

To summarise, Experiment 3 investigated the effects of website appeal (high vs. low appeal) and brand familiarity (high vs. low familiarity) *on* ratings of perceived advertisement appeal and familiarity in an attempt to identify how a website may be visually framing an advertisement. Furthermore, eye tracking was employed to examine possible differences in visual sampling of the websites and advertising depending on the visual appeal and brand familiarity of the website and advertising. Here the possibility of interplay between the characteristics of website and advertisement occurs, shaping where users' attend.

1.1.5 Individual differences in cognitive processing

The majority of research in this domain focuses on typical populations with little consideration of individual differences and how this might impact on cognitive processing of websites and judgements of appeal. One group of individuals that have been identified as being of particular interest are individuals with autism spectrum disorders (ASD). Recently, companies such as Microsoft have been actively seeking to employ individuals with autism because of "strengths such as accuracy, a good eye for detail and reliability" (BBC, 2015). These strengths may be because they are thought to differ in their cognitive processing of visual information (Happé & Booth, 2008; Happé and Frith, 2006; Frith, 2012; Bölte et al., 2007; Chen et al., 2012). In their classic research, Happé and Frith (2006) demonstrated that individuals with ASD tend to process highly detailed information more accurately and efficiently than the typical population. This is attributed to the influential theory of 'weak central coherence'.

A concept proposed by Frith (1989; 2003), central coherence refers to our inherent cognitive drive to draw large amounts of information together when analysing a situation or problem, examining it as a *whole*. This concept is based on the notion of global and local processing. In a typical population, global processing

is thought to take precedence when examining an object or scene, coming into effect during the early stages of visual processing, i.e. we see the forest before the trees, analysing the situation as a whole (Navon, 1977). As time passes, we automatically shift to local processing, focusing on the finer details of the visual scene in order to facilitate detailed analysis (Bar et al. 2006).

This is encompassed in past work by Oliva and colleagues who demonstrated how individuals tend to extract the overall gist of a visual scene quickly, using global features, before moving on to examine the finer details (Schyns and Oliva, 1994; Greene & Oliva, 2005; Oliva et al., 2004; 2005; 2006). Therefore, when time is limited, such as when given only milliseconds to analyse a visual stimulus, it is widely thought that global processing is key to how we perceive, make sense of, and evaluate what we are attending to (Förster & Dannenberg, 2010; Navon, 1977; Thielsch & Hirschfeld, 2010; 2012).

In contrast to the visual processing displayed in typical individuals, the theory of weak central coherences proposed that this drive for global coherence is weakened in individuals with ASD, resulting in an inability to integrate pieces of information into coherent wholes. In place of this drive towards processing information globally is an affinity for local, detail-focused processing that often results in superior task performance in ASD when dealing with complex information where global processing may be a hindrance (Happé, 2013; Soulières, Zeffiro, Girard & Mottron, 2011). These differences in cognitive style may impact the way in which these individuals make judgements and decisions about the internet and their experiences of websites.

Despite there being limited research investigating the online needs of some specific populations (e.g. Karreman, van der Geest & Buursink, 2007; Stefano, Borsci & Stamerra, 2010), from the current review of the literature there appears to

be no research which focuses on website appeal evaluations in minority populations, including individuals with ASD. Experiment 4 (see Chapter 5) addresses this issue by bringing together current work on differences in visual processing between autistic individuals and the typical population examining how this may affect website appeal evaluations. ASD formed a primary focus not least because these individuals are being actively recruited on the basis of an assumed cognitive strength, but also given that autism affects more than 1 in 100 individuals in the UK alone (NAS, 2016). Therefore, it is of vital importance that we address this gap in the literature, expanding our current understanding of how these individuals perceive and cognitively process evaluations of website appeal.

Evidence suggests that participants with ASD exhibit a bias towards processing of high spatial frequency information, which has also been linked to local processing of detailed information (Behrmann, Thomas & Humphreys, 2006; Caplette, Bruno & Frédéric, 2016; Deruelle, Rondan, Salle-Collemiche, Bastard-Rosset & Fonséca, 2008; Kéïta et al., 2014; Kikuchi, Senju & Hasegawa, 2013). As noted by the theory of weak central coherence, individuals with ASD tend to process information locally more than typical populations who in contrast tend to show a bias towards global, less detailed, processing. It is an open question about how these differences in processing might affect website appeal.

Research carried out by Thielsch and Hirschfeld (2010; 2012) provides some clues about how these different biases might operate. They examined the impact of high and low spatial frequencies in website evaluations in a typical population and found that even though ratings of appeal were significantly predicted by high spatial frequencies (i.e. local processing), low spatial frequencies (i.e. global processing) still made a unique contribution. Of particular interest was their finding that *only* low spatial frequency (global) information is used when making rapid judgements of

website appeal, with high spatial frequency information only beginning to have influence when participants were given longer to view website stimuli. Therefore, the question arises as to how this reliance on low spatial frequency information when making rapid judgements of appeal affects individuals with autism who typically display a preference towards more detailed cognitive processing. This link between cognitive processing and spatial frequency information provides a paradigm in which to examine this in detail. Through combining this knowledge with the literature pertaining to our understanding of ASD and cognitive processing, along with that relating to the timescale of decision-making when evaluating website appeal, as discussed in Experiment 2 and 3, several key questions can be considered: namely, how does the bias towards local processing shown in autistic individuals shape their judgements of website appeal and how will changing the type of spatial information present affect this? Furthermore, how do these differences in cognitive style affect the timescale of processing, if at all, and are individuals with ASD just as able to make reliable judgements of website appeal in a short space of time, despite their more detailed processing? Experiment 4 examined these possibilities, exploring differences in evaluations of website appeal between a typical and ASD population, whilst controlling what spatial frequency information was present. This was achieved through the use of spatial frequency filters (high vs. low vs. no spatial frequency filter) on each website landing page, altering the type of information (global or local) present. Participants were given either 250ms or 6s website viewing time, examining the reliability of appeal judgements under restricted timescales. Combining this with convergent eye tracking data allowed for further exploration, examining whether individuals with ASD demonstrate differences in eye movements and if so, how this relates to the judgements they make.

To summarise, it was expected that this programme of research would make it possible to address a number of gaps in the literature to date with respect to users' perceptions of website appeal. Experiment 1 addresses the use of limited and/or poorly controlled for stimulus sets. Experiments 2-4 address the nature of the processing involved when making judgements of website appeal, the timeline in which they occur, and how these processes are influenced by other variables such as verbal and visual framing effects and individual differences. The implications of the data from experiments for theories of aesthetic appeal is discussed. Particular attention is given to the extent to which Leder et al.'s theory can explain these findings and a modified version of their theory is presented.

CHAPTER 2

2.1 Experiment 1: Norms of subjective website appeal

Browsing websites has become a common activity in our daily lives, something which for most is now second nature. From online research and banking to grocery shopping and online entertainment, the Internet is used as a platform to host an array of activities that we, as the user, take part in. For many companies and organisations their website landing, or 'home', page has become their shop front window advertising their brand and services, often on a global scale. Website designers therefore need to ensure that website landing pages are attractive to a broad range of individuals (Douneva, Jaron & Thielsch, 2016; Moshagen & Thielsch, 2010, Thielsch & Hirschfeld, 2018).

There is now a large body of research examining the characteristics deemed to be important in determining what makes a website appealing (see Chiou, Lin & Perng, 2010; Moshagen & Thielsch, 2010; Thielsch, Blotenberg & Jaron, 2014 for reviews). As noted in Chapter 1, research has often used a limited set of bespoke stimuli when investigating which characteristics determine user evaluations of appeal. This chapter will examine research to date whilst looking at why using restricted sets of stimuli may limit how well research findings can be generalised. Furthermore, it will report the findings of a large study which created a corpus of websites that could be used in future research: ratings of key website characteristics were obtained for 480 websites from 700 participants to obtain normative ratings for each website. Websites were selected for the corpus to ensure they were varied in terms of appeal and familiarity and provided a good representation of different forms of website and content found on the internet, from websites for products, services and ecommerce, through to social media, news and information databases.

2.1.1 Aesthetic appeal

Aesthetic derives from the Greek *aisthetikos* meaning sensitive or pertaining to the sense of perception. The philosophy of art has been studied across the centuries but it was only in the 19th century that Fechner (1876) established the field of experimental aesthetics. Current definitions of aesthetic appeal vary from art or design-based aesthetic critiques to definitions by measurement such as simple yes/no like/dislike responses (see Reber, Schwarz & Winkielman, 2004 for a review). The concept of aesthetic appeal has its foundations routed in philosophy, beginning with philosophers such as Plato and Aristotle, where this domain was largely occupied by art. Aesthetic appeal in terms of art has been concerned with the beauty of an object or stimuli and its ability to invoke a positive emotional response (see Page, McManus, González & Chahboun, 2017, Palmer, Schloss & Sammartino 2013, for reviews). Certainly, it is in the domain of art that some of the first measurements of aesthetic pleasure and appeal were developed. For example, a prominent theoretical metric which is still discussed today is the golden ratio. This is a mathematical equation and geometric proportion regarded as the key to creating aesthetically pleasing art (Abbas, 2017; see Stieger & Swami, 2015, for a discussion).

The foundations laid by those such as Plato and Aristotle later made way for influential works by individuals such as Kant, who was one of the first to outline aesthetics as a subjective concept (Dickie, 1997). It was here aesthetics began to develop its subjective underpinnings where beauty is what it is perceived to be i.e. an aspect which is in the eye of the beholder. Modern research has built upon these foundations and focused much more on studying aesthetics and appeal in a scientific manner (Fechner, 1876), recognising appeal as an individually varying and subjective experience, whilst also being an ongoing response which has underlying cause and determining characteristics, rather than just a 'specialist' response to art

(Jacobson 2006; Shimamura & Palmer 2012). These methods stress the importance of being able to accurately record aesthetic judgements and identify the cause of these responses. Research has examined aspects of colour (e.g. Hurlbert & Ling 2007; Palmer & Schloss 2010) and spatial structures (Graham & Redies 2010; Palmer & Griscom 2013) in determining appeal, through to the impact of individual differences, where it is widely acknowledged how individuals can vary dramatically on their aesthetic preferences (e.g. McManus 1980, McManus, Jones & Cottrell, 1981). Such research has been grounded in theories of aesthetic response such as the mere exposure effect (Zajonc 1968; Palmer, Gardner & Wickens, 2008), based on the premise that the more you are exposed to a stimulus the more you will like it. Fluency theory develops this concept, suggesting that when stimuli are perceived repeatedly they become easier to process and that this perceptual fluency results in more positive subjective responses (see Oppenheimer & Frank, 2008, for a review).

In terms of what constitutes aesthetic appeal, Palmer et al. (2013) conducted an extensive review of the literature examining the concept and history of 'appeal' from the philosophical foundations of artistic appreciation, to more recent attempts at identifying the 'science of aesthetics' (Fechner, 1876, onwards). In their view aesthetic experience does not only apply to positive or extreme situations but is embedded in our subjective responses to stimuli in almost every aspect of our daily lives. This is not dissimilar to the approach taken by Oppenheimer and others (e.g. Alter & Oppenheimer, 2009; Oppenheimer & Frank, 2008; Reber, Schwarz & Winkielman, 2004). Recent research examining the appeal of icons and websites has taken this approach and uses individuals' subjective perceptions of stimuli to investigate aesthetic appeal (e.g. McDougall & Reppa, 2008; Moshagen and Thielsch, 2010; Reppa & McDougall, 2015).

Based on these approaches the term ‘appeal’ is used in this thesis to refer to mild aesthetic experiences made on the basis of simple judgements of liking by participants. This is thought most likely to be analogous to the judgements that users are making when they encounter websites. It should also be noted that liking and appeal in this instance refer to the power to attract whereas preference refers to selecting one thing over another. While similar mechanisms are thought to underpin both liking judgements and preferences, the focus here is on judgements of appeal.

2.1.2 Measures of website appeal

Many tools to date have employed single-item measures in order to assess appeal (e.g., Hassenzahl, 2004; Sonderegger and Sauer, 2010). However, it has been argued that this type of measure is less reliable given its ‘singularity’ (Schmidt and Hunter, 1996) and cannot adequately discriminate between the dimensions of aesthetic appeal, only providing a judgement overview (Dollinger and Malmquist, 2009). Typically, measures used today attempt to identify critical aesthetic dimensions using a factor analytic approach.

An early example of such a tool was the creation of The Web Analysis and Measurement Inventory (WAMMI; Kirakowski, Claridge & Whitehand, 1998; Kirakowski & Cierlik, 1998). The WAMMI was designed to establish a global measure for evaluating users’ satisfaction of a website and consisted of five dimensions of a user’s experience; attractiveness, control, efficiency, helpfulness and learnability. These five dimensions were taken from an earlier questionnaire known as the Software Usability Measurement Inventory (SUMI; Kirakowski & Corbett, 1993) which was used to reliably evaluate desktop applications. After the success of the SUMI, Kirakowski et al. (1998) developed a similar questionnaire for recording user satisfaction with websites, the WAMMI. This was achieved by gathering participants’ views of different website experiences, both positive and negative.

These statements were factor analysed resulting in a five-factor model of user-perceived satisfaction. Although this is a five factor model, it is only one domain, attractiveness, which specifically relates to aesthetic appeal as described in this research, again falling into the single measure category in terms of appeal. Therefore, the WAMMI is primarily a measure of usability rather than aesthetic appeal. Other global measures have attempted to measure website success and usability but again these often only use a single dimension in their models to measure aesthetic appeal. For example, van Schaik and Ling (2005) identified five factors assessing the quality of human-computer interaction to be used when evaluating websites. However, only *one* of their measures relates directly to website aesthetics, a scale which had originally been created by Tractinsky, Katz and Ikar (2000).

Other measures take a more multi-dimensional approach to appeal. In a series of experiments, Lavie and Tractinsky (2004) designed and validated a measure which recognised *two* dimensions of the visual aspects associated with evaluating website appeal. Firstly the classical aesthetics of a website which relates to aesthetic appeal and structure and secondly, the expressive aesthetics of a website, relating to creativeness and originality. These two dimensions were validated using a series of factor analyses which began with a set of 41 characteristics obtained from their literature review along with input from eleven professionals such as web designers and human-computer interaction researchers. Using exploratory factor analysis, data from an initial sample of one-hundred and twenty-five participants was analysed with eight factors emerging from the original 41 characteristics. However, further analysis indicated a two-factor solution may be optimal; classical and expressive aesthetics. Work such as this was one of the first to delve into this domain with

more depth, laying the foundations for future works by other researchers (e.g. Moshagen & Thielsch, 2010).

Although arguably not with the same care and attention, further scales have been developed which consider multiple-item measures of visual aesthetics (e.g. Hong & Kim, 2004; Moshagen, Musch & Göritz, 2009; van der Heijden, 2003). However, there is little consistency in the key factors identified. These variations in the literature have made it difficult to consistently characterise websites and successfully measure aesthetic appeal. In a review, Moshagen and Thielsch (2010) underlined that not only is there an array of different characteristics being juggled in an attempt to measure and classify appeal, many refer more to usability rather than aesthetics, and those which do account for aesthetics often classify this as a single dimension, which they contend may not be the case. They argue that while significant progress has been made, several issues still remain such as lack of validity and questions over whether any current scales represent all relevant aspects of visual website aesthetics.

Research carried out by Moshagen and Thielsch (2010; 2013) has, however, attempted to address these issues through providing a 'precise operational definition' (Moshagen & Thielsch, 2010, p689) along with a more compelling measure of website appeal. They conducted an extensive systematic review of the literature to examine all possible website characteristics which might contribute to perceptions of website appeal. In total, they identified 84 characteristics that were grouped into 12 domains. Table 1, drawn from their review, shows the different aspects of website design which previous research had recognised as determinants of subjective perceptions of website appeal.

Table 1: *Aspects of visual website design examined by researchers.*

Aspect examined	**Research**
Animations, visual effects, movement, dynamics	Lavie and Tractinsky (2004), Rau et al. (2007), Sutcliffe and de Angeli (2005), Tarasewich et al. (2001).
Balance, equilibrium, symmetry	Bauerly and Liu (2006, 2008), Bi et al. (2011), Brady and Phillips (2003), Lai et al. (2010), Lavie and Tractinsky (2004), Ngo et al. (2003), Zheng et al. (2009).
Coherence, craftsmanship, harmony, modernity, professionalism, style	de Angeli et al. (2006), Kim et al. (2003), Hassenzahl (2004), Lavie and Tractinsky (2004).
Colour	Brady and Phillips (2003), Coursaris et al. (2008), Cyr et al. (2010), de Angeli et al. (2006), Hall and Hanna (2004), Kim et al. (2003), Ling and van Schaik (2002), Papachristos et al. (2006), Schrepp et al. (2006), Shieh and Lin (2000), Simon (2001), Sutcliffe and de Angeli (2005), Tarasewich et al. (2001).
Complexity, diversity, variety	de Angeli et al. (2006), Ngo et al. (2003), Pandir and Knight (2006), Tuch et al. (2009).
Grouping, structure, order	Bauerly and Liu (2006, 2008), de Angeli et al. (2006), Lavie and Tractinsky (2004), Ling and van Schaik (2002), Schmidt et al. (2009), Schrepp et al. (2006), Schenkman and Jönsson (2000).
Homogeneity, unity, regularity, uniformity	Kim et al. (2003), Ngo et al. (2003), Tarasewich et al. (2001).
Images, icons, graphics	de Angeli et al. (2006), Lai et al. (2010), Schenkman and Jönsson (2000), Schmidt et al. (2009), Simon (2001), Tarasewich et al. (2001).
Novelty, creativity, inventiveness, interestingness	Haig and Whitfield (2001), Lavie and Tractinsky (2004), Pandir and Knight (2006).
Proportion, cohesion	Bauerly and Liu (2006, 2008), Ngo et al. (2000, 2003).
Simplicity, clarity, parsimony, density	Lai, Chen, Shi, Liu & Hong (2010), de Angeli et al. (2006), Karvonen (2000), Lavie and Tractinsky (2004), Ngo et al. (2003), Rau et al. (2007), Schmidt et al. (2009).
Text, fonts, links	Ling and van Schaik (2002), Schenkman and Jonsson (2000), Schmidt et al. (2009), Tarasewich et al. (2001).

Moshagen and Thielsch devised a questionnaire examining each of these 84 characteristics and using factor analysis on data collected from a large sample of 300 participants across several studies, reduced these to 18, refining them into four main website characteristics. This analysis was used to create the Visual Aesthetics of Websites Inventory (VisAWI). The final four website characteristics that they identified were:-

(i) Simplicity: The aspects of a website that facilitate the perception and processing of the layout.

(ii) Diversity: The visual richness, creativity and novelty of a website.

(iii) Colourfulness: The evaluation of the colour schemes and combinations in that website.

(iv) Craftsmanship: How professional the website is, reflecting whether the site has been created with skill and using modern technologies.

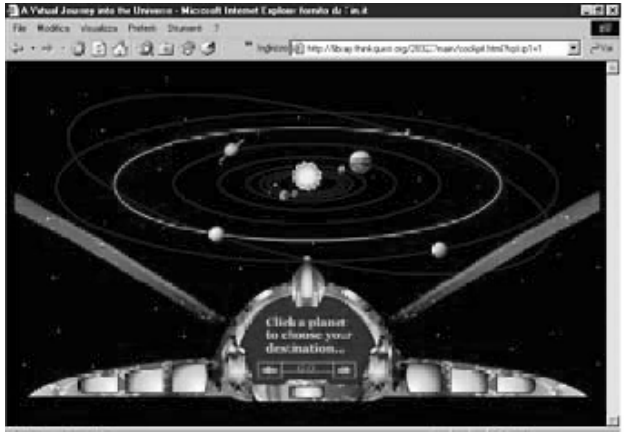
Given both the extensive literature review and the large sample of participants obtained to underpin subsequent factor analysis, the VisAWI appears to be the most reliable and valid tool for measuring perceptions of website appeal to date. Therefore, this measure was adopted for use in the studies which follow.

2.1.3 Experimentation Stimuli – The 'Fixed-Effect Fallacy'

The assumption typically made in the literature to date examining website appeal assumes that conclusions drawn from a limited set of stimuli will be easily generalised across the wider domain, something which is not always the case. In psycholinguistics this issue is characterised as the 'language as a fixed-effect fallacy' and refers to the way in which researchers often do not provide statistical evidence to show their findings generalise beyond the specific sample of stimulus materials used (Brysbaert, 2007; Clark, 1973; Raaijmakers, 2003). The early work by Clark (1973) demonstrated that when stimuli are controlled carefully for experimental

reasons variation is restricted and with it the ability to transfer findings across other stimuli and into the wider domain. He argued that experimental statistical analyses needed to account for this issue and recommended the use of both by-participants and by-items analysis, combining them to make an overall F value, known as minF. By examining variation by-items as well as by-participants and setting the criterion that both F values should be significant, Clark provided a conservative estimate of statistical significance for instances in which limited stimulus sets were used. Others, however, have suggested that this statistic is too conservative and may result in Type II errors (see Hutchinson, Wei & Louwerse, 2014).

As more recent work has demonstrated (e.g. Brysbaert, 2007; Hutchinson, Wei & Louwerse, 2014) this issue is not restricted to psycholinguistics and applies throughout an array of other psychological domains including those which employ memory tasks or use other forms of stimuli such as images (Raaijmakers, 2003). Indeed, this issue can be directly related to much of the work undertaken in the area of website appeal and design. As already noted, research examining aspects of website appeal have often employed a small or individually tailored set of website stimuli which have been purposely chosen to allow for specific experimental manipulation, thus allowing for experimental control but reducing variation considerably. For example, Hartmann, Sutcliffe and de Angeli (2008) examined user judgments of appeal and usability across different user interfaces (see Figure 1). However, in each study only two versions of two websites were used, each of which had been specifically developed for their experiments. Similarly, research conducted by van Schaik and Ling (2008) involved using only four versions of the same website in their experimental design. While these websites may be easier to control experimentally, it is difficult to justify generalising these findings across the broad array of website content available online.



(a) Astronomy website: Metaphor-based interface

(b) Astronomy website: Menu-based interface

(c) History website: Metaphor-based interface

(d) History website: Menu-based interface

Figure 1: Websites used by Hartmann et al.(2008) to examine differences in appeal between metaphor-based and menu-based interface.

Furthermore, even studies which have employed a larger stimulus set of fifty to one hundred websites (e.g. Lindgaard et al. 2006; Thielsch, Blotenberg & Jaron, 2014; Thielsch & Hirschfeld, 2010) have used stimuli which have still been selected by the experimenters themselves, often not piloted before use under experimental conditions. Therefore, findings from studies such as this have to be treated with some caution as they still may not form an adequate representation of 'real world' websites used by the general population. Although being clearly identified in psycholinguistic research, this issue remains largely unrecognised in studies examining website design and appeal. This is one of the issues which Experiment 1 attempts to address.

The difficulty for research is to obtain the correct balance between generalisability and experimental control and this is typified in the 'language as a fixed-effect fallacy' debate. (see Brysbaert, 2007; Hutchinson, Wei & Louwerse, 2014). In terms of experimental control, it is important to know exactly what is being varied and to what extent and, where this is not the case, incorrect assumptions may be drawn when determining the cause of experimental effects. Reconciling both these demands when selecting appropriate stimuli for research has typically been done by using appropriate large corpora where appropriate stimulus characteristics have been quantified and from which stimuli can be selected (e.g. Bestgen & Vincze, 2012; Dan-Glauser & Scherer, 2011; Prada, Rodrigues, Silva & Garrido, 2015). The data obtained for the website corpus in Experiment 1 is designed to do this for website stimuli.

2.1.4 Lost in time?

Advances in technology have made way for the development of many new design techniques, along with crisper graphics and higher attention to detail, and the visual appeal of an interface has become more important relative to its usability (de

Angeli, Sutcliffe & Hartmann, 2006; Hassenzahl. 2004; Hekkert, 2006). It is therefore important to recognise that website design is a dynamic and fast-moving area and that the corpus obtained in Experiment 1 represents the time at which data was gathered. The need to do this has been recently highlighted by Silvennoinen and Jokinen (2016) who provided an updated corpus for research examining icons on interfaces. They examined how icon design and preference has changed over time from 1995 through to 2015 as technologies have advanced and user experience has become more important. They noted that particular attention needs to be given to time-related aspects of visual design when users' perceptions of appeal are being considered. Despite being time-limited, the principals and methods used are important and updates versions of the corpus can be produced when required. This has already been done for icon corpora: the ratings of symbol and icon characteristics obtained by McDougall, Curry & Bruijn, (1999) have recently been updated and advanced by Prada, Rodrigues, Silva & Garrido (2015).

2.1.5 Individual Differences

An area which is often neglected when creating a corpus containing normative data is the role of individual differences. Where they are considered, emphasis is often placed on gender differences (e.g. Prada, Rodrigues, Silva, & Garrido, 2015; Rodrigues et al., 2017). The limited research to date has suggested there may be some gender differences when examining website appeal (e.g. Moss & Gunn, 2009). For example, symmetry is thought to be associated with enhanced aesthetic perception, but in a study examining gender differences in website design, Tuch, Bargas-Avila and Opwis (2010) found that the importance of this design characteristic was only significant in males, indicating gender may be an important variable to consider. For this reason, Experiment 1 also examined gender differences to establish whether or not gender influences appeal judgement.

Furthermore, the majority of research on website appeal focuses on a typical population with little consideration given to other significant individual differences and how this may influence on judgements of appeal. As discussed later in Chapter 5, this is no truer than for individuals with Autism Spectrum Disorder, who are thought to process information differently to typical individuals (Frith, 1989; 2003). However, it is not known how these differences in cognitive style affect judgements of perceived website appeal. Therefore, as a precursor to Chapter 5, the current experiment extends beyond the aims outlined previously examining the relationship between autistic traits, as measured by the Autism-Spectrum Quotient (Baron-Cohen et al., 2001), and judgements of perceived website appeal.

2.1.6 Measuring website characteristics: subjective norms for 480 websites

Rating corpora have been used in a variety of domains to measure stimulus characteristics. Examples include:-

(i) In psycholinguistics for the development of verbal materials (Bestgen & Vincze, 2012; Proctor & Vu, 1999) and images from line drawings (e.g. Cycowicz, Friedman, Rothstein, & Snodgrass, 1997; Snodgrass & Vanderwart, 1980) to more complex real-life visual stimuli when examining picture naming (e.g. Dan-Glauser & Scherer, 2011; Marchewka, Żurawski, Jednoróg, & Grabowska, 2014).

(ii) In the field of facial recognition and its disorders there are now large databases for human face stimuli (e.g. Ebner, Riediger, & Lindenberger, 2010; Langner et al., 2010).

(iii) Ratings of symbol and icon characteristics have also been obtained in the human-computer interaction domain (McDougall, Curry & Bruijn, 1999; Prada et al., 2015).

Experiment 1 obtained subjective ratings from a large number of participants across key characteristics for a corpus of 480 website landing pages. These included measures of appeal, familiarity and informativeness. As noted earlier, one of the most well-founded tools developed for evaluating a users' experience of a website is the VisAWI, based on the 4 key website characteristics isolated in Moshagen and Thielsch's work (2010); simplicity, diversity, colourfulness and craftsmanship. This consisted of eighteen questions, with several items relating to each of the four characteristics (see Appendix A). Based on further research and factor analyses, Moshagen and Thielsch (2013) later created a short version of the VisAWI for use as a quick and effective tool for evaluating individuals' experiences of a website with one question relating to each of the four characteristics (see Appendix A). Given the extensive literature review, along with the scale of their investigations ensuring both the reliability and validity of the VisAWI, it was a natural choice to include this given the aims of the present study. Ratings of simplicity, diversity, colourfulness, and craftsmanship were therefore obtained for each website landing page along with a rating of overall appeal.

Overall appeal. It was thought useful to gain subjective norms on the overall aesthetic appeal of a website. This would allow us to examine whether or not each of the 4 dimensions identified by Moshagen and Thielsch were indeed separable. An overall measure provides a single benchmark measure for each stimulus and can also be used to examine relationships between appeal, usability and performance more easily. Appeal ratings may well be related to usability and user performance, not least because it determines how much effort an individual will make towards a task (McDougall & Reppa, 2008; Reppa & McDougall, 2015; Sonderegger, Zbinden, Uebelbacher & Sauer, 2012).

Familiarity. Familiarity has been found to influence the speed with which we respond to websites (Galleta, Henry, McCoy & Polak, 2006) and icons on interfaces (McDougall & Isherwood, 2009). The more familiar a stimulus is, the more like it is to be appealing (Fang, Sing & Aluwahlia, 2007; McDougall, Reppa, Kulik & Taylor, 2016; Lindgaard et al., 2006). In Experiment 1 two types of familiarity are distinguished; brand familiarity and website familiarity. A website may be visited many times making the appearance of the website more familiar and this is referred to as website familiarity. This may be distinguished from brand familiarity i.e. the familiarity of the brand represented by the website. It may be that an individual is familiar with a brand, but has not visited the website before. What is not known is whether or not brand familiarity can be differentiated from website familiarity. This was examined in the present study.

Informativeness. The informativeness of a website refers to the amount of content and information it portrays along with how successful it is in enabling the user to extract the required information from the webpage. Informativeness has been linked with judgements of appeal and website effectiveness; more informative websites lead to more positive evaluations (Chakraborty, Lala & Warren, 2002; Thielsch et al., 2014), however, these evaluations may have quite a different basis in comparison to those associated with visual characteristics.

To summarise, the aim of this study was to provide normative ratings of a large corpus of varied websites. Ratings were obtained for overall appeal and key visual characteristics (using the VisAWI), as well as familiarity (previously shown to be correlated to appeal) and informativeness. On the basis of previous research one might expect:-

(i) That overall ratings of appeal would be related to each of the 4 dimensions rated using the VisAWI.

(ii) While each of the dimensions of the VisAWI might be expected to be inter-related to some extent, given that these were identified as 4 separate factors by Moshagen and Thielsch, correlations *between* these dimensions should not be as high as with overall ratings of appeal.

(iii) That ratings of brand familiarity may differ from website familiarity, although this is an open question given the lack of research to date.

(iv) That ratings of website informativeness will differ – and not be correlated with – ratings based on the visual properties of websites.

2.2 Method

2.2.1 Participants

Seven-hundred participants (141 Males, 559 Females) took part in this study aged between 18 and 35 (M= 21.93, SD= 8.64). Participants were recruited from Bournemouth University and the surrounding community and were offered either a chance to win £50 to spend at Amazon UK or course credits as an incentive to take part. The study was approved by the Ethics Committee at Bournemouth University. Informed consent was obtained from all participants prior to taking part who were provided with both briefing and debriefing information.

2.2.2 Materials

Stimuli consisted of 480 screenshots of different website landing pages taken from a wide array of subject matters (see Appendix B, for examples). These websites were chosen at random by searching online for different subject matter in accordance with the content domains outlined in previous research (see Moshagen & Thielsch; 2010, Thielsch & Hirchfeld, 2010) selecting various websites from each domain. This included content domains such as ‘e-commerce’, ‘entertainment’, ‘social platforms and ‘search engines’, among others. Landing pages were used as in general they are the first page encountered on a website and determine whether or not users will click through to other pages or move away from the website. Each stimulus measured 800 pixels by 478 pixels and were in jpeg format. Survey Monkey (www.surveymonkey.net) was used to create and administer the questionnaires online. The websites were rated using the 4 questions taken from the short version of the VisAWI (Moshagen & Thielsch, 2013), along with a scale of overall appeal, familiarity, and informativeness (see Table 2). In order to look at individual differences beyond those such as gender, participants were also asked to complete the short form of the Autism-Spectrum Quotient (AQ), a questionnaire

which provides an insight as to whether an individual holds any of the characteristics or traits associated with autism, thus giving a glimpse of their cognitive style (Allison, Auyeung & Baron-Cohen, 2012; Baron-Cohen et al., 2001; see Appendix C).

2.2.3 Procedure

All 480 websites were randomly assigned to one of 6 survey sets. Each participant was asked to rate 80 websites on a single dimension in order to avoid 'rating fatigue'. Participants did not rate websites twice; they rated *one* of the sets of 80 websites on a *single* dimension only. This created a total of 6 survey sets each containing a set of 80 website stimuli. Each set of 80 websites had 6 subsets, one for each dimension of the VisAWi, one for overall ratings of appeal and finally, one for informativeness ratings. This totalled 36 separate surveys, each of which was completed by approximately 21 participants. This was done in order to ensure that previous given ratings regarding say, colourfulness, would not then inform ratings of craftsmanship. Other corpora, in contrast, have relied on participants providing multiple ratings of the same stimuli (e.g. Prada et al., 2015). In these instances, it is difficult to ascertain the extent to which one rating has been influenced by another and what subsequent correlations between ratings mean, particularly if inter-correlations between statistics are high. In addition to their singular rating of appeal or informativeness, all participants were also asked to rate how familiar they were with the brand, as well as if they had visited the website before.

Participants completed the surveys online. Figure 2 provides an example of a typical rating page presented in the survey. One website stimulus was presented per page along with a response section. With the exception of website familiarity, which was a 'yes' or 'no' multiple choice question, all aspects were rated on a 1-7 Likert scale where 1 = low on a given dimension and 7 = high on a given

dimension. Table 2 summarises the instructions and scale anchors for each of the dimensions. Each survey took approximately 20 minutes to complete. Before starting the main survey, participants were given two practice websites to familiarise themselves with the process.

Table 2: *Summary of statement and scale anchors.*

Dimension	Statement	Scale
Simplicity (VisAWI)	Everything goes together on this site.	1 = Strongly disagree 7 = Strongly agree
Diversity (VisAWI)	The layout is pleasantly varied	1 = Strongly disagree 7 = Strongly agree
Colourfulness (VisAWI)	The colour composition is attractive.	1 = Strongly disagree 7 = Strongly agree
Craftsmanship (VisAWI)	The layout appears professionally designed.	1 = Strongly disagree 7 = Strongly agree
Appeal	Please rate how appealing you find this website	1 = Not informative at all 7 = Very informative
Brand Familiarity	I am familiar with the brand.	1 = I have not seen this brand before 7 = very familiar indeed with the brand.
Website Familiarity	I have visited this website before	Yes or No
Informativeness	Please rate how informative you find this website	1 = Not informative at all 7 = Very informative

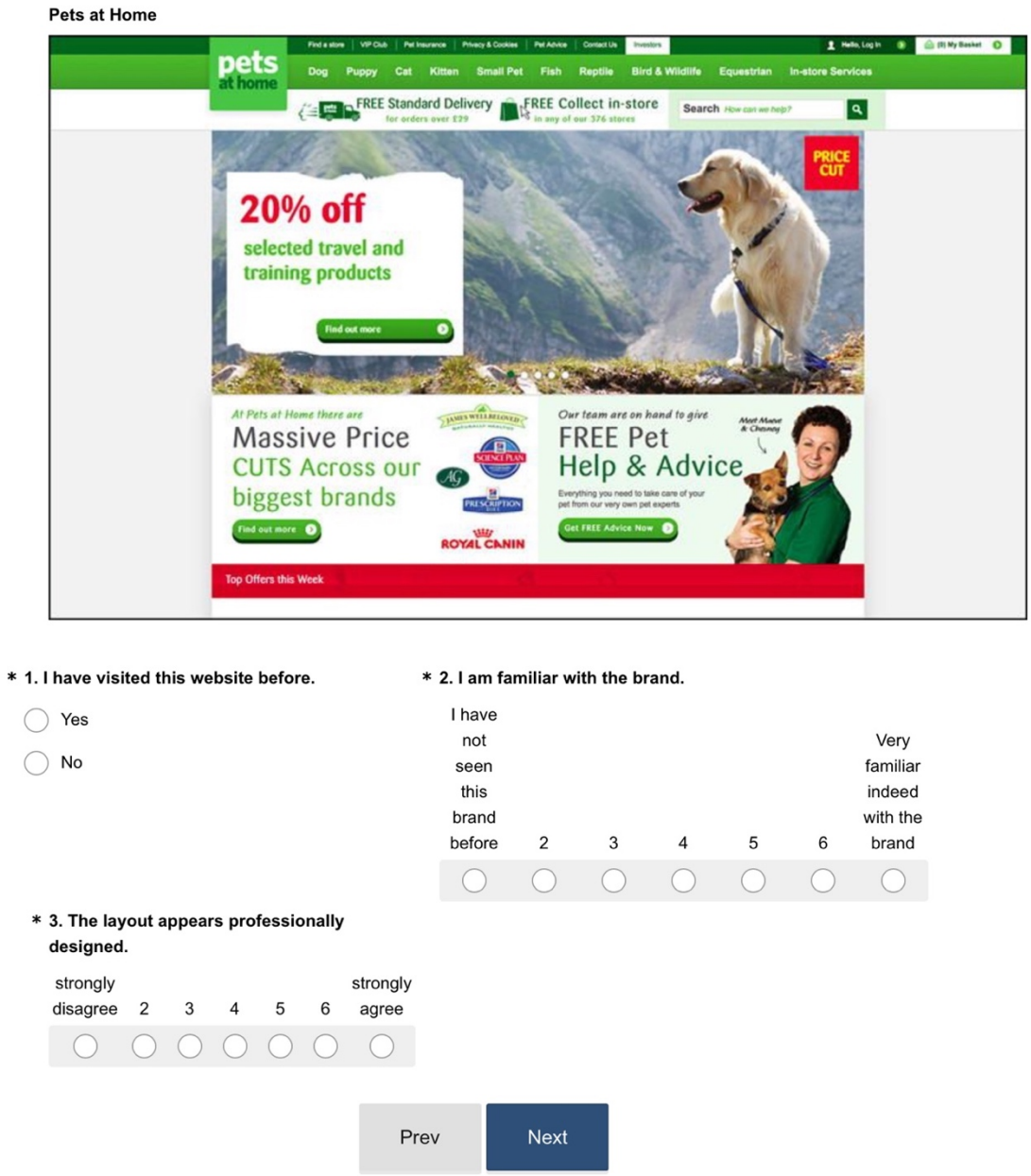


Figure 2: A typical survey rating page presented to participants on-line. Question 3 relates to the single dimension which changes between survey sets as outlined in the method.

2.3 Results

The analysis reported are by-items, rather than by-participants, since it is the website materials which are of primary interest (see McDougall et al., 1999; Prada et al., 2015, for a similar approach).

Table 3 shows the mean, standard deviation and range for each of the ratings obtained, as well as measures of skew. Overall ratings from the VisAWI, overall appeal and informativeness appear to have means in the mid-range with relatively little skew in the distributions observed. However, it is clear that websites which were relatively unfamiliar are in preponderance. Subsequent analyses will examine whether the same relationships pertain between ratings when familiar vs unfamiliar websites are examined separately. Details of ratings for each website are provided in Appendix D.

Table 3: *Means, standard deviations, minimum, maximum, and measures of skew for each corpus rating (N=480).*

	Mean	SD	Minimum	Maximum	Skew
Simplicity	4.38	0.87	1.57	6.24	-.29
Diversity	3.87	.91	1.38	5.86	-.46
Colourfulness	3.67	.96	1.19	6.10	-.18
Craftsmanship	4.20	1.01	1.33	6.24	-.45
Appeal	3.46	1.01	1.10	6.33	-.003
Brand Familiarity	2.79	1.86	1.01	6.84	.79
Website Familiarity	1.85	0.23	1.01	2.00	-1.90
Informativeness	3.71	.65	1.38	5.78	-.24

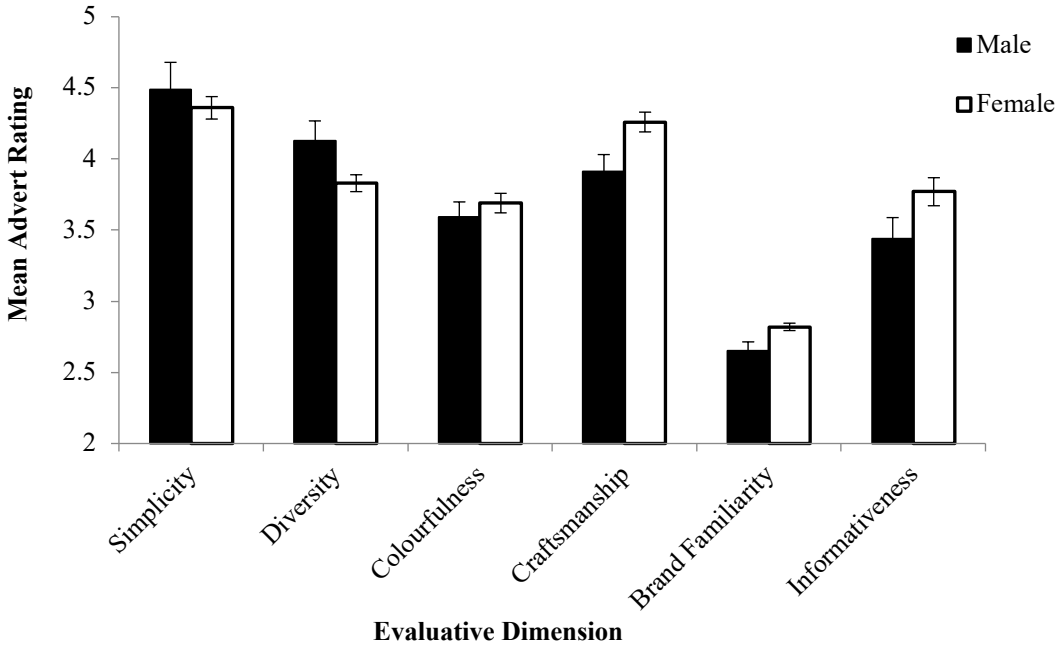
2.3.1 Gender Differences

Table 4 presents the means, standard deviations and difference t-tests for each dimension between men and woman. Using Bonferroni corrections, comparative analysis showed there to be no significant differences between any of the dimensions with one exception being brand familiarity. As demonstrated in figure 3a, females tended to rate websites as significantly more familiar than males.

2.3.2 Individual Differences: The Autism-Spectrum Quotient

In order to examine the differences, participants were grouped in to either a high AQ group (score of 5-10; N= 110) or low AQ group (0-3; N=465). For comparative purposes those with a score of 4 were excluded as on average this was the most common and median score. Table 5 shows the means, standard deviations and difference t-tests for each dimension between the high and low groups. After accounting for Bonferroni corrections, there was a significant difference in perceived ratings with respect to colourfulness ($p<.01$) and borderline significance in terms of ratings of craftsmanship ($p=.011$). As the graph in Figure 3b indicates, individuals in the high AQ group tended to give lower ratings. What is also interesting to note here is, although not significant, it is clear from the graph that those in the high AQ group tend to give lower evaluative ratings across all dimensions, with the exception of brand familiarity.

(a) Gender differences



(b) AQ differences

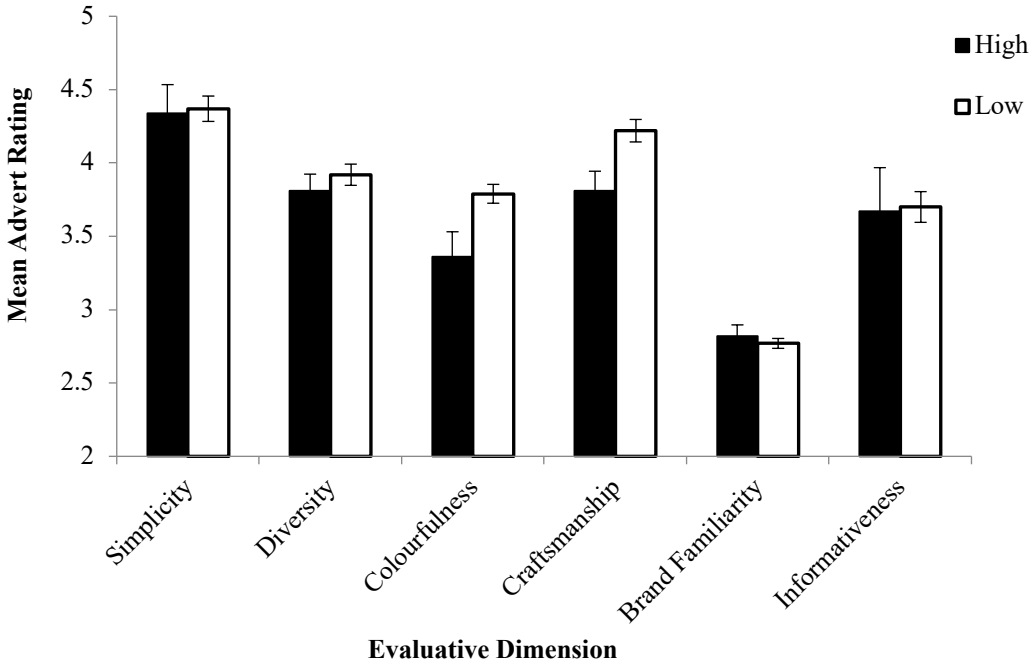


Figure 3: (a) gender differences and *(b)* AQ differences between evaluative dimensions.

Table 4: *Means, standard deviations and mean difference t-tests between men and woman across dimensions.*

	Men		Woman		Difference Test for Gender	
	Mean	SD	Mean	SD	t	*p*
Simplicity	4.49	.80	4.36	.82	-.64	.526
Diversity	4.13	.58	3.83	.62	-1.95	.054
Colourfulness	3.59	.57	3.69	.68	.68	.501
Craftsmanship	3.91	.53	4.26	.72	2.04	.043
Brand Familiarity	2.65	.67	2.82	.60	2.60	.010
Informativeness	3.44	.51	3.77	.71	1.53	.131

Table 5: *Means, standard deviations and mean difference t-tests between high and low AQ groups across dimensions.*

	High		Low		Difference Test for AQ group	
	Mean	SD	Mean	SD	t	*p*
Simplicity	4.34	.91	4.37	.80	.122	.903
Diversity	3.81	.50	3.92	.68	.68	.499
Colourfulness	3.36	.80	3.79	.57	2.85	.005
Craftsmanship	3.81	.64	4.22	.69	2.60	.011
Brand Familiarity	2.82	.71	2.77	.61	-.47	.638
Informativeness	3.67	.84	3.70	.71	.12	.904

2.3.3 Correlations

Table 6 shows the correlations observed between ratings. In line with the experimental hypotheses, the pattern of correlations can be summarised as follows:-

(i) Overall ratings of appeal are very closely related to *all* dimensions of the VisAWI.

(ii) All dimensions of the VisAWI are very closely correlated with each other, raising questions about the independence of these factors in Moshagen and Thielsch's (2013) original analysis.

(iii) Brand familiarity and website familiarity are closely correlated. Since these measures were not independently obtained, some caution should be exercised in interpreting this particular finding. Additionally, familiarity as a dimension appears to be closely related to ratings of appeal (including the VisAWI). This is particularly the case for familiarity with the brand, which may be a better overall index of familiarity.

(iv) While ratings of informativeness are weakly correlated with simplicity and familiarity, they are *not* correlated with more visually-based ratings of appeal. This suggests that web content is evaluated differently from measures of appeal. This might be expected on the basis of recent findings (Thielsch et al., 2014) which suggest that evaluation of information content taps different processes in comparison to evaluations of the visual content of a website.

Table 6: *Correlations between ratings of the website corpus (N=480).*

	Simplicity	Diversity	Colourfulness	Craftsmanship	Appeal	Brand Fam.	Website Fam.	Informativeness
Simplicity	-							
Diversity	.87**	-						
Colourfulness	.79**	.84**	-					
Craftsmanship	.87**	.89**	.85**	-				
Appeal	.86**	.86**	.86**	.88**	-			
Brand Fam.[1]	.70**	.62**	.53**	.68**	.66**	-		
Website Fam.[2]	-.58**	-.49**	-.42**	-.53**	-.56**	-.84**	-	
Informativeness	.18**	.08	.07	.05	.09	.11*	-.17**	-

[1]Brand familiarity; [2]Website familiarity

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

2.4 Discussion

This study set out with the intention to create and develop a normative database of website stimuli which could be used in research across domains such as human-computer interaction and psychology, ensuring the appropriate experimental control of stimuli. As outlined previously, there has been considerable research undertaken when creating resources such as this in the domains of psycholinguistics (e.g. Bestgen & Vincze, 2012; Dan-Glauser & Scherer, 2011; Marchewka et al., 2014), facial recognition (e.g. Ebner et al., 2010; Langner et al., 2010), and symbol and icon characteristics have also been obtained in the human-computer interaction domain (McDougall et al., 1999; Prada et al., 2015). Despite this, no similar data is available for websites and, as a result, many studies have developed their own, individually tailored stimulus sets often selected by the researcher themselves (e.g. Hartmann et al., 2008; van Schaik & Ling, 2008). This makes it difficult to know how well their findings may generalise beyond the experimental boundaries. The corpus developed in this study shows how these issues might be resolved and ensure researchers have the ability to appropriately control stimuli, whilst allowing the creation of larger, more varied stimulus sets that still maintain experimental control. This data formed the basis for creating the stimulus sets used in subsequent studies reported in this thesis.

It is interesting to note that overall ratings of appeal are highly correlated with simplicity, diversity, colourfulness and craftsmanship also being all strongly correlated. This raises questions with respect to the assumptions made by Moshagen and Thielsch (2010; 2013) with respect to the independence of these dimensions. Importantly, because ratings were obtained independently from different groups of participants, with the exception of brand and website familiarity, this makes high correlations between each aspect of website appeal less likely. The fact that they

were so high when obtained from different participants suggests that earlier, simpler measures of website appeal (e.g. Lavie and Tractinsky, 2004) may be sufficient to successfully assess aesthetic appeal.

In terms of familiarity, brand familiarity and website familiarity appear to be closely correlated to one another, suggesting they are very much inter-related. However, caution must be taken given that, unlike the other dimensions, these measures were not independently rated. As expected, familiarity with both the brand and website is positively related to all aspects of the VisAWI, as well as ratings of overall appeal (including the VisAWI). This is particularly the case for familiarity with the brand suggesting this may be a better overall measure of familiarity. This is in line with previous research which has found links between familiarity and appeal (McDougall et al., 2016; Fang et al., 2007; Lindgaard et al., 2006). Furthermore, as might be expected from recent research (Thielsch et al., 2014) informativeness was weakly correlated with simplicity and familiarity, and did not correlate with any other measures. These findings suggest that the evaluation of information content is associated with the content, rather than the visual appeal of the website, therefore being treated separately to website appeal.

Some differences in website perceptions appeared to arise as a result of gender (see Figure 3a) suggesting that gender may be useful to consider in future research and provides some support for previous research suggesting that gender has a role in the way we make judgements with respect to websites (e.g. Moss & Gunn, 2009; Tuch et al., 2010). However, in the current study these gender differences were not significant. This may have been due to a large variation in group size between male and female participants and therefore should be treated with caution. Differences were also apparent in participants' perceptions depending of their score on the AQ, measuring where individuals are placed on the autistic spectrum. Those

who scored highly on the AQ, indicating a higher number of traits associated with autism, tended to rate dimensions less positively. This is interesting and could be related to the assumptions which suggest individuals with autism spectrum disorder can process stimuli in a different manner to typical individuals. This possibility is examined further in Chapter 5.

CHAPTER 3

3.1 Experiment 2: The effects of exposure time and framing on website appeal

It is now well established that users' affective experience can be just as important as usability and performance when examining website design (e.g. Hartmann, Sutcliffe & de Angeli, 2008; Hassenzahl, 2004; Mack & Sharples, 2009; Schmidt, Liu & Sridharan, 2009). The importance of perceptions of the aesthetic appeal of interfaces in determining perceived usability was highlighted in an influential study by Tractinsky, Katz and Ikar (2000). They demonstrated that participants' *initial* aesthetic appeal affected their *post-use* perceptions of both aesthetics and usability. In contrast, participants' initial perceptions of usability did not affect their later perceptions. As a result, Tractinsky and his colleagues concluded that 'what is beautiful is usable' (Tractinsky et al., 2000, p. 127).

As noted in Chapter 2, research has focused on defining the characteristics of a website which contribute to users' perceptions of appeal when forming decisions about a website interface (e.g. Moshagen & Thielsch, 2010; 2013). However, this only tells us one part of the story. At the beginning of the appeal decision 'timeline', research has consistently demonstrated that users' can make rapid reliable judgements of appeal in 50-200 milliseconds (Handy, Smilek, Geiger, Liu & Schooler, 2008; Lindgaard *et al*., 2006; 2011; Tractinsky, Cokhavi, Kirschenbaum & Sharfi, 2006).

'Context of use', in its broadest sense, also influences attitudes to websites. Research has shown that a single user review of website material can influence attitudes to a website over a five-month period (Muchnik, Aral & Taylor, 2013) and there is a growing literature on the role of online reviews appearing in determining the success of product sales and services (Karakaya & Barnes, 2010; Sahoo, Dellarocas & Srinivasan, 2018; Zhu & Zhang, 2010). We also know that

information available prior to viewing a website such as our perceptions of a brand (e.g. Cho & Oh, 2012; Park & Lennon, 2009; de Angeli, Hartmann & Sutcliffe, 2009) and whether or not that information is positive or negative (Hartmann, Sutcliffe & de Angeli, 2008) can have an impact on decision-making.

Experiment 2 brings together these two strands of research in order to investigate the nature of decision-making in the initial stages of processing, primarily focusing on: -

(i) Rapid appeal evaluations – how users are making initial judgements about websites and how presentation time may influence these evaluations

(ii) How framing information prior to exposure impacts upon decision-making with respect to website appeal evaluations, examining how judgements may be shaped by prior brand information even before stimuli are processed

(iii) The role of eye movements in understanding how users' process online content and how this their eye moments relate to their perceived judgments of appeal.

In Experiment 2, the presentation time (500ms vs 6s vs unlimited, self-paced time) and the frame of prior brand information (positive vs negative vs no frame control) was systematically varied. Data from the website corpus was used to manipulate website characteristics, and positive and negative brand information messages were used to frame the websites. The differences in perceived ratings of appeal were examined across both time and frame conditions to explore how presentation time affects users' judgements of perceived website appeal, along with the influence of how information is framed. Eye movements were recorded to examine the relationship between the online content sampled and the appeal judgements participants made. In line with previous research (Lindgaard et al., 2006; Tractinsky et al., 2006; Tuch et al., 2012), it was expected the judgements of

perceived appeal made in the 500ms condition would be highly correlated to those in the 6s and unlimited, self-paced condition (identified as UL from this point forward). Websites which were positively framed were expected to receive more positive ratings of appeal. The literature with respect to the formation of appeal perceptions (both first impressions and subsequent processing), along with the possible framing effects of branding on website appeal are now reviewed. The use of eye tracking in website research is also examined and identified as a possible tool for understanding the decision-making processes when evaluating websites.

3.1.1 First impressions: The processing of initial judgements of appeal

Given that this research was concerned with the initial timeline of processing in making judgements of website appeal, it is important to consider how quickly first impressions are made. The way in which first impressions of stimuli are formed rapidly is now well documented and applies to impressions as disparate as personality (Bar, Neta & Linz, 2006), architecture (Akalin, Yildirim, Wilson & Kilicoglu, 2009), software interfaces (Saadé and Otrakji, 2007) and even car design (Leder and Carbon, 2005). The processes which underpin and form these first impressions have been shown to influence our mid- to long-term behaviour (e.g. Plous, 1993; Rabin & Schrag, 1999). Similar processes operate for websites where individuals' initial impressions are critical in capturing their interest and establishing an intention to stay and use the website (see Tuch et al., 2012, for a review).

Users may spend remarkably little time on website landing pages with some reports suggesting they stay for less than one minute before moving on (Zheng, 2018) whilst others suggest that more than 50% of website visits users spend fewer than fifteen seconds on the landing page (Haile, 2014). Designers may have much less than fifteen seconds to make a first impression if very fast initial judgements do not alter once made. Certainly, Norman's early work on 'emotional' product design

suggests that this may be the case. Norman (2004) proposed that users make very fast initial responses - 'visceral beauty responses'- which are immediate, holistic and physiologically based, assuming that these responses were likely to influence later judgements. This long-term effect on decision-making is referred to as the 'halo effect', where initial impressions of a stimulus are transferred and carried over to our evaluation of other attributes of that stimulus (see also Hartmann et al., 2008; Lindgaard et al., 2006; 2011). Thus, if our initial response to a website is negative then we are more likely to judge other website attributes negatively (Fang, Sing & Aluwahlia, 2007).

3.1.1.1 Rapid evaluations of website appeal

In a well-known seminal study, Lindgaard et al. (2006) demonstrated that individuals automatically make a reliable judgement of website appeal in the first 50ms of viewing it. In their study, participants were shown a selection of websites for either *500 milliseconds* or *50 milliseconds* and asked to rate their visual appeal. This process was repeated to examine whether the ratings of appeal obtained on the first occasion were reliable, rather than just random responses given to please the experimenter. Correlations between ratings taken on the first and second occasion were extremely high *irrespective* of whether or not participants had seen the websites for 500ms or just 50ms. Lindgaard et al. argued that individuals make holistic and physiological responses (LeDoux, 1996; Damasio, 2000), where seeing a stimulus for the briefest of glances enables them to develop some form of pre-conscious judgement. At the same time Tractinsky, Cokhavi, Kirschebbaum and Sharfi (2006) also examined judgements of visual appeal of websites using both 500ms and 10 second presentation times, demonstrating again that ratings obtained at 500ms correlate very highly with judgements at 10 seconds. In 2011, Lindgaard et al. conducted further, more rigorous, investigations adopting a masking paradigm

to ensure that visual processing of the target stimulus did not exceed the given presentation time. Once again they demonstrated how individuals' form a reliable judgement in just 50ms.

The work by Lindgaard and colleagues has become very influential, stimulating growth in research examining how initial judgements are formed as well as initial impressions of perceived usability (Lindgaard et al., 2011), trust (Albert, Gribbons & Almadas, 2009) and credibility (Robins & Holmes, 2008). Building on Lindgaard et al.'s initial paradigm, research typically displays a selection of website landing 'home' pages with varying presentation times (see Tuch et al., 2012). For example, Michailidou, Harper and Bechhofer (2008) examined visual complexity and its influence on aesthetics after a presentation time of 7 seconds. They reported strong correlations between visual complexity and aesthetics: webpages which are perceived as clearer and more organised being deemed less complex and more aesthetically pleasing. Table 7, drawn from a review by Tuch and colleagues, provides a summary of research inspired by Lindgaard et al.'s work. This research has shown how reliable and consistent judgements of appeal can be made in a very short amount of time and that these may have a lasting impact on our long-term behaviours and attitudes. Furthermore, research clearly demonstrates the importance of visual aesthetics in determining aspects of an interface or website other than appeal, including usability (de Angeli, Sutcliffe & Hartmann 2006; Hassenzahl & Monk, 2010; Thielsch et al., 2014; Tuck, Roth, Hornbæk, Opwis & Bargas-Avila, 2012), trust (Karvonen, Cardholm & Karlsson, 2000; Seckler et al., 2015) and overall impressions and satisfaction (Kang & Kim, 2006; Palmer, 2002; Shukla, Sharma, & Swami, 2010; Tuch, Bargas-Avila & Opwis, 2010). This has led to aesthetic appeal dominating a large amount of research dedicated to human-computer interaction (see Bargas-Avila & Hornbæk, 2011, for a review). Given this,

focus should be given to understanding the processes underpinning how these judgements are made (Tuch et al., 2012). When considering the timescale of decision-making, the literature would expect individuals to make a reliable judgment of website appeal even when only given 500ms to view a stimulus. This notion is examined in the current experiment through comparing independent judgements of appeal made at 500ms, 6 seconds and an unlimited, self-paced amount of time. This is something which experiment 2 aimed to examine.

Table 7: *Summary of research publications the field of website appeal and first impressions.*

Publication	**Research topic**	**No. of stimuli; participants**	**Exposure time**	**Mask**	**Dependent variables**	**Findings**
Lindgaard et al. (2006), study 1	Attractiveness	100; 22	First and second trials: 500ms	No	Visual appeal	Appeal judgments after 500ms are highly reliable.
Lindgaard et al. (2006), study 2	Attractiveness	50; 31	First and second trials: 500ms, third: unlimited	No	Visual appeal; design characteristics (third trial)	Appeal judgments after 500ms correlate highly with judgments without time restrictions.
Lindgaard et al. (2006), study 3	Attractiveness	50; 40	Group #1: 50ms, group #2: 50ms	No	Visual appeal	Reliable appeal judgments are already formed after 50ms.
Tractinsky et al. (2006), study 1	Attractiveness	50; 40	First trial: 500ms, second trial: 10 s	No	Visual appeal; objective response latency	Attractiveness ratings after 500ms correlate highly with ratings after 10s. Extreme attractiveness ratings were provided faster by participants than moderate ones.
Tractinsky et al. (2006), study 2	Attractiveness	24; 53	first trial: 500ms, second trial: unlimited	No	Classical & expressive aesthetics	High correlation between attractiveness and classical/expressive aesthetics (Lavie & Tractinsky, 2004). Low attractiveness is associated mainly with very low ratings of expressive aesthetics.

Kim and Fesenmaier (2008)	First impression	50; 65	7s	No	First impression; informativeness; usability; credibility; inspiration; involvement; reciprocity.	Inspiration and usability are factors that lead to favourable first impression.
Lindgaard et al. (2008), study 1	Cultural effects reg. attractiveness	50; 72	Group #1: 50ms, group #2: 500ms; 2 trials	No	Visual appeal	There were no cultural differences regarding attractiveness ratings of US websites.
Lindgaard et al. (2008), study 2	Cultural effects reg. attractiveness	50; 80	Young: 50ms, old: 500ms; 2 trials	No	Visual appeal	Chinese/Taiwanese participants rated visual appeal higher than Canadians when judging web pages of their native culture, but no differences emerged for North American web pages.
Michailidou et al. (2008)	Visual complexity and aesthetics	30; 55	First and second trials: 7s z	No	Visual complexity; classical & expressive aesthetics	Strong correlation between visual complexity and structural elements (links, images, words and sections) as well as aesthetics (organization, clearness, cleanliness, interestingness and beautifulness).
Robins and Holmes (2008)	Attractiveness and credibility	42; 20	Unlimited	No	Credibility	When the same content is presented using different levels of aesthetic treatment, the content with a higher aesthetic treatment was judged as having higher credibility.

Albert et al. (2009)	Trust	50; 64	First and second trials: 50ms	Yes	Trust	Approximately 50% of participants were consistent in their trust assessments for the same web sites across both trials. There was a significant correlation between trust assessments of both trials, averaged across all participants.
van Schaik and Ling (2009), study 1	Attractiveness and context	50; 125	First trial: 500ms, second trial: unlimited	No	Visual appeal (first trial); classical & expressive aesthetics (second trial)	Context increases stability of judgments from perceptions after brief exposure to those after self-paced exposure. More attractive pages are preferred over less attractive ones after brief exposure, but only if no context is provided.
van Schaik and Ling (2009), study 2	Attractiveness and context	2; 115	First trial: 500ms, second trial: unlimited, third trial: site usage	No	Visual appeal (first trial); classical & expressive aesthetics (second trial); mental workload; task performance	Context increases the stability of judgments from perceptions after self-paced exposure to those of after site use. After brief exposure, classically aesthetic pages that are information oriented are rated as more attractive than expressively aesthetic pages.
Lindgaard et al. (2011), study 1	Attractiveness	50; 20	First and second trials: 50ms	Yes	Visual appeal	Shows that results of prior studies in this field can be replicated, even if masking is used.

Lindgaard et al. (2011), study 2	Attractiveness, trust, usability	50; 48	First and second trials: 50ms	No	Visual appeal, perceived trustworthiness, and perceived usability	Judgments of appeal, trust and usability were highly consistent from one trial to the next in aggregate and comparisons of individual data. All three judgments were driven predominantly by appeal.
Thielsch and Hirschfeld (2012)	Attractiveness	50; 92	50, 500 and 10,000ms	Yes	Visual appeal	High correlations between aesthetic responses to low-pass filtered (LF), high-pass filtered and unfiltered websites. Moderate effect of LF when stimuli are presented only once and very briefly for 50ms.
Tuch et al. (2012), study 1	Visual complexity, prototypicality and perceived aesthetics	120; 59	50, 500, 1000ms	Yes	Perceived beauty	Higher complexity resulted in lower beauty ratings and high prototypicality resulted in higher beauty ratings. An interaction between both visual complexity and prototypically suggests they are somehow related with respect to their influence on perceived beauty.
Tuch et al. (2012), study 2	Visual complexity, prototypicality and perceived aesthetics	120; 82	50, 500, 1000ms	Yes	Perceived beauty	Confirmed findings of previous study and suggested the combination of low VC and high PT ina web page leads to higher ratings of perceived beauty.

3.1.2 Aesthetic processing and visual appeal

Research has also examined more effortful, long-term processing, of aesthetic appraisal suggesting a complex and multi-dimensional process in judgements of appeal (for example, Clore, Gasper & Garvin, 2001; Lindgaard and Whitfield, 2004; Lindgaard et al., 2011; Pickford, 1972; Reber, Schwarz & Winkielman, 2004). An influential model of aesthetic judgement that advances beyond first impressions has been proposed by Leder and his colleagues (Leder, Belke, Oeberst & Augustine, 2004; Leder, Ring, & Dressler, 2013; Brieber, Nadal, Leder & Rosenberg, 2014). This theory proposes a five-stage information-processing model of aesthetic judgement, involving both automatic and deliberate processing (see Figure 4). According to Leder et al., we automatically carry out the first 2 stages of judgement, perceptual analysis and implicit memory integration, in the first moments of viewing a stimulus. These processes seem likely to be implicated in the formation of our first impression of a website (Tuch et al., 2012) and include analysing the complexity of the stimulus and how well structured it is, as well as identifying how familiar the stimulus is to us, all contributing to the inevitable judgments we make. If these processes are occurring implicitly in the first instances of viewing a website then it is vital that we understand what characteristics of a website contribute to initial aesthetics judgments.

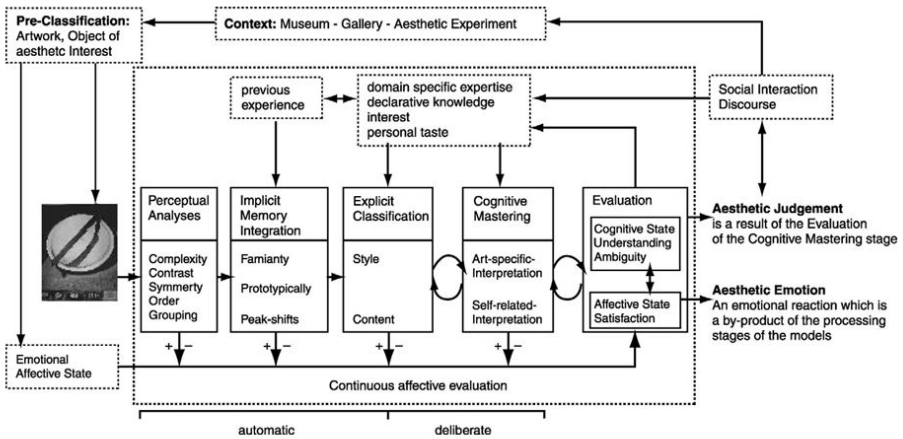


Figure 4: Model of aesthetic processing (Leder et al., 2004).

The latter three stages Leder et al.'s model of aesthetic judgement differ from the first two stages in that they rely on higher cognitive processes which can be influenced by the observers' expertise and knowledge, as well as the context of the situation. Following this model, one might assume that when individuals are given longer to process a website, these higher processes begin operating to shape and change users' judgements of appeal. However, the extent to which later judgements change the initial fast evaluations which have already taken place in the initial automatic processing stages is an open question. Are these instantaneous judgements stable? Do they still apply several seconds later? Or do more top-down processes start to influence as proposed by Leder et al.'s model? Experiment 2 examined this question using an unlimited, self-paced condition where participants could view each website for as long as they wished to, thus providing the opportunity to identify when this 'switch' from automatic to deliberate processing may occur and how this affects users' evaluations of appeal.

The evidence to date indicates that first impressions are rapidly formed. Websites therefore need to be designed to ensure they are appealing initially in order to maximise the probability of later positive evaluations. This research will examine participants' decision-making processes initially (after 500ms) and later (after 6s *or* after unlimited, self-paced evaluation time) using convergent evidence from eye tracking, performance measures and users' conscious evaluations of websites. It was hypothesised that if our initial judgements do indeed shape our final judgements, then initial evaluations made by individuals after 500ms should be consistent with evaluations being made after longer exposure times (6s and UL) where higher cognitive processes are implicated (as described in the later stages of Leder at al.'s model). If, however, the heuristics and processing underpinning evaluations changes over time, irrespective of initial evaluations, then different patterns of evaluation

may emerge when participants are given longer to evaluate the websites (i.e. in the 6s and UL condition). This should be reflected not only in evaluation ratings but in the pattern of visual sampling across the websites. For this reason, eye tracking was used in this study to provide data convergent with rating evaluations.

3.1.3 Brand framing and judgements of website appeal

One important aspect of a website which may influence a user's initial judgement of appeal is the information already in memory with respect to the website brand. Certainly, in terms of the model of aesthetic processing proposed by Leder et al., this is an aspect which would be most prominent in the implicit memory integration stage, where familiarity plays a significant role in shaping our judgements. This concept is important given how website users' brand memory and attitudes are constantly being shaped by marketing information (Herz & Brunk, 2017; van Reijmersdal, 2009). This information may 'frame' users' perceptions of website appeal.

3.1.3.1 Judgement and decision-making

Tversky and Kahneman (1981) first introduced the notion of the framing effect. The framing effect results from the way in which information is presented when decision-making, introducing a cognitive bias to which individuals unconsciously respond. They proposed that the outcomes from decision-making problems depends on how problems are contextualised with positive gains being seen as more persuasive and therefore more likely to influence decision-making (Kahneman & Tversky, 1979). In a classic experiment, Tversky & Kahneman (1981) showed how presenting the same information in a positively or negatively framed way shaped participants decisions (see Figure 5). Two groups of participants were given an identical cover story. Group 1 was asked to choose between two positively framed solutions to the problem (programmes A and B) while Group 2

was asked to choose between two negatively framed solutions (programmes C and D). Despite the fact that identical information is presented to both groups, most people in Group 1 chose program A, where the prospect of saving 200 lives is seen as a more attractive option than the riskier one-in-three chance of saving 600 lives, whereas those in Group 2 tended to opt for program D, where the certain death of 400 people is less appealing than the two-in-three chance that 600 people will die. This difference in judgement is explained by how the information is framed. Outcomes given in Group 1 are described by the number of lives *saved* and in Group 2 by the number of lives *lost.* This results in a shift from risk aversion to risk taking behaviour. Since this early classic study, a great deal of research has demonstrated the framing effect in action (e.g. Kühberger, 1998; Gallagher & Updegraff, 2012) and numerous studies have demonstrated the robustness of this effect (see Gong et al., 2013; Piñon & Gambara, 2005, for reviews).

Cover Story	
A city of 600 people is likely to be attacked by a deadly disease that might result in the deaths of its inhabitants. You have been asked to select a strategy that will help the city combat the epidemic.	
Group 1: Positive Frames	***Group 2: Negative Frames***
Programme A: This programme ensures that 200 people will be saved. Programme B: One-third probably that all will be saved, and two-thirds probability that none of them will be saved.	Programme C: Even after implementation of this programme, 400 people will die. Programme D: One-third probability that no one will die, and two-thirds probability that all 600 will die.

Figure 5: Example of a problem presented in Tversky & Kahneman's (1981) study.

Levin, Schneider and Gaeth (1998) distinguished between three kinds of framing in order to explain inconsistencies in the framing literature. These were 'standard risky choice framing' referring to the original concept as proposed by Tversky and Kahneman (1981), 'goal framing' where the goal of an action or behaviour is framed, and 'attribute framing' where only one attribute in a given context is manipulated and evaluated in terms of favourability. Here an object or event is framed either in a positive or negative way, with evaluations being compared to determine the framing effects (see Figure 6).

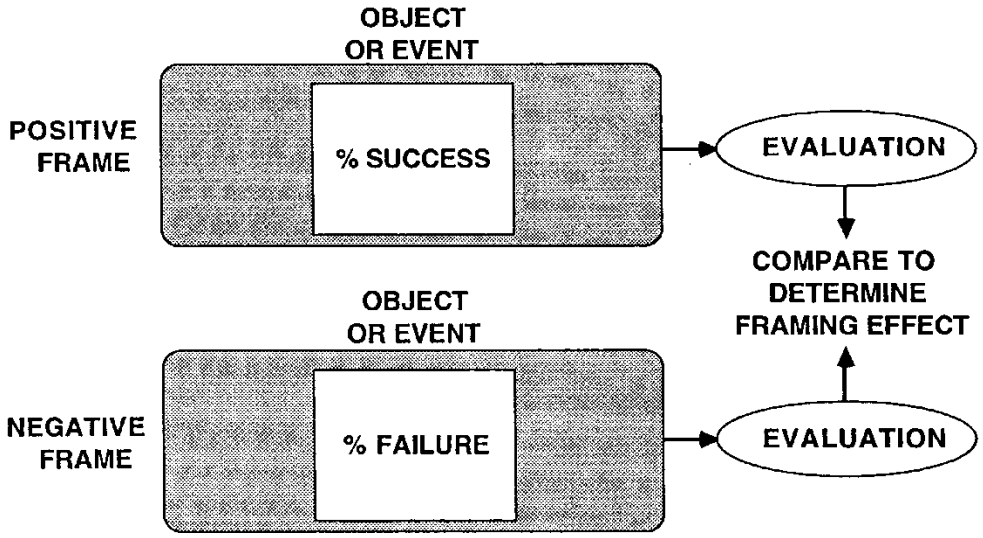


Figure 6: Typical example of the attribute framing paradigm (Levin et al., 1998).

Framing effects are also thought to be multidimensional and are implicated in both 'fast' (automatic) and 'slow' (effortful top-down) processing. The first, intuitive system, is responsible for fast instant judgements which are affective and automatic. The second slower, system is more analytical and rational (Chaiken & Trope, 1999; Kahneman & Frederick, 2002; Mukherjee, 2010; Sloman, 1996; Stanovich & West, 2000). Recent work by Guo, Trueblood and Diederich (2017) describes how this dual-process theory can explain framing effects in the faster

intuitive system that responds automatically to stimuli. They found evidence that the effects of framing were heightened when time pressure was increased and concluded that these effects arose from a fast, intuitive system. If this is the case, then it seems likely that framing information prior to viewing websites may well affect rapidly formed judgements of appeal. This was examined in the present experiment.

3.1.3.2 Framing the brand

In the consumer literature, the importance of brand perception and familiarity is arguably one of the most important factors in determining consumer choices. Ultimately, a brand reflects the entire experience which a consumer has with the product and/or service and plays an important part in the effectiveness of marketing and gaining consumer choice and trust (see Alvarez & Fournier, 2016; Keller & Lehmann, 2006; Schmidt, 2006, Sprott & Liu, 2016, for reviews). In terms of deciding where we will shop, we are likely to choose a brand we are more familiar with, over lesser known brands and this has a strong positive association with purchase intentions (Malik et al., 2013). Research has therefore examined how we can shape brand perceptions and influence the choices individuals make and the use of message framing is one way of doing this. Consumers rely on online reviews to provide them with adequate information to build their brand perceptions on and ultimately, their purchasing decisions (Hennig-Thurau, Gwinner, Walsh & Gremler, 2004; Bernoff & Li, 2008). The use of positive or negatively framed reviews has been shown to influence the likelihood of booking a hotel, with positively framed reviews leading to increased booking intentions and higher consumer trust (Sparks & Browning, 2011; Browning, So & Sparks, 2013). Chen and Chang (2016) found that positively framed product messages created a more favourable view of the target product and increased purchase intentions.

The influence of framing on perceptions of website appeal has received very little attention. One exception is a study by Hartmann, de Angeli and Sutcliffe (2008), who examined the impact of framing on user experience and judgements of website appeal. Hartmann et al. deployed attribute framing where each participant was given information about a particular website prior to being exposed to it. This information was either positively or negatively framed, relating to one website attribute; attributes were either usability, the look of the website, its content, or service quality. For example, information presented which focused on the look (attractiveness) of a website was framed in either a positive way, '90% of users find the website visually attractive' or a negative way, '10% of users find the website visually unattractive'. They found that the way in which information is framed has a large influence on users' judgements of website quality and appeal. Participants who received positively framed information prior to exposure tended to rate the associated attributes and overall website quality more positively, with the opposite effects being demonstrated for participants given negative information. However, although this study did take into account appeal through the use of Lavie and Tractinsky's (2004) scale items of classic and expressive aesthetics, these were considered with all other variables and not as a specific factor (i.e. it was not independent).

Experiment 2 examined the role of message framing in forming judgements of website appeal, particularly in relation to participants' first impressions of the websites. Key questions which were addressed were (a) the extent to which the framing effects observed might be triggered during initial fast evaluations of the websites viewing a website and (b) whether or not they create longer lasting effects, carrying over to or being consistent with judgements made after longer presentations times. On the basis of earlier research (Guo et al., 2017; Hartmann et al., 2008) it

was expected that framing messages would have an impact on user judgements of appeal even when websites are presented for just 500ms. Given the importance of branding (Alvarez & Fournier, 2016; Esch, Langner, Schmitt & Geus, 2006), brand information messages prior to viewing the associated website were presented which were either negatively framed, positively framed, or not framed at all (i.e. the baseline control condition).

3.1.4 Eye movements in website evaluations

Tracking eye movements has become an invaluable tool when examining cognitive processes in a number of different research domains, for example often being used for demonstration purposes in marketing and advertising to indicate where individuals look using heat maps (but see Karatekin, 2007; Sereno, Babin, Hood & Jeter, 2009; Wedel & Pieters, 2008a, for reviews). It has been argued that eye movements provide us with an excellent indication of the cognitive processes underlying visual search (e.g. Liversedge & Findlay, 2000; Wedel & Pieters, 2008b). Nevertheless, research employing eye tracking techniques to examine website usability (e.g. Bergstrom, Olmsted-Hawala & Jans, 2013), attention (e.g. Sutcliffe & Namoun, 2012) and online advertising (e.g. Rieger, Bartz & Bente, 2015) has been limited. Whilst eye tracking has been occasionally employed to analyse things such as what elements of a website individuals look at when viewing a website (e.g. Djamasbi, Siegel & Tullis, 2010), there is almost no eye tracking research related to website appeal evaluations and only very recently have eye tracking methods been adopted to examine appeal and first impressions in user interfaces.

In 2013, Nainwal proposed a method combining eye tracking analysis and individual experience in order to investigate visceral appeal, i.e. rapid evaluations of appeal. Eye tracking was used to examine what elements in an interface underpinned the participants' appeal judgements. This was achieved through

analysing aggregate heat maps along with individual gaze behaviour including gaze direction and fixation across different time points. By examining this with convergent subjective opinions, it was possible to ascertain how participants not only looked at similar elements of an interface, but looked at them in a similar order. This type of information provides a more detailed look at the underlying cognitive processing taking place, whilst also allowing such gaze patterns to be recorded and used to inform future design. However, while paving the way to show how eye tracking may be a useful methodology to employ when examining website appeal the assumptions and conclusions used in Nainwal's research are difficult to relate to Leder et al.'s model, or the literature in general. This is due not only to the unusual choice of presentation (3s), which is an age in terms of making judgements of aesthetic appeal (e.g. Lindgaard et al; Moshagen & Thielsch), but also because the methodology varies very much from the literature in general whilst only recruiting a small sample. That withstanding, the study by Nainwal still demonstrates the benefits of using convergent data from eye tracking in an attempt to further our knowledge and understanding of the cognitive processing involved when using the internet, and indeed, computer interfaces in general (see Djamasbi, 2014, for a review). For this reason, the present experiment employed eye tracking methodology. Participants dwell time on pictorial, textual, branding and menu information on website landing pages was examined as participants viewed them prior to making appeal judgements. Of particular interest was the possibility that similar appeal judgements would be made in the 500ms condition (despite limited dwell time) as in the longer six second and unlimited, self-paced experimental conditions. The possibility that differences in eye movements may result from positive or negative framing was also examined.

3.1.4.1 Recording eye movements

In the wider domain of human-computer interaction, the use of eye tracking has grown exponentially in recent years with advances in technology and affordability making it possible to incorporate eye tracking methodology into many forms of research (Duchowski, 2007; Poole & Ball, 2006). With this has come a greater recognition of how eye movements may vary depending on the nature and context of a task (Gegenfurtner, Lehtinen & Saljo, 2011), leading to an increase in the range of potential measures which can be employed when examining users' eye movements. The use of eye tracking when examining website appeal has been very limited (but see Djamasbi 2014, for a review of eye tracking and web experience) making it difficult to ascertain the best metric to use in the present research. Typically areas of interest are identified in a stimulus and then metrics measure the attention given to each area. Two of the eye tracking measures often used when examining areas of interest in website research are the number of fixations and dwell time on areas of interest in the stimulus. In this experiment and those that follow dwell time was used in favour of the number of fixations because this provides an index not only of *where* participants are looking but also the *duration* of time spent attending to each area (Cyr & Head, 2013; Cyr, Head, Larios, & Pan, 2009; Poole & Ball, 2006).

To summarise, Experiment 2 brings together two strands of research examining (i) rapid appeal evaluations focusing on how users are making initial judgements about websites and how longer presentation time may influence these evaluations and (ii) how presenting attribute framing information prior to exposure of a website impacts on these rapidly formed evaluations. This research examined participants' evaluations of website appeal when given 500 milliseconds, 6 seconds or an unlimited, self-paced amount of time to view websites and whether their

decisions were framed by presenting positive, negative or no brand framing information prior to viewing. Given what is known about rapid appeal evaluations of websites (Lindgaard et al., 2006; 2011; Tractinsky et al., 2006), it was expected that those given longer website viewing times would sample the website more extensively but that their initial appeal decisions would not differ from those given only 500ms to evaluate the website. Given the findings from previous studies (e.g. Hartmann et al., 2008), it was also hypothesised that attribute framing would influence users' judgements of website appeal, with positive framing resulting in more positive appeal evaluations.

3.2 Method

3.2.1 Design

A 3 x 3 mixed design was employed in this experiment with presentation time a between-subjects factor (500ms vs. 6s vs. unlimited presentation time) and framing message a within-subjects factor (positive vs. negative vs. no framing). The effects of presentation time and message framing was considered on the following dependent variables:-

(i) Ratings of perceived website appeal

(ii) Dwell time on website branding

(iii) Dwell time on website navigation

(iv) Dwell time on main website image

(v) Dwell time on main website text

Furthermore, additional multiple regression analysis was conducted in order to examine the predictors of appeal, namely prior website appeal ratings, brand familiarity and informativeness ratings.

3.2.2 Ethics

This study was reviewed and approved by the Bournemouth University Ethics Committee in line with the Ethics Code of Practice. Prior to taking part, all participants gave written consent once they had been fully briefed on what the experiment entailed.

3.2.3 Participants

In total, 60 participants (17 Males and 43 Females) took part in this study between the age of 18 and 55 (M = 24.59, SD = 7.65). Participants were recruited from Bournemouth University and were given course credits for taking part. All participants reported normal or corrected to normal vision and were regular users of computers and the internet. To provide the opportunity to examine individual differences in cognitive style, the Autism-Spectrum Quotient (Allison et al., 2012; Baron-Cohen et al., 2001) was completed by all participants.

3.2.4 Materials

A set of thirty-nine websites were selected from the corpus created previously in Chapter 2. Each group contained a randomised set of 13 positively framed websites, 13 negatively framed websites and 13 websites with no framing (see Appendix E for a full list of websites selected). Examples of positive and negative framing are shown in Figure 7. These three sets were varied and controlled in accordance with prior evaluations of creativity, diversity, simplicity, colourfulness (i.e. measures of appeal) and familiarity collected from the previous corpus study. This meant that we would be able to control for these aspects while examining the differences which emerged as a result of the message framing.

Table 8 shows the mean and standard deviation for each website group demonstrating how they vary, whilst staying as matched sets. To ensure the three sets of websites did not significantly differ, a one-way ANOVA was conducted to

analyse possible group differences. As expected, there were no significant differences either in appeal, $F(2,38) = .007$, $p = .993$, or familiarity, $F(2,38) = 1.15$, $p = .329$, indicating that each set had been successfully matched.

Table 8: Means and standard deviations for each website set.

Website Set		*Mean*	*SD*	*Min*	*Max*	*Skew*
Set 1: Positive framing Websites 1-13	Appeal rating	3.97	1.06	2.14	5.48	- .12
	Familiarity rating	4.47	1.57	1.93	6.77	- .26
Set 2: Negative framing Websites 14-26	Appeal rating	3.98	.94	2.05	5.19	- .64
	Familiarity rating	3.58	1.64	1.38	6.11	- .30
Set 3: No framing Websites 27-39	Appeal rating	4.02	1.37	1.10	6.33	- .40
	Familiarity rating	3.59	1.91	1.02	6.50	.43

3.2.5 Procedure

Participants viewed websites via the Eyelink 1000 eye tracker, positioned 74cm away from a 1920x1080 flat screen monitor. Participants eye movements were calibrated with the eye tracker prior to starting the experimental session using a 9-dot calibration (Duchowski, 2007; Holmqvist et al., 2011). Participants viewed websites for *either* 500ms, 6s, *or an* unlimited, self-paced amount of time (participants were asked to press a spacebar to progress between websites in this condition).

Each participant was shown 39 websites; for 13 of the websites positive brand information was presented prior to viewing the website, for 13 others negative information was presented, and for the remaining 13 no prior information was given. Given the importance of branding (Karakaya & Barnes, 2010; Sahoo, Dellarocas & Srinivasan, 2017; Zhu & Zhang, 2010), information messages were brand orientated

and presented in terms of loss (negatively framed) and gain (positively framed). An example of this is presented below in Figure 7. To ensure reliability, where possible both versions of information were kept identical with only the key words of loss or gain changing (i.e. 'with the tourist business down 22% on last year' versus 'with the tourist business up 22% on last year'). The procedure for each trial is shown in Figure 8. Participants viewed websites via the eye tracker where the procedure for each experimental trial was:

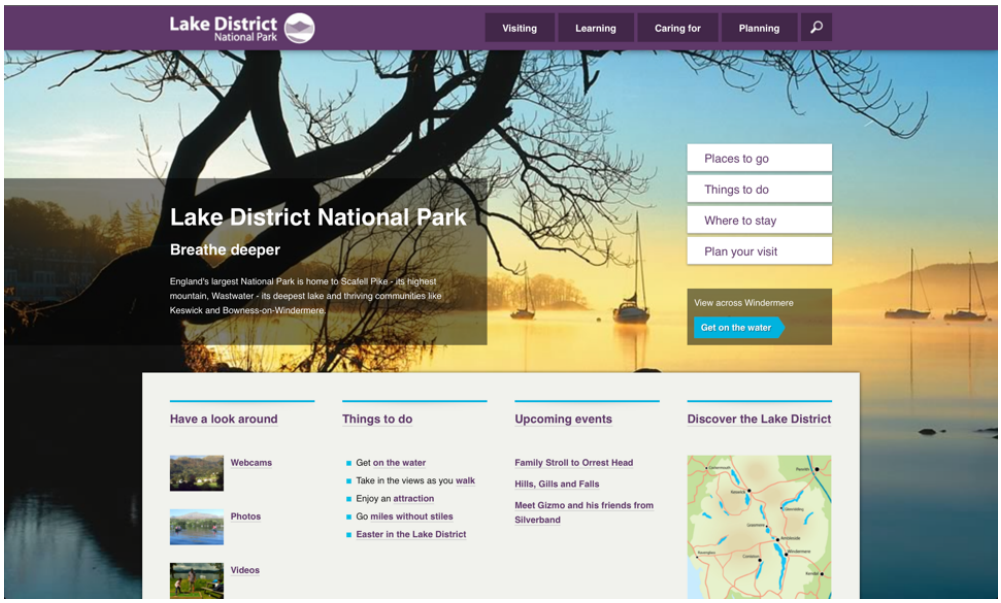
(i) Where applicable, participants were presented with a single piece of framed brand information to read.

(ii) This was followed by the 500ms presentation of a fixation cross.

(iii) The associated website was then presented for either 500ms, 6s or unlimited time.

(iv) A mask was then shown for 100ms. In line with previous research (Thielsch & Hirschfeld, 2010; 2012), to create the mask a website stimulus which rated as average appeal and familiarity was selected from the corpus Chapter 2. This was transformed into greyscale and pixelated into 2x2 pixels and randomly rearranged.

(v) Participants were then asked to rate the website according to how appealing they found it on a scale of 1 (not appealing at all) to 5 (very appealing). Participants were given 5 practice trials in order to familiarise themselves with the process.



Positive Frame

The Lake District has maintained its place in the top 10 must-visit destinations in the UK with the tourist business up 22% on last year.

Negative Frame

The Lake District has lost its place in the top 10 must-visit destinations in the UK with the tourist business down 22% on last year.

Figure 7: Example of positive and negative framing messages for the Lake District National Park website.

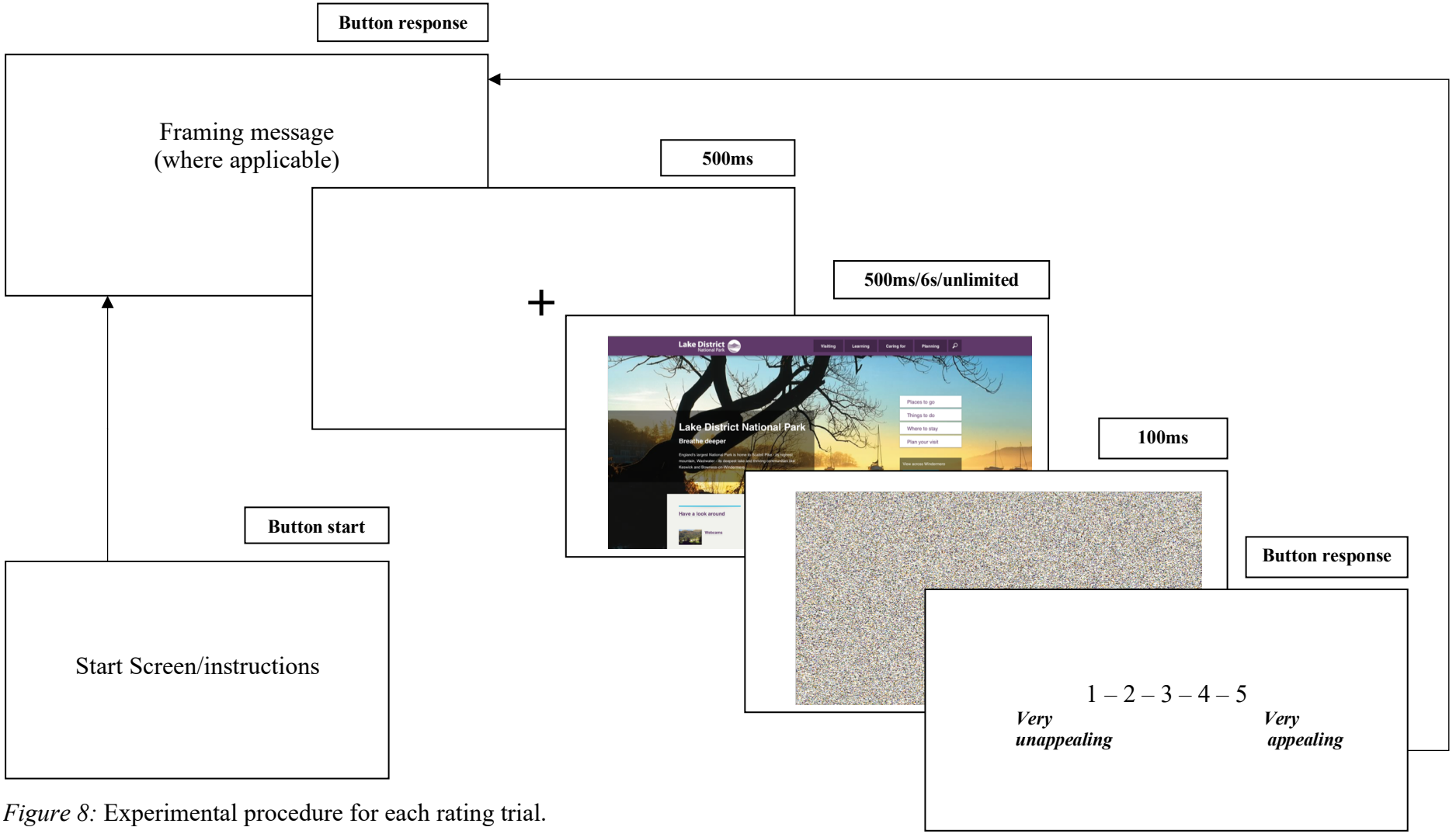


Figure 8: Experimental procedure for each rating trial.

3.3 Results

A 2-way analysis of variance was used to examine ratings of perceived website appeal with presentation time (500ms vs 6s vs unlimited) as a between-subjects effect and framing message (positive vs negative vs none) as a within-subjects effect. To enable further comparison between presentation times, ratings of website appeal in the 500ms, 6s and unlimited conditions were correlated to examine the extent to which the ratings obtained in the rapid 500ms condition relate to those made after longer presentation times. Normative data from the website corpus was used to carry out further analyses (regression) to examine which variables may be predicting ratings of appeal. Similar 2-way analyses of variance was used to examine eye movements on the websites with presentation time (6s vs unlimited) again as a between-subjects factor and framing message (positive vs negative vs none) as a within-subjects factor. Table 9 provides a summary of the main effects and interactions of time and frame condition on the dependent variables.

Four main areas of interest were used to extract eye movement data. These areas were selected on the basis of previous research (e.g. Moshagen & Thielsch, 2010; 2012) and through discussion with experts in the field of website creation and management who were asked to specify the four most important aspects of website design. These were:

(i) The branding/logo area

(ii) The navigation menu

(iii) The main image

(iv) The main text.

A group of five individuals were independently asked to outline all four of the above aspects for each of the 39 websites used in this experiment. These were consolidated to create the areas of interest for each stimulus (see Appendix F for an example).

Table 9: The effects of time and frame on each dependent variable.

	Time				***Frame***				***Time x Frame***			
Dependent Variables	*F*	*df*	***p***	η_p^2	*F*	*df*	***p***	η_p^2	*F*	*df*	***p***	η_p^2
Perceived website appeal (see Figure 6)	1.68	1, 57	.20	.06	5.15	2, 114	.007*	.08	.64	4, 114	.64	.28
Dwell time on website branding/logo (see Figure 7a)	1.37	1, 38	.25	.035	11.36	2, 76	< .001**	.23	1.23	2, 76	.23	.03
Dwell time on website navigation (see Figure 7b)	2.57	1,38	.12	.06	2.70	2, 76	.07	.06	.06	2, 76	.94	.002
Dwell time on website image (see Figure 7c)	1.90	1, 38	.18	.05	99.17	2, 76	< .001**	.72	.13	2, 76	.88	.003
Dwell time on text (see Figure 7d)	.21	1, 38	.65	.005	27.98	2, 76	< .001**	.42	.96	2, 76	.39	.03

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

3.3.1 The effects of time and frame on perceived website appeal

Figure 9 shows the effects of time and frame on perceived judgements of website appeal and the results from analyses of variance examining website. As hypothesised, the time participants had to view the website had no impact on the ratings of website appeal they provided (see Table 9). However, contrary to what was predicted, positively framed websites appear to have a *negative* impact on ratings of website appeal with websites in the positive condition consistently being rated less positively (M= 2.86, SD= .45) than those in the negative (M= 2.96, SD= .45) and no framing condition (M= 3.02, SD= .44). Bonferroni analysis confirmed the no framing and negative framing conditions were similar (p= .71) with the positively framed condition being rated significantly lower than the no framing condition (p= .009). There was no significant effect of presentation time, suggesting that we do indeed make reliable instantaneous judgements of perceived appeal in the early stages of viewing a stimulus and that these do not change even when more time to consider the website is available. There was no significant interaction between presentation time and framing message on perceived ratings of appeal (p > .05).

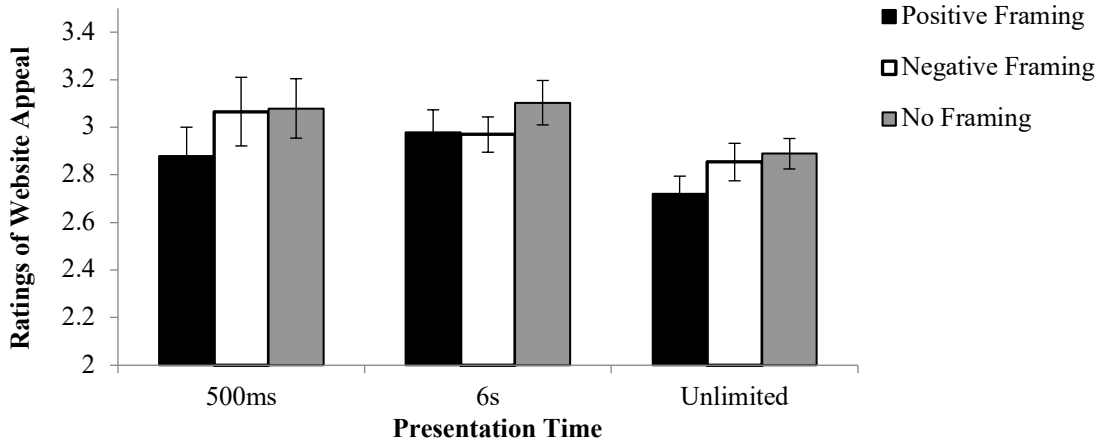


Figure 9: Ratings of perceived website appeal for 500ms, 6s and unlimited presentation times.

Furthermore, as shown in Table 10, ratings of website appeal were highly correlated between all three presentation times (500ms vs. 6s. vs. Unlimited), confirming that reliable judgements of website appeal can be made under restricted timescales.

Table 10: *Correlations between ratings of appeal in the 500ms, 6s and unlimited, self-paced conditions (N=20).*

	500ms	6s	Unlimited
500ms	-		
6s	.65**	-	
Unlimited	.62**	.70**	-

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

3.3.2 The effects of time and frame on eye movements

In the 500ms condition, participants had very little time to fixate on a stimulus, being able to make one to two fixations at most. This makes reliable analysis of eye movement data impractical in this condition so it is not considered in the analyses which follow. A series of 2 x 3 ANOVAs were conducted here which examined the effects of time (6s vs. unlimited time) and frame (positive vs. negative vs no framing) on each area of interest. Figure 10 summarises the findings for each interest area.

In order to account for differences in the absolute dwell time between areas of interest which may be due to having longer to attend in the unlimited condition, raw dwell time data from each area of interest was transformed into a percentage of the total dwell time spent attending to each website.

This was achieved using the following formula:

$$\frac{\boldsymbol{Interest\ Area\ Dwell\ time\ (ms)}}{\boldsymbol{Total\ Dwell\ Time}}\ \boldsymbol{x\ 100}$$

3.3.2.1 Percentage dwell time on website brand logo.

There was a significant effect of framing. As shown in Figure 10*(a)*, those given positive frames for the website spent less time on the brand logo (M= 7.98, SD= 2.70) than those given negative (M= 8.92, SD= 3.09) and no framing (M= 10.05, SD= 3.07; see Table 9). Bonferroni comparisons confirmed significantly less time was given to the brand logo in the positive condition than the no framing condition ($p < .001$). The effect of presentation time was not significant and similar patterns of eye movements were observed in both the 6s and unlimited conditions (see Figure 6a).

3.3.2.2 Percentage dwell time on website navigation.

Figure 10*(b)* shows the effects of time and frame on dwell time with respect to the website navigation. Here it appears participants spent less time looking at the navigation bar when a website was not framed. This is in contrast to the negative condition where more attention was given. However, analysis indicated this was not significant, as shown in Table 9. Despite this, participants spent more time looking at the navigation bar in the positive framing condition (M= 7.83, SD= 3.19) than in the negative (M= 6.95, SD= 3.53) and no framing (M= 6.97, SD= 3.86) conditions. There was no significant effect of time or any significant interaction.

3.3.2.3 Percentage dwell time on website image.

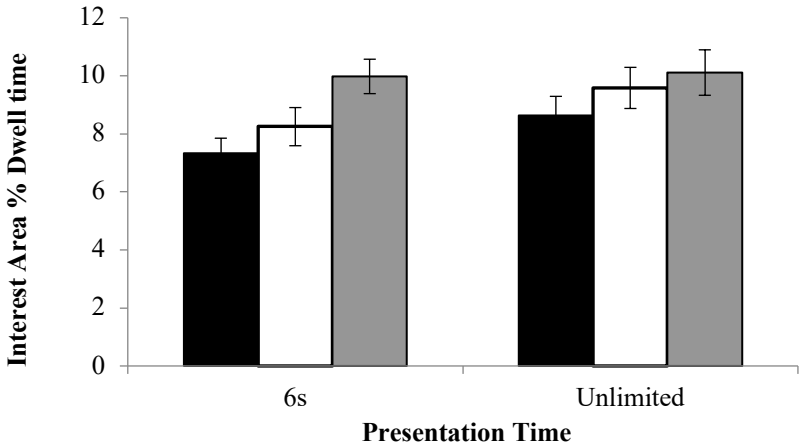
As shown by Figure 10*(c)*, there is a clear impact of framing on the amount of dwell time given to the websites main image. Here images on websites which were positively framed attracted less attention than both the negative condition, as

well as the unlimited condition, where percentage dwell time was highest. This is unusual given how is was expected that positive framing would have resulted in more attention, not less. Again, analysis showed there was a significant effect of frame with website images in the positive condition having less time spent on them overall (M= 16.05, SD= 5.44) than those in the negative (M= 24.33, SD= 6.87) and no framing (M= 25.85, SD= 5.66; see Table 9) conditions. Bonferroni comparisons confirmed the negative and no framing conditions to be similar ($p > .05$), whilst the positively framed condition received significantly lower attention than both the negative and no framing conditions ($p < .001$). Furthermore, there was no significant effect of time or interaction.

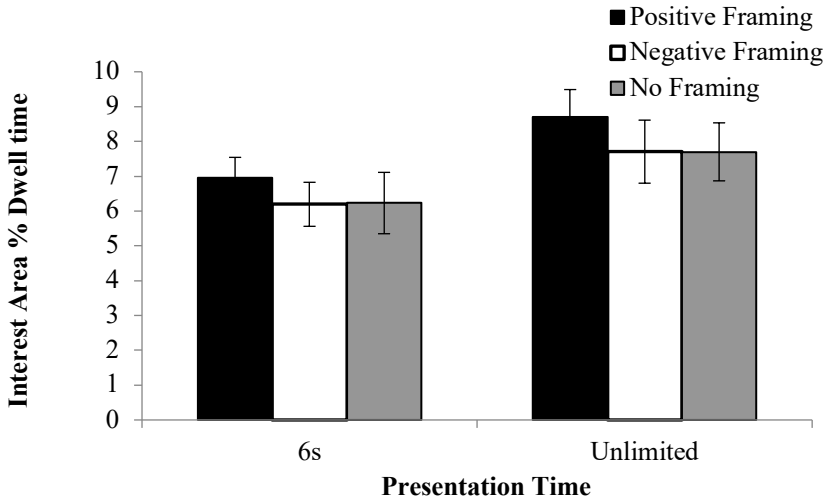
3.3.2.4 Percentage dwell time on website text.

As demonstrated in Figure 10*(d)*, there seems to be a larger effect of framing in the unlimited condition than in the 6 second condition, although analysis revealed that this effect of time was not significant. However, as shown in Table 9, there was a significant effect of frame on percentage dwell time on website text with overall less time spent examining the text in the positive (M= 20.07, SD= 5.38) and negative (M= 18.86, SD= 5.13) conditions than in the no framing (M= 24.06.14, SD= 5.46) conditions. Bonferroni comparisons confirmed percentage dwell time to be similar in the positive and negative condition ($p > .05$), whilst being significantly higher in the no framing condition ($p < .001$). There was no significant interaction.

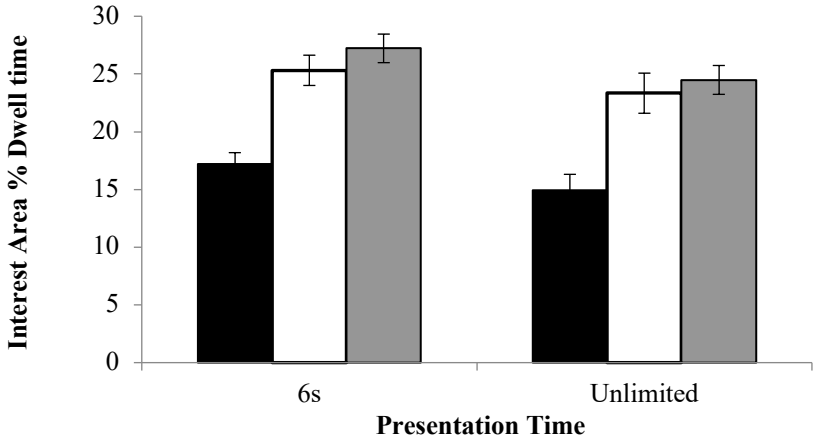
(a) Website branding/logo



(b) Website navigation



(c) Main website image



(d) Main website text

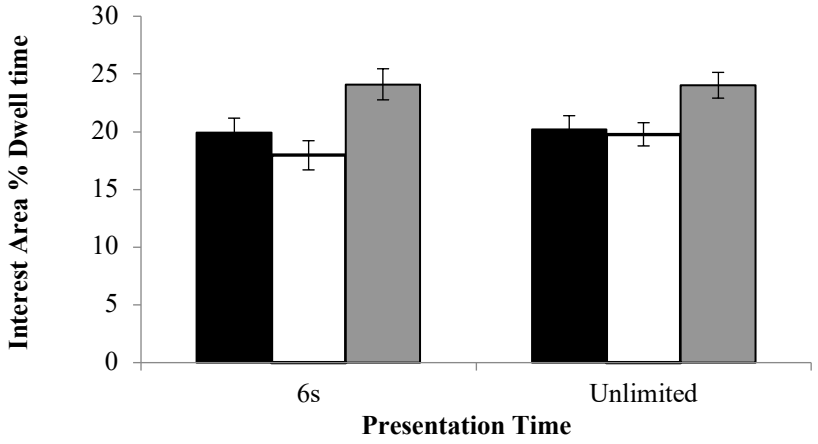


Figure 10: Means and standard errors for time and frame across each interest area.

3.3.3 Regression: Predictors of appeal

Regressions were carried out to examine the role of stimulus appeal, brand familiarity and informativeness ratings in determining participants' web appeal ratings. A series of fixed order regressions were carried out in which stimulus appeal, brand familiarity and informativeness were each entered first into the regression equation. This process made is possible to examine the extent to which each stimulus characteristic uniquely predicted participants' ratings of website appeal. Table 11 provides a summary of the analyses for each presentation time. Although further regressions were conducted in which brand familiarity and informativeness were entered into the equation first, these yielded very similar results and so are not included in this table.

Table 11: *Summary of Stepwise Regression Analyses: Stimulus Characteristics as Predictors of Participants' Ratings of Website Appeal.*

Order	Variable	R	Adjusted R^2	df	F	p-value
500ms presentation time						
1	Appeal	.87	.76	1,37	118.2	.000
2	Brand familiarity	.89	.78	1,36	5.46	.025
3	Informativeness	.90	.81	1,35	2.56	.118
6s presentation time						
1	Appeal	.89	.79	1,37	139.42	.000
2	Brand familiarity	.90	0.81	1,36	4.67	.037
3	Informativeness	.92	.84	1,35	6.60	.015
Unlimited presentation time						
1	Appeal	.85	0.73	1,37	102.46	.000
2	Brand familiarity	.89	0.79	1,36	10.43	.003
3	Informativeness	.92	0.83	1,35	10.28	.003

Stimulus appeal, unsurprisingly, is the primary determinant of participants' current ratings of appeal. Interestingly, however, brand familiarity also has a significant role to play in determining website appeal. Higher brand familiarity results in higher ratings of website appeal from participants. At longer presentation times, the informativeness of the website also has a unique role to play in predicting participants' appeal ratings.

3.4 Discussion

Experiment 2 examined participants' evaluations of website appeal when given 500ms, 6 seconds or an unlimited time to view websites. Furthermore, the possibility of framing effects were explored where participants were presented with positive, negative or no brand framing information prior to viewing in order to examine how this may effect judgements of website appeal.

As expected, this experiment showed that individuals can make reliable, rapid judgements of website appeal when only given a very short amount of time to view a website. Participants' ratings of appeal highly correlated across all 3 presentation conditions, supporting previous research examining rapid evaluations of websites (e.g. Lindgaard et al., 2006; 2011; Thielsch et al., 2014; Tuch et al., 2012). The use of a between-subjects design when examining presentation times where each participant only viewed a stimulus once removed the possibility of other inherent psychological effects, such as the mere-exposure (Zajonc 1968; Palmer et al. 2008) or halo effect (Norman, 2004) influencing judgements of appeal. In contrast, earlier work (e.g. Lindgaard et al.) often presented the same websites to participants *twice*, providing an opportunity for such effects to operate. Furthermore, the eye tracking data obtained demonstrates that appeal decisions are not dependent on where an individual attends given how there is only time to make 1-2 fixations on average when given just 500ms. Given longer presentation times participants visually

sampled websites systematically but this had no effect on the appeal judgements that they made. These findings emphasise how rapid appeal judgements relate very much to the automatic, unconscious processes outlined in Leder et al.'s model of aesthetic processing, but that these also shape our long-term judgements of appeal. The use of an unlimited presentation time was included in an attempt to identify when the switch from automatic to deliberate processing occurs. Interestingly, participants in this condition only spent an average of 1.5 seconds longer sampling a website than those in the restricted, 6 second condition, suggesting judgements of appeal are generally made in a short space of time. It may be that there is a natural switch from automatic, unconscious processing to deliberate, more thoughtful processing, but when this change occurs is still unclear on the basis of this experiment. However, 'long-term' in this instance still refers to a relatively short space of time. How long lasting these initial judgements of appeal stay valid across a matter of hours, weeks or longer, is something that still needs to be explored.

When examining the effects of framing, contrary to what was expected given past research (e.g. Hartmann et al., 2008), *positive* brand information presented prior to viewing websites had a *negative* impact on appeal ratings. Furthermore, websites given negative brand information or no framing information were more likely to receive more positive judgements of website appeal than those preceded by positively framed information. Furthermore, in general eye movements indicated that participants paid less attention to the areas of interest on a website in the positively framed condition than in both the negative and no framing conditions. In contrast, websites that were preceded by no framed brand information tended to receive higher levels of attention. Taking these findings into account, the possibility arises that the brand messages used to frame websites may have been too obvious. In today's society individuals tend to be more informed when viewing online

content. If the intention of the messages were too apparent they may have been seen as 'untrustworthy' and 'unrealistic' making them ineffective. A possible explanation is provided by Van Reijmersdal (2009) who discussed the role of brand placement prominence on consumer brand memory, attitudes and purchase intentions. She describes how increasing brand placement prominence has a positive effect on brand memory and attitudes, but under specific circumstances this can 'misfire' resulting in a negative impact. This is especially true when consumers become aware of an obvious or deliberate selling attempt, where cognitive defences against persuasion are activated (Friestad and Wright, 1999; Nairn and Fine, 2008; Russell, 2002; Wright, Friestad & Boush, 2005). It is possible that a similar effect is taking place here causing participants to respond in an unexpected way. It may be that the traditional framing paradigm is outdated in terms of shaping users' judgements and decision with respect to online content and that more visual or implicit forms of framing may be more effective.

Finally, regression analyses were conducted to examine the role of stimulus appeal, brand familiarity and informativeness ratings in determining participants' perceived ratings of website appeal. While the overall appeal of a stimulus was clearly the primary determinant of participants' appeal judgements, brand familiarity appears to have a crucial role in determining website appeal. Increased brand familiarity results in more positive ratings of website appeal supporting previous assumptions that what is familiar is appealing (Fang et al., 2007; McDougall et al., 2016). Interestingly, under the longer presentation times informativeness begins to play a significant role in shaping users' evaluations of website appeal. According to Leder's model, this may be when the deliberate stages of processing begins to take effect. It is here in the deliberate stages of Leder et al.'s model that aspects such as the content, informativeness or usability of a website starts to be considered

(Thielsch et al., 2014). This suggests that the switch between early, automatic processing and later, deliberate processing begins to take place around 6 seconds into viewing a stimulus.

To summarise, this chapter examined rapid appeal evaluations of websites along with how presenting framed messages prior to exposure may shape these evaluations. Compelling evidence was provided to support the assumption that individuals can make reliable judgements of appeal after only viewing a website for half a second and that these judgements are not dependent on eye movements. Contrary to the experimental hypotheses, the findings indicated that positive framing decreased perceived appeal ratings, a finding opposite to what was expected, contradicting the framing literature. Furthermore, the role of eye movements in shaping users' decisions was unclear and thus are examined further in subsequent chapters. If the framing paradigm adopted by this chapter is somewhat outdated then perhaps more implicit, visual framing should be considered. Advertisements are a clear example of implicit framing. They are indeed often an integral part of many modern websites and thus may be visually framed by the website that they appear alongside. Indeed it is remarkable that the 'goodness' or effectiveness of an advertisement is still considered in isolation (e.g. Elsen, Pieters & Wedel, 2016; Pieters & Wedel, 2012) with little consideration as to how this might be moderated by website characteristics, such as appeal and familiarity, or vice versa. Given that websites and advertisements often coexist with each other, it could be argued that this relationship is a 'modern' equivalent to the framing paradigm used in this experiment and therefore may be a more effective method for examining how users' judgements of appeal may be influenced by other forms of material present. This is examined in Experiment 3.

CHAPTER 4

4.1 Experiment 3: Visual framing effects of websites on embedded advertising

Previous chapters have considered the website characteristics which contribute to perceptions of appeal. Experiment 2 focused on the nature and timescale of decision-making and the impact of short term framing on these processes. The findings from this experiment suggested that the traditional framing paradigm may be outdated when trying to shape users' judgements of website appeal: positive attribute framing messages about the brand appeared to be regarded as too obvious, leading to more negative effects. Experiment 3 takes a more contemporary approach, examining the visual framing effects of website appeal and brand familiarity on participants perceptions of advert[2] appeal and brand familiarity. The assumption was that the appeal and brand familiarity of the websites in which advertisements are situated are likely to influence the perceived appeal and familiarity of the adverts, i.e. to frame judgements made with respect to the adverts. This possibility was examined by presenting websites whose appeal and brand familiarity was systematically varied using the corpus of ratings obtained in Experiment 1. The appeal and familiarity of the adverts was also controlled using ratings obtained prior to carrying out Experiment 3. In addition to obtaining participants judgements about the adverts, the influence of appeal and brand familiarity on participant eye movements was also examined. Based on unpublished data from this laboratory, it was expected that participants would be likely to spend *more* time looking at the main image on the website if it was appealing but *less* time looking at familiar branding information (see also Wedel & Pieters, 2008a; 2008b).

[2] 'Advertisement has been shortened to 'advert' throughout.

Also, the possibility of interplay between website and advert characteristics in shaping users' attention was examined.

4.1.1 Online advertising

Goldfarb (2014) proposed that online adverts can be classified into three general types:

(i) Search engine advertising, where adverts appear alongside search results,

(ii) Classified adverts, which appear on specific websites designed to promote goods and services,

(iii) Display advertising, such as banner adverts which appear alongside websites.

Display advertising is the most popular method of advertising on the internet with most websites gaining revenue in this way (Cho and Cheon, 2004; Balseiro, Feldman, Mirrokni & Muthukrishnan, 2014) and this forms the focus for the present experiment.

4.1.1.1 Efficacy and appeal

Research examining the efficacy of online display advertising has focused on interactivity (Cho & Leckenby 1999; Liu & Shrum, 2002), social media (Brajnik & Gabrielli, 2010; Schultz & Peltier, 2013) and banner adverts (Burke, Hornof, Nilsen & Gorman, 2005; Goldstein, Suri & McAfee, 2014) with the aim of creating online advertising which appeals to the consumer and is therefore effective (see Goldfarb 2014; Ha, 2012; McCoy, Everard, Polak & Galletta, 2007, for reviews). Several factors have been found to determine advertising efficacy including originality, creativity, as well as content, advert placement and design (Goodrich, 2011; Okon, Efremfon & Akang, 2016; Pieters, Warlop & Wedel, 2002; Sun & Wang, 2010). The factors identified as determinants of advertising *efficacy* have often been associated with website *appeal* (see Chiou, Lin & Perng, 2010; Moshagen & Thielsch, 2010; Thielsch et al., 2014 for reviews of website appeal) but the effects of

appeal do not appear to have been explicitly evaluated. It was hypothesised that, when adverts were perceived to be appealing, advertising would be more effective, i.e. they would be prepared to pay more for a product if the brand was already familiar.

4.1.1.2 Measuring purchase intentions

In consumer research, a classic way to measure the efficacy of an advert is through recording purchase intentions and likelihood to buy (Blackwell, Miniard & Engel, 2001; Brown, 2003; Kotler & Armstrong, 2010). A common way of measuring purchase intentions is asking participants what they would pay for an advertised product. This measure is often the preferred form of measurement because it is a better predictor of perceptions of the advert than other measures such as click-through rates (Erdem, Keane & Sun, 2008; Sun & Wang, 2010; Weisstein, Kukar-Kinney and Monroe, 2016). For this reason, participants were asked how much they were prepared to pay for advertised products in this experiment. As a measure it had the combined advantage of investigating whether or not the influence of a website carries through to purchase intentions and also provides a tool to examine the effectiveness of the adverts used in this study.

4.1.1.3 Brand familiarity

The effects of brand familiarity on the efficacy of online advertising has similar effects to that of brand familiarity of websites (see Alvarez & Fournier, 2016; Keller & Lehmann, 2006, for reviews). Adverts with familiar branding are generally viewed more positively and have greater impact when viewed repeatedly than adverts with unfamiliar branding (Campbell & Keller, 2002). Familiar adverts are also recalled more successfully than unfamiliar adverts, even when individuals are specifically asked to ignore the adverts (Jessen & Rodway, 2010). Familiar adverts have also been found to be more persuasive having greater influence on purchase

behaviour (Sun & Wang, 2010) with participants prepared to pay more for familiar brands (Kim, Kaufmann & Stegemann, 2014; Kim, Natter & Spann, 2009). Brand and product knowledge also has a positive effect on purchase intentions (Weisstein, Kukar-Kinney & Monroe, 2016). In the present experiment it was therefore hypothesised that being more familiar with the brand represented in the advert would increase participants' ratings of advert appeal, also being prepared to pay more for the advertised product.

4.1.2 The effect of websites on advertisements

When adding advertising to a website, some form of interaction between the site and the advert might be expected. An important assumption underpinning website advertising is that even when participants are not aware of seeing an advert they will build a more favourable attitude toward the advertised brand and be more likely to make a purchase (Afef & Jamel-Eddine, 2012; Lee, Ahn & Park, 2015; Yoo, 2008; Shapiro, Macinnis & Heckler, 1997). Research has examined the role of the 'congruency', or match, between advert and website. Adverts are perceived to be more appealing when displayed on 'highly congruent' websites, where the advertised product is similar to the theme of the website (Flores, Chen and Ross, 2014; see Brajnik & Gabrielli, 2010; Pomirleanu, Schibrowsky, Peltier & Nill, 2013, for reviews).

A recent study by Auschaitrakul and Mukherjee (2017) is of particular interest. They examined the importance of ensuring an advert 'fits' appropriately into the website on which it is displayed. They found that adverts which appeared on commercial retail websites (in comparison to non-commercial, social websites) were more likely to result in higher levels of 'fit fluency' increasing advert effectiveness. Fit fluency refers to the relationship between website and advert and how well they associate with one another. As demonstrated in Auschaitrakul and

Mukherjee's study, increased fit fluency results in greater advert efficacy and more positive attitudes towards the brand. This study provides rare data indicating how a website may influence, or frame, the appeal and efficacy of an advert. However this study used a limited set of only two website stimuli and did not examine the effect of fit fluency on participants' perceptions of the appeal of the advert. To date no research has examined the effect of either the visual appeal or brand familiarity of the website on the adverts which appear on it. Experiment 3 therefore examines the framing influence of website appeal and brand familiarity on participants' perceptions of the advert. It was hypothesised that participants' perceptions of embedded advertising would be positively influenced when the appeal and brand familiarity of the website they appeared on was high.

4.1.3 Eye movements and online advertising

As noted earlier, the use of eye movements in this domain is a relatively recent development. With respect to online adverts, studies to date have examined the influence of advert location on the emergence of banner ad blindness (i.e. when individuals do not notice banner adverts, Resnick & Albert, 2014), and the impact of banner format and animation on advert effectiveness (Li, Huang & Bente, 2016; but see Wedel & Pieters, 2008a; 2008b; Wedel 2013; 2018, for reviews). Research has begun to explore the relationship between the website and advert with respect to eye movements, with congruency, or 'fit fluency' being a primary topic of interest. Hervet, Guérard, Tremblay and Chtourou (2010) found that the amount of time (fixation/gaze duration) spent looking at an advert was modulated by congruency, with *incongruent* adverts receiving more attention than congruent adverts. This could be because the lack of 'fit' of incongruent adverts makes them more distinctive increasing the visual attention given to the adverts. Despite increased fixation times on incongruent adverts, Hervet et al. found that memorability was *higher* for

congruent adverts. Other recent research appears to support Hervet et al.'s findings. Resnick and Albert (2016) conducted two eye tracking studies examining the effects of advert design, website relevancy and task relevancy on the level of attention given to banner adverts. They asked participants to complete information-seeking tasks while viewing web pages that contained adverts either related or unrelated to the page content. In line with Hervet et al.'s earlier findings, they found that participants spent less time attending to relevant adverts.

While the use of eye tracking is increasing when examining how consumers processing advertising information, it is not a technique which has been adopted to investigate the effect of website appeal and brand familiarity on the judgements and decisions we make when viewing an advert. Is the amount of attention given to an advert dependent on the properties of the advert itself and/or the properties of the website that it appears on? What can this tell us about the processing behind the judgements and decisions which we are making? Certainly the interplay between advert and website appears to be important in the congruency research to date. For this reason, data on participants' eye movements were obtained in Experiment 3 in order to examine:-

(i) The effects of website *appeal* and advert *appeal* on attention and how these interact to shape individuals attention to a website and advert. One possibility was that more visually appealing advertisements may attract more attention, detracting attention from the website. If this is the case, then participants may be more likely to purchase, or pay more, for the product advertised.

(ii) The effects of website *familiarity* and advert *familiarity* on attention and the interaction between the two. Familiarity with the brand in the advert may lead to more or less dwell time on the advert. Research to date (Hervet et al,

2010; Resnick & Albert, 2016) suggest that greater brand familiarity, like congruency, could lead to *less* attention being paid to the advert).

It may be that the balance of appeal or familiarity between the website and embedded advert may determine where users' attention is directed, i.e. the 'interplay' between both website and advert characteristics needs to be considered.

To summarise, Experiment 3 introduces the novel concept of visual framing, i.e. the way in which evaluations or judgements about an advert, or the products it advertises, may be framed by the visual characteristics website associated with it. Website appeal (high vs low) and familiarity (high vs low) were varied and the effects on participants' perception of the embedded advert were noted along with any changes in the way in which their attention was directed using eye movement data. It also examined whether the experimentally manipulated visual characteristics of the adverts (high vs low appeal; high vs low familiarity) affected participants' perceptions of the adverts, the way they attended to them, along with what they would be prepared to pay for the products advertised.

4.2 Method

4.2.1 Design

A 2 x 2 repeated measures design was employed to examine the effect of website appeal (high vs. low appeal) and website familiarity (high vs. low familiarity) on perceived advert appeal and advert familiarity. The effects of advert appeal and familiarity were also investigated in an identical 2 x 2 repeated measures design examining the effects of pre-experiment manipulation of advert appeal (high vs. low appeal) and advert brand familiarity (high vs. low familiarity) on participants' perceived judgements of advert appeal and familiarity. A within-

subjects design was employed. The effects of website and advert familiarity and appeal on the following dependent variables was noted:-

(i) Ratings of perceived advert appeal

(ii) Ratings of perceived advert familiarity

(iii) Dwell time on adverts

(iv) Dwell time on website branding

(v) Dwell time on main website image

(vi) Percentage of average purchase price participants were prepared to pay for advertised products.

4.2.2 Ethics

The methods and procedures reported in this study were reviewed and approved by the Bournemouth University Ethics Committee in line with the Ethics Code of Practice. All participants read and signed consent forms before participating in the experiment.

4.2.3 Participants

In total, twenty-five participants (7 Males and 18 Females) took part in this study. They were aged between 18 and 49 years (M= 23.33, SD= 8.10). Participants were recruited from Bournemouth University and were given course credits for taking part. All participants reported normal or corrected to normal vision and were regular users of computers and the internet. As in previous experiments, the Autism-Spectrum Quotient (Allison et al., 2012; Baron-Cohen et al., 2001) was completed by all participants in order to later examine individual differences in cognitive style with respect to appeal ratings.

4.2.4 Materials

Data from the website corpus (see Chapter 2) was used to select 32 websites varying in appeal (appealing vs unappealing) and familiarity (familiar vs unfamiliar)

creating 4 types of stimulus. Table 12 shows the mean and standard deviation for each type of website. To ensure the groups varied as expected, t-tests were conducted. As expected, the appealing websites significantly varied from the unappealing websites on appeal, $t(30) = 14.28$, $p < .001$, and the websites also significantly varied on familiarity between groups, $t(30) = 26.90$, $p < .001$ (see Appendix G for a full list of the websites selected).

In order to select appropriate advert stimuli, appeal and familiarity ratings were obtained across a corpus of 77 advertisements which had been sourced online and/or created and edited using Adobe Photoshop. Forty-four participants (18 males and 26 females) aged between 18 and 26 were recruited from Bournemouth University and asked to complete an online survey where they rated each advert on appeal and familiarity using a 7-point Likert scale, where 1 referred to very unappealing/not familiar at all and 7 to very appealing/very familiar, respectively.

Table 12: *Means, standard deviations, minimum, maximum, and measures of skew for all corpus ratings and group conditions.*

Advert Characteristic		***Mean***	***SD***	***Min***	***Max***	***Skew***
Advert Appeal (ratings 1-7)		3.92	.76	2.52	5.54	.27
Brand Familiarity (ratings 1-7)		4.78	2.13	2.20	7.82	.198
Advert Type	**Rating**					
Familiar Appealing	Appeal	3.90	.35	3.47	4.48	-.29
	Familiarity	7.20	.81	5.43	7.82	-1.87
Familiar Unappealing	Appeal	2.44	.56	1.46	3.19	.64
	Familiarity	7.02	.34	6.57	7.45	.003
Unfamiliar Appealing	Appeal	3.51	.22	3.26	3.94	-1.30
	Familiarity	2.69	.28	2.30	2.95	-.66
Unfamiliar Unappealing	Appeal	2.29	.48	1.77	3.09	-.74
	Familiarity	2.76	.50	2.20	3.75	1.10
Website Type	**Rating**					
Familiar Appealing	Appeal	5.37	.29	5.00	5.86	.52
	Familiarity	5.88	.42	5.36	6.60	.64
Familiar Unappealing	Appeal	3.27	.51	2.14	3.76	-1.81
	Familiarity	5.50	.56	4.21	6.19	-1.92
Unfamiliar Appealing	Appeal	5.11	.36	4.71	5.86	1.30
	Familiarity	1.69	.32	1.30	2.27	.61
Unfamiliar Unappealing	Appeal	2.77	.41	2.14	3.19	-.56
	Familiarity	1.33	.28	1.08	1.96	1.76

Table 12 shows the mean, standard deviation and range for each of the ratings obtained, as well as measures of skew (see Appendix H for the complete set of normative advert data). As might be expected, ratings of appeal and familiarity appear to have means in the mid-range with relatively little skew in the distributions observed, with the range of scores being somewhat narrower for ratings of appeal than for familiarity.

Using the normed rating data, four groups of adverts were selected for use in the main experiment presented later. Each group contained 8 adverts taken from the corpus and were chosen to represent each condition in the main experiment: familiar, appealing adverts, familiar, unappealing adverts, unfamiliar, appealing adverts and unfamiliar, unappealing adverts. Table 12 shows means and standard deviations of subjective ratings for each advert group (see Appendix G for a full list of the adverts selected). T-tests confirmed that appeal significantly varied between appealing and unappealing groups, $t(30) = -7.79$, $p < .001$, as did familiarity between familiar and unfamiliar groups, $t(30) = 13.75$, $p < .001$.

Each of the thirty-two adverts selected from the pilot study were then paired with one of the 32 websites. This was achieved by randomly assigning two of each advert type to each website group (see Appendix G). Therefore, each type of websites was assigned two adverts which were familiar and appealing, two that were familiar and unappealing, two unfamiliar and appealing, and two adverts which were unfamiliar and unappealing. Using Adobe Photoshop, each advert was then added to its website counterpart in the form of a side advertisement (see Figure 11). The advert appeared twice on each website (one on each side) and they were randomly placed either in the top left and right corners or bottom left and right corners. Adverts were placed on both sides of the advert for two main reasons. The first being to prevent a left/right bias from occurring when viewing the stimuli (Smith &

McDougall, 2009), and most importantly, to try and make the adverts as realistic as possible. To incorporate the adverts further, the empty white space left as a result of adding the adverts to the website was filled with the primary colour taken from the website. To ensure the aspect ratio was equal across stimuli all website images were used in their original format, sized 2880x1722px and adverts were sized to each have a total size of approximately 100,000px. Once the stimuli were finalised, they were then scaled down overall to fit the 1920x1080px monitor used in the main experiment.

4.2.5 Eye tracking

To examine the eye tracking data in this study a similar methodology was used to that employed in Experiment 2 (see Chapter 3, section 3.1.4). The primary addition to this was the inclusion of the adverts to the stimuli. Both adverts were outlined as areas of interest on each stimulus with data from both being combined to make a single data point: overall dwell time to adverts. Given this added complexity, only 3 areas of interest were selected:

(i) The website branding/logo area

(ii) The website main image

(iii) Both adverts (combined).

Given the prominence of the website branding/logo and main image areas in the previous study these two aspects were selected over the website navigation bar and text. A group of five individuals were independently asked to outline these interest areas for each of the 32 stimuli used in this experiment. Areas of common interest were selected as interest areas for each stimulus (see Appendix F for an example).

As noted in the previous chapter, dwell time was selected as the measure of choice given its ability to provide the duration of time spent attending to an area of interest. In contrast to Experiment 2 (Chapter 3), which considered percentage dwell

time, the current experiment considered dwell time in its standard form. This was because only one presentation time (6s) was examined in the current research, therefore removing the need to compensate for an increase in presentation time as discussed in Chapter 3 (see Section 3.3.2). Furthermore, dwell time (or gaze duration) has often been the measure of choice in the consumer literature when exploring the effects of visual advertising (e.g. Pieters & Wedel, 2004; Pieters, Wedel & Batra, 2010; but see Ashby, Johnson, Krajbich & Wedel, 2016; Wedel, 2013, for reviews). Therefore, it was deemed the most appropriate measure to consider given the current focus of this experiment.

(a) Appealing unfamiliar website with appealing familiar advert.

(b) Appealing unfamiliar website with unappealing familiar advert.

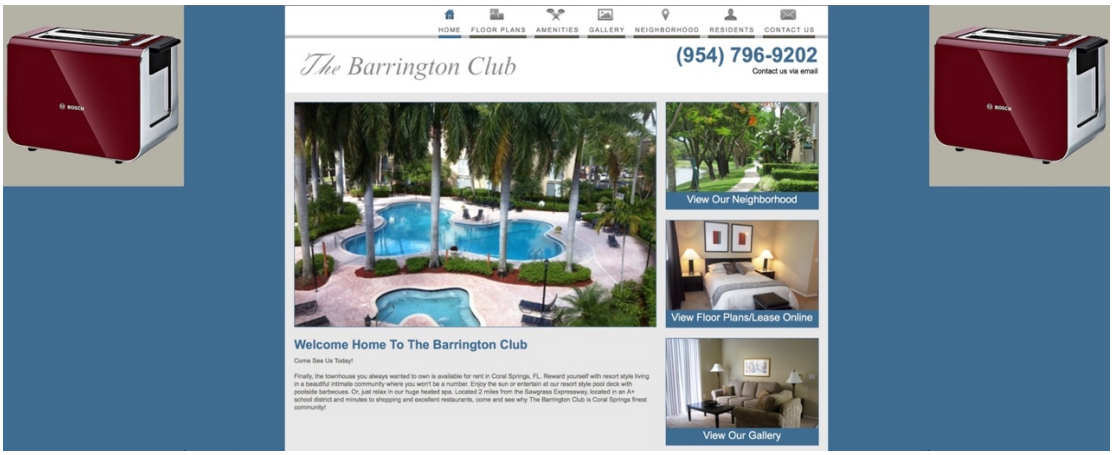


Figure 11: Example experimental stimuli showing combining website and online display advertising.

4.2.6 Procedure

Participants viewed the stimuli via the Eyelink 1000+ eye tracker, positioned 74cm away from a 1920x1080 flat screen monitor. Eye movements were calibrated with the eye tracker prior to starting the experimental session using a 9-dot calibration (Duchowski, 2007; Holmqvist et al., 2011). The procedure for each trial is summarised in Figure 12, where the procedure for each experimental trial was:

(i) A fixation cross was presented in the centre of the screen for 500ms.

(ii) This was followed by a stimulus that was presented for 6 seconds.

(iii) A mask was then shown for 100ms. In line with the previous experiment, the mask was created using a website stimulus with average appeal and familiarity, selected from the corpus Chapter 2. This was transformed into greyscale and pixelated into 2x2 pixels and randomly rearranged.

(iv) Participants were then asked to rate the *advert* they had just seen according to how appealing they found it on a scale of 1 (very unappealing) to 5 (very appealing). Participants were given 5 practice trials in order to familiarise themselves with the process.

Once participants had completed all 32 experimental trials, they were then shown each of the 32 adverts again, without the websites and asked to rate how familiar they were with the brand on a 1 (not familiar at all) to 5 (very familiar) scale, whilst also stating how much they would pay for the advertised product in GBP. These measures were collected to examine purchase intentions and how brand familiarity and advert appeal may be moderating appeal.

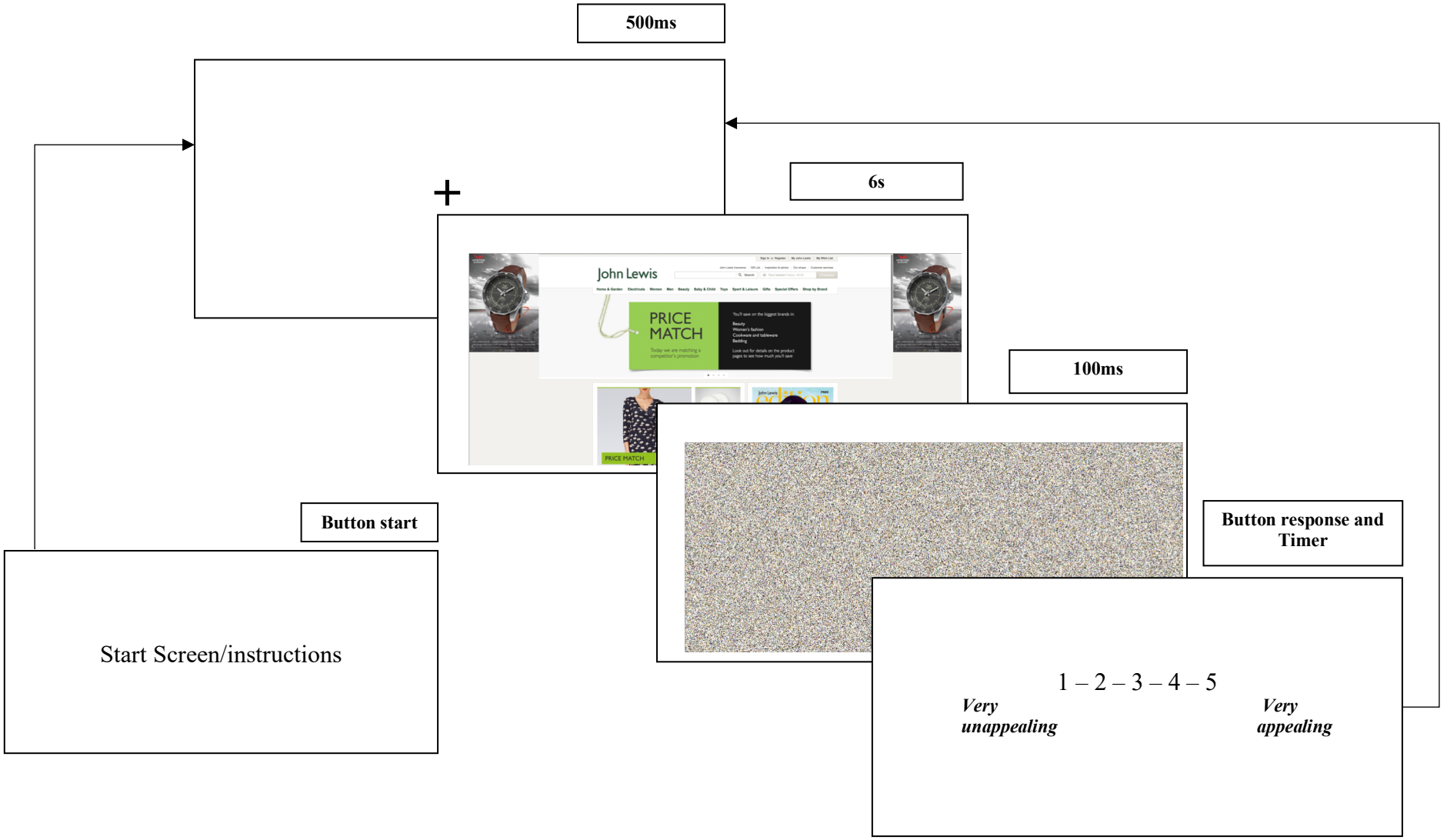


Figure 12: Experimental procedure for each rating trial.

4.3 Results

The effect of website appeal and familiarity was considered separately from the effect of advert appeal and familiarity:

(i) Within-subjects analysis of variance examining the effects of website appeal (appealing vs unappealing) and familiarity (familiar vs unfamiliar) on each of the dependent variables

(ii) Within-subjects analyses of variance examining the effects of advert appeal (appealing vs unappealing) and familiarity (familiar vs unfamiliar) on each the dependent variables.

As noted earlier, the dependent variables were participants' ratings of advert appeal and advert familiarity, and the percentage of average purchase price participants were prepared to pay for advertised products. Data on eye movements was also analysed in the same way and this included the dwell time on adverts, website images and website branding information.

4.3.1 The effects of website appeal and familiarity on each dependent variable

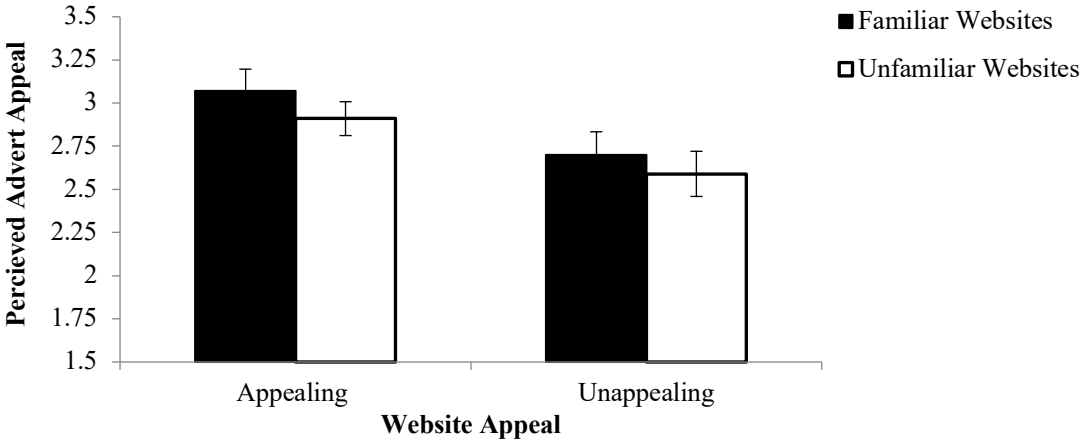
Table 13 provides a summary of the main effects and interactions of website appeal and familiarity on the dependent variables.

4.3.1.1 Ratings of perceived advert appeal.

Figure 13*(a)* shows the effects of website appeal and familiarity on perceived advert appeal. As hypothesised, when an advert is placed on an appealing website, the appeal of the website positively influences user judgements of perceived advert appeal (see Table 13). Ratings of perceived advert appeal increased when websites were appealing and decreased when websites were unappealing M(unappealing website) =2.64, SD= 0.35, M(appealing website) = 2.99, SD= 0.49. This suggests that the websites in which adverts are placed act as visual 'frames' for the way they are evaluated. There was also a small significant effect of website familiarity on

advert appeal ratings with adverts on familiar websites being rated slightly higher, M(familiar website) = 2.88, SD= 0.44, M(unfamiliar website) = 2.75, SD= .48 but no significant interaction between the website appeal and familiarity ($p > .05$).

(a) Perceived advert appeal



(b) Perceived advert familiarity

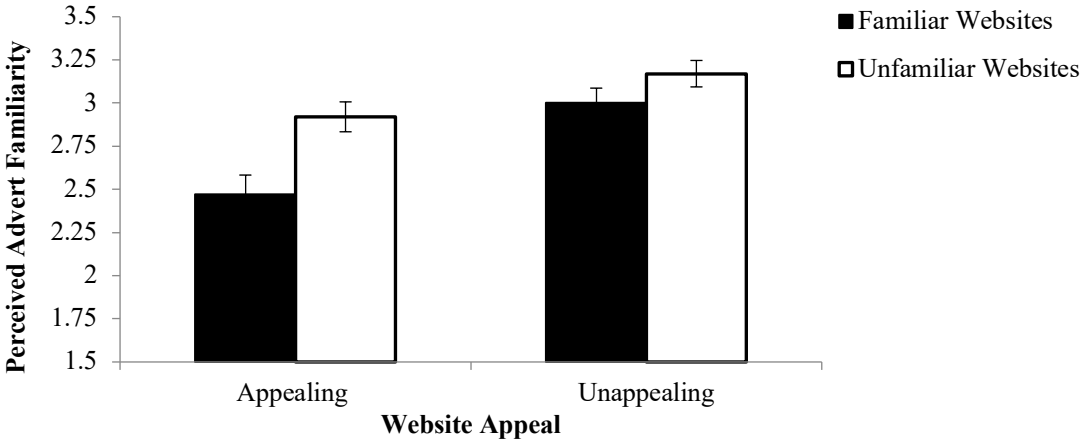


Figure 13: The effects of website appeal and familiarity. Means and standard errors for *(a)* perceived advert appeal and *(b)* perceived advert familiarity.

Table 13: *The effects of website appeal and familiarity on each dependent variable.*

	Website appeal			***Website familiarity***			***Website appeal x familiarity***		
Dependent Variables	*F(1,24)*	***p***	η_p^2	*F(1,24)*	***p***	η_p^2	*F(1,24)*	***p***	η_p^2
Perceived advert appeal (Figure 3a)	6.63	.017*	.22	4.44	.046*	.16	.18	.67	.008
Perceived advert familiarity (Figure 3b)	47.17	< .001**	.66	17.04	< .001**	.42	5.77	.02*	.19
Dwell time on adverts (Figure 4a)	.24	.63	.01	3.40	.08	.12	.03	.87	.001
Dwell time on website branding (Figure 4b)	.18	.70	.007	23.02	< .001**	.49	2.76	.11	.10
Dwell time on website image (Figure 4c)	44.05	< .001**	.65	.52	.48	.02	29.80	< .001**	.55
Amount prepared to pay (Figure 5)	.07	.79	.003	.03	.86	.001	.01	.91	.001

*p<.05; **p<.01

4.3.1.2 Ratings of perceived advert familiarity.

Figure 13*(b)* shows familiarity ratings in each condition. As shown in Table 13 websites were familiar, familiarity ratings for adverts were significantly *lower* than when websites were unfamiliar, M(familiar website) = 2.77, SD= 1.30, M(unfamiliar website) = 3.07, SD= 1.32 . When websites were appealing familiarity ratings were also significantly lower than when websites were unappealing, M(appealing website) =2.72, SD= 1.21, M(unappealing website) = 3.11, SD= 1.39. As illustrated in Figure 13*(b)*, there was also a significant interaction between website appeal and familiarity on advert familiarity, with familiarity ratings for adverts being particularly low when websites were both appealing and familiar. T-tests confirmed a significant difference of perceived advert familiarity between familiar and unfamiliar websites in the appealing condition, t(24) = -4.13, $p < .001$, but not in the unappealing condition t(24) = -2.14, $p < .04$.

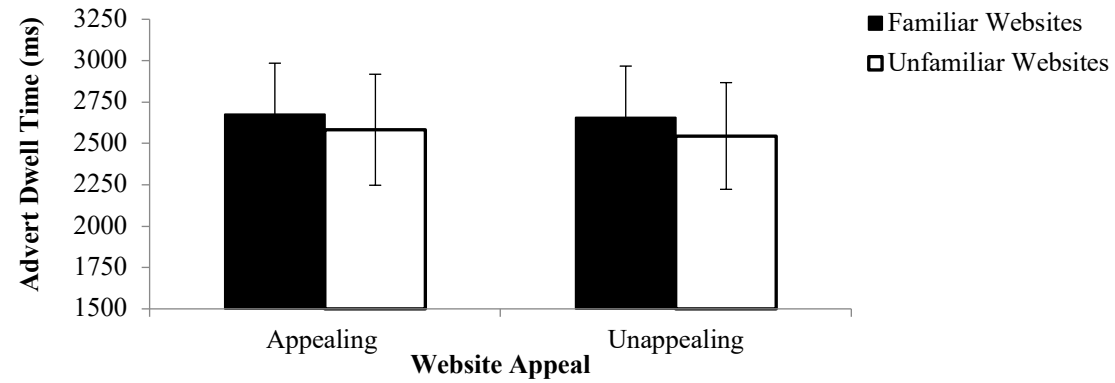
4.3.1.3 Dwell time on adverts.

There were no significant effects of website appeal or familiarity on the amount of attention (dwell time) given to adverts (see Figure 14*a*).

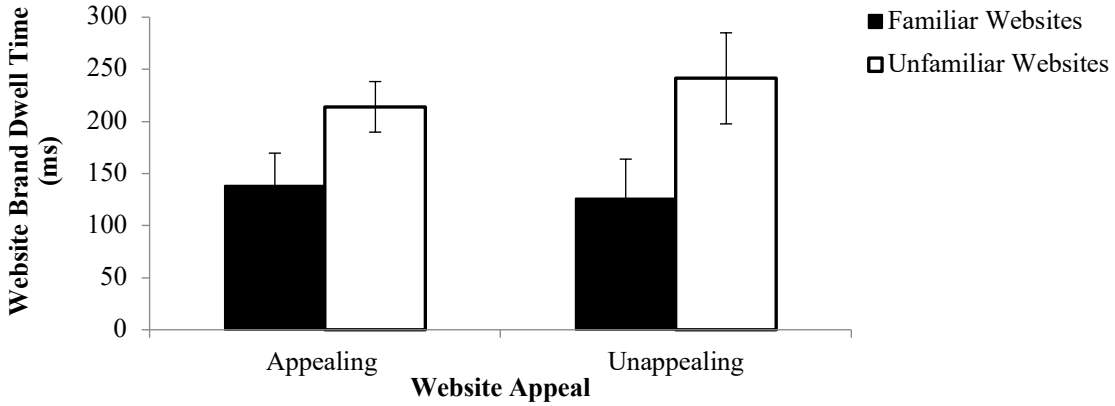
4.3.1.4 Dwell time on website brand.

There was a significant effect of website familiarity on the dwell time on the web branding, M(familiar website) = 132.11, SD= 100.44, M(unfamiliar website) = 227.64, SD= 118.22, see Figure 14*b*). There were no other significant effects.

(a) Dwell time on adverts



(b) Dwell time on website brand



(c) Dwell time on website image

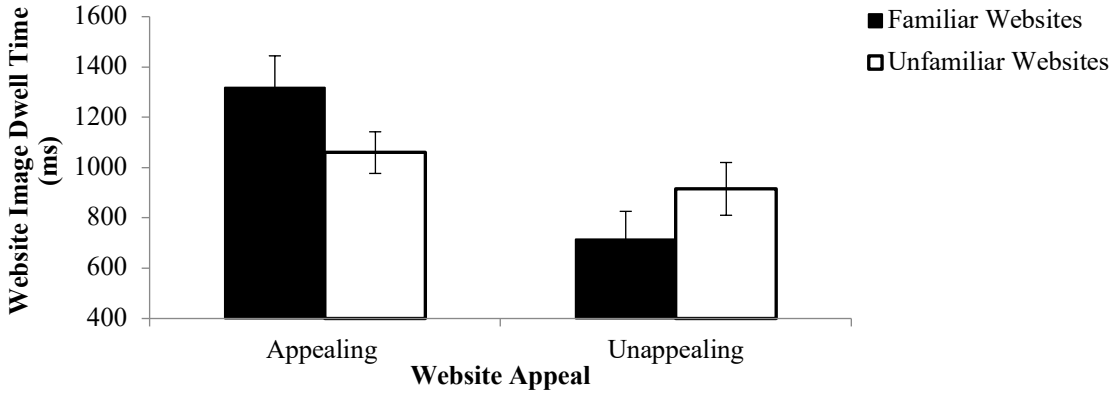


Figure 14: The effects of website appeal and familiarity. Means and standard errors for *(a)* dwell time on adverts, *(b)* dwell time on website brand and *(c)* dwell time on website image.

4.3.1.5 Dwell time on website image.

There was a significant effect of website appeal on dwell time on the website image (see Figure 14c). More attention was given to the main image on appealing websites (M=1188.15, SD= 524.75) than unappealing websites (M= 815.47, SD= 521.82). There was also a significant interaction between website appeal and familiarity. T-test comparisons revealed that the difference in dwell time between familiar and unfamiliar websites was moderated by appeal group. Dwell time on the image was significantly greater for familiar than for unfamiliar appealing websites, $t(24) = 4.34$, $p < .001$. In contrast, when websites were unappealing dwell time was significantly *less* for familiar than for unfamiliar websites, $t(24) = -3.46$, $p = .002$. This suggests that familiarity of a website has a complex effect on how an individual samples the content they are provided.

4.3.1.6 Percentage prepared to pay.

The percentage prepared to pay for each advertised product was calculated by first taking the amount a participant stated they were prepared to pay in GBP and converting it into a percentage relative to the overall 'prepared to pay' mean, i.e. the average of all response amounts given for the advertised product. This was done using the following formula:

$$\frac{\textbf{Amount prepared to pay}}{\textbf{Mean amount prepared to pay}} \textbf{ x 100}$$

This calculation was carried out for each participant and then averaged across each condition to create the overall percentage prepared to pay for a product. This meant that it was possible to have a percentage higher than 100 as participants were able to pay over and above the mean amount paid. For example, if the mean amount prepared to pay for a product was £10 , but a participant was prepared to pay £11, they are prepared to pay over and above the mean, thus resulting in a percentage

higher than 100 (in this case, 110%). As can be seen from Table 13 and Figure 15 there was almost no influence of website appeal and familiarity on the amount prepared to pay for the advertised product.

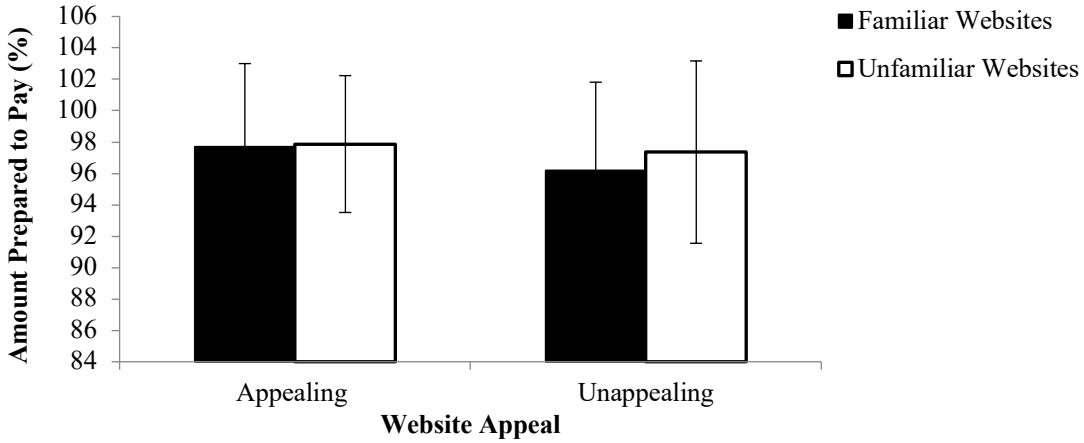


Figure 15: The effects of website appeal and familiarity. Means and standard errors for amount prepared to pay.

4.3.2 The effects of advert appeal and familiarity on each dependent variable

A summary of the main effects and interactions of advert appeal and familiarity can be found in Table 14.

4.3.2.1 Ratings of perceived advert appeal.

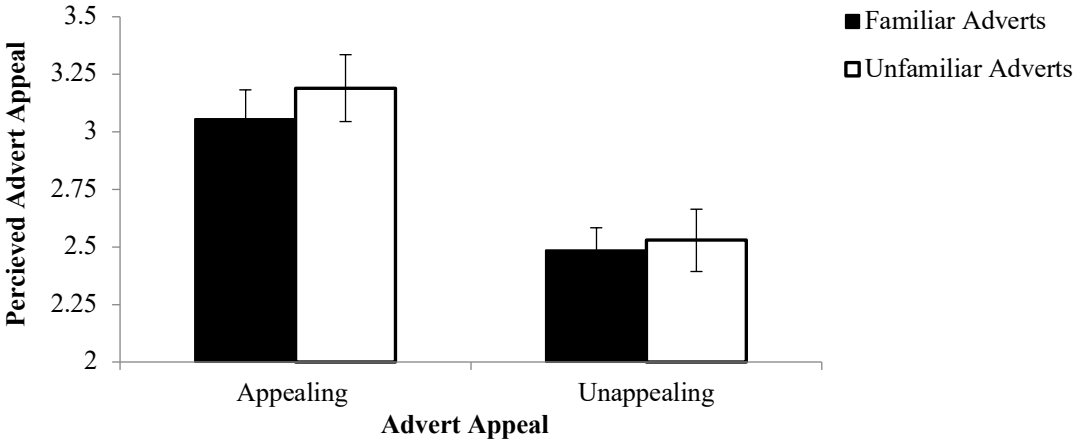
The effect of advert appeal on ratings of perceived advert appeal was highly significant, M (appealing adverts) = 3.12, SD= .36), M (unappealing adverts) = 2.50, SD= .29, see Figure 16*a*). This was as expected given the pre-experimental manipulation of advert appeal. There were no other significant effects observed.

4.3.2.2 Ratings of perceived advert familiarity.

Similarly, there was a significant effect of advert familiarity, M(familiar adverts) = 3.87, SD= .89, M(unfamiliar adverts) = 1.84, SD= .70. There was also a significant interaction between advert appeal and familiarity. This interaction is shown in Figure 16*(b)* where it is evident that the difference in ratings of perceived

advert familiarity between familiar and unfamiliar adverts are greater for unappealing adverts than for appealing adverts. However, T-test comparisons confirmed both were highly significant in the appealing condition, $t(24) = 8.89$, $p < .001$, and unappealing condition, $t(30) = 13.50$, $p < .001$.

(a) Perceived advert appeal



(b) Perceived advert familiarity

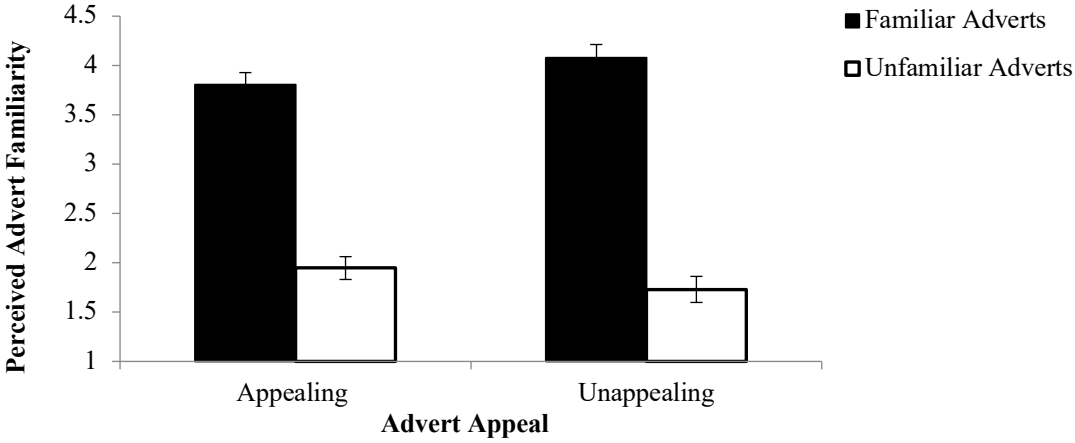


Figure 16: The effects of pre-experimentally manipulated advert appeal and familiarity on participants' perceptions of advert appeal and familiarity. Means and standard errors for *(a)* perceived advert appeal and *(b)* perceived advert familiarity.

Table 14: *The effects of advert appeal and familiarity on each dependent variable.*

	Advert appeal			***Advert Familiarity***			***Advert appeal x familiarity***		
Dependent variables	*F(1,24)*	***p***	η_p^2	*F(1,24)*	***p***	η_p^2	*F(1,24)*	***p***	η_p^2
Perceived advert appeal (Figure 6a)	17.63	< .001**	.42	1.66	.21	.08	.41	.53	.02
Perceived advert familiarity (Figure 6b)	.11	.75	.004	138.33	< .001**	.85	11.72	.002*	.33
Dwell time on adverts (Figure 7a)	17.28	< .001**	.42	9.16	.006*	.28	8.37	.008*	.26
Dwell time on website branding (Figure 7b)	19.25	< .001**	.45	.02	.88	.001	29.55	< .001**	.55
Dwell time on website image (Figure 7c)	89.05	< .001**	.79	.01	.92	< .001	6.96	.01*	.23
Amount prepared to pay (Figure 8)	.28	.60	.01	1.48	.24	.06	1.92	.18	.07

*p<.05; **p<.01

4.3.2.3 Dwell time on adverts.

There were significant effects of both advert appeal, M(appealing advert) =2727.98, SD= 245.85, M(unappealing advert) = 2502.62, SD= 304.81, and familiarity, M(familiar advert) = 2519.10, SD= 258.97, M(unfamiliar advert) = 2724.32, SD= 304.48, on dwell time to adverts (see Table 14). Furthermore, there was a significant interaction between advert appeal and familiarity (see Figure 17*a*). T-test comparisons revealed a significant difference in dwell time between familiar and unfamiliar adverts in the appealing condition, t(24) = -4.12, $p < .001$, but not in the unappealing condition, t(24) = .02, $p = .98$.

4.3.2.4 Dwell time on website brand.

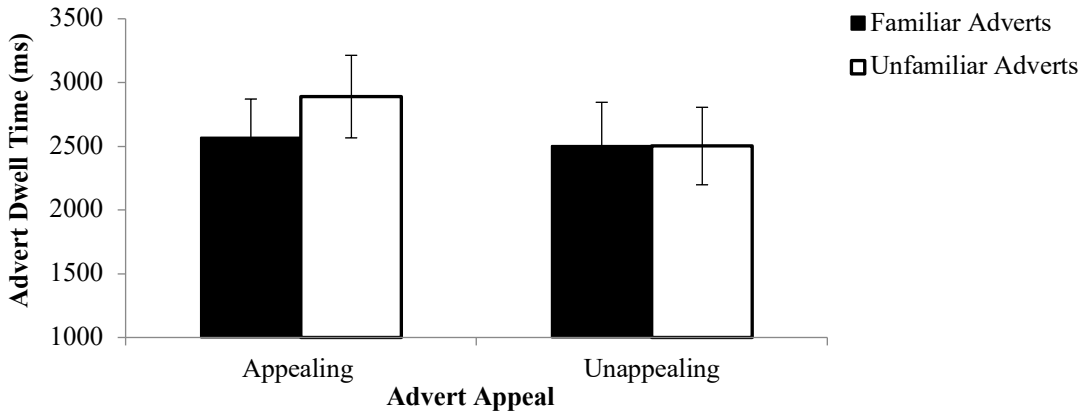
There was a significant effect of advert appeal on the dwell time on the website brand, M(appealing advert) =140.14, SD= 109.03, M(unappealing advert) = 219.61 , SD= 116.94. There was also a significant interaction between the two effects (see Table 14). This interaction is shown in Figure 17*(b)*, where t-test comparisons again demonstrated a link between familiarity and appeal. Dwell time to the brand was significantly higher in the unfamiliar, appealing advert condition compared to their familiar counterparts, t(24) = -3.10, $p = .005$, whist the opposite relationship was demonstrated for the unappealing adverts, where more familiar adverts led to significantly more attention being given to the website brand than for unfamiliar adverts, t(24) = 3.57, $p = .002$.

4.3.2.5 Dwell time on website image.

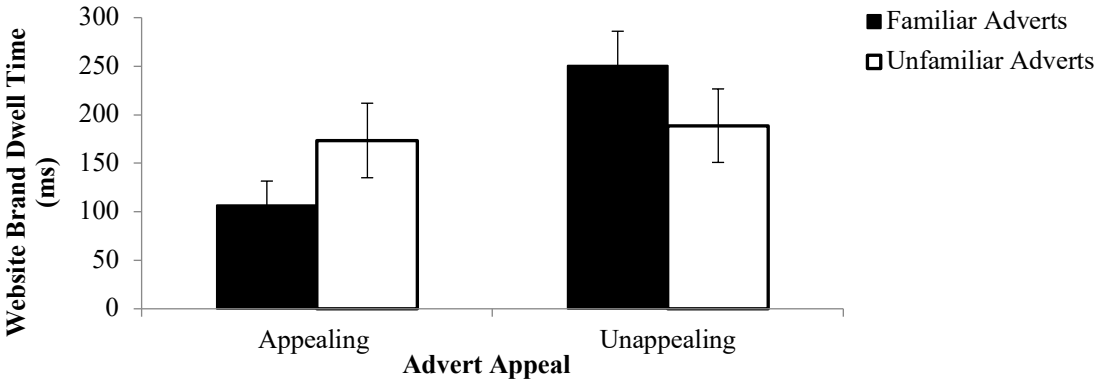
There was a significant effect of advert appeal on dwell time on the website image, M(appealing advert) = 754.83, SD= 502.38, M(unappealing advert)= 1248.80, SD= 489.10. There was also a significant interaction between advert appeal and familiarity, as demonstrated in Figure 17*(c)*. Here dwell time for the website image is higher for *unfamiliar* adverts in the appealing condition when

compared to appealing, familiar adverts. The reverse pattern takes effect for the unappealing condition where familiar adverts resulted in greater dwell time on the website image. However, t-test comparison indicated that these differences were not significant ($p > .01$).

(a) Dwell time on adverts



(b) Dwell time on website brand



(c) Dwell time on website image

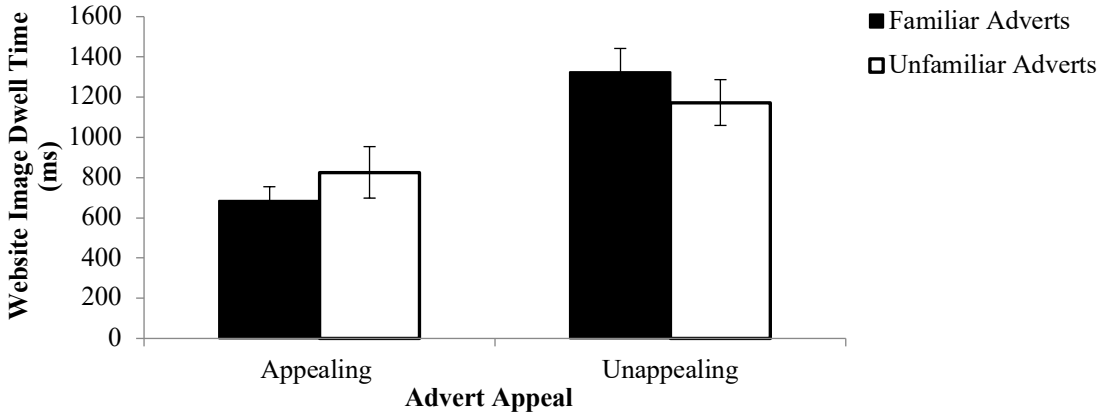


Figure 17: The effects of pre-experimentally manipulated advert appeal and familiarity on interest area dwell time. Means and standard errors for *(a)* dwell time on adverts, *(b)* dwell time on website brand and *(c)* dwell time on website image.

4.3.2.6 Percentage prepared to pay.

Percentage prepared to pay was calculated using the same procedure as outlined in the previous section. As shown in Figure 18, there were again no significant effects of advert appeal or familiarity on the amount individuals were prepared to pay ($p > .05$; see Table 14). This suggested that this measure may not be accessing product appeal or intention to buy as intended.

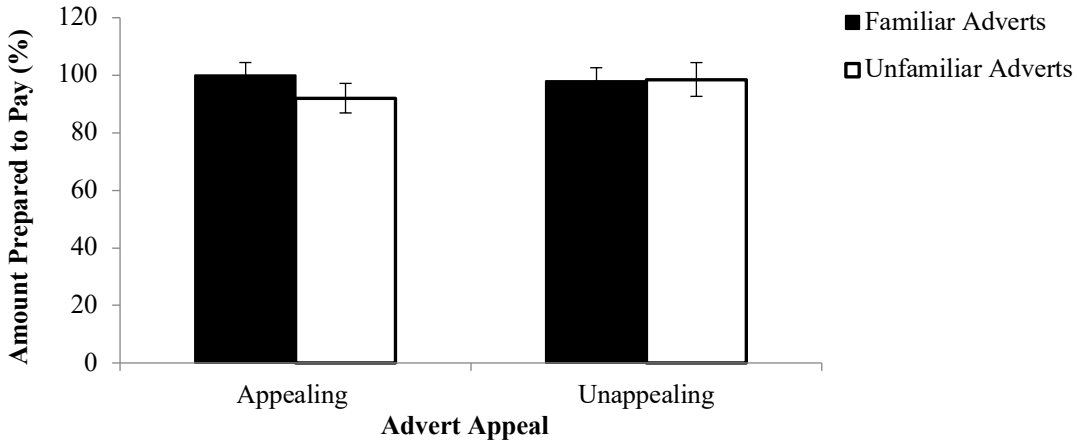


Figure 18: The effects of advert appeal and familiarity. Means and standard errors for amount prepared to pay.

4.4 Discussion

The study reported in this chapter examined the impact and relationship a website has with a given advert which appears alongside it. Although there has been considerable research which has examined the effectiveness of online advertisements (see Goldfarb, 2014; Ha, 2008; 2012; McCoy et al., 2007, for reviews), little consideration seems to have been given to the effects that websites have on the embedded adverts which appear alongside them and also the how they may interact with each other, i.e. the interplay between website and advert. In the present experiment the concept of visual framing was used for the first time, referring to the way in which the visual characteristics of a website may 'frame' an advert which appears alongside it. The experiment examined:-

(i) the visual framing effects of website appeal and brand familiarity on perceptions of advertisement appeal and brand familiarity

(ii) the relationship between website and advertisement appeal and brand familiarity and how this influences users' eye movements and attention.

Given the amount of research accumulated on the importance of website appeal (e.g., Cyr et al., 2010; Golander, Tractinsky & Kabessa-Cohen, 2012; Lindgaard et al., 2011; Moshagen and Thielsch, 2010; Schmidt et al., 2009) and brand knowledge (Campbell & Keller, 2002; Sun & Wang, 2010; Kim et al., 2009; 2014; Weisstein et al., 2016), this study focussed on whether the effects of website appeal and brand familiarity might extend beyond the website itself and contribute to the level of perceived appeal on embedded advertising. This is clearly important since current advert placement algorithms do not appear to take this interaction into account. Given how online display advertising is among the most popular method of advertising on the internet with most websites gaining revenue in this way, exploring this possibility may provide crucial feedback for the marketing community.

The findings reported here suggest that it is not enough to assume if an advert is appealing then it will be successful. This study has shown that characteristics of the website in which the advert appears will also affect advert appeal and therefore, efficacy. As hypothesised, there was a clear link between website appeal and advert appeal with website appeal being an important predictor of how appealing an advert is perceived to be, so providing support for the notion of visual framing. When an advert is embedded alongside an appealing website, this positively increased the level of perceived appeal that an advert is given (see Figure 13*a*). Familiarity also appears to play a significant role: adverts presented on websites with more familiar brands are deemed to be more appealing.

Other findings were not so straight forward and revealed a complex inter-dependency between website and advertisement characteristics. These findings suggested that, when advertisements appeared alongside appealing and familiar websites, participants perceived the advertisements to be *less* familiar (see Figure 13*b*). This could be explained by examining possible contrast effects, i.e. that when a stimulus appears with a highly familiar and appealing website, it will appear *relatively* unfamiliar in comparison. One might argue that in terms of product promotion through advertising, the benefits of increasing advert appeal via presenting it alongside an appealing, familiar website may outweigh the need to maintain advert familiarity. However, considering past research demonstrating the importance of familiarity in determining appeal (e.g. McDougall et al., 2016, see also Chapter 2, Experiment 1), then if appearing alongside an appealing and familiar website is actually reducing the familiarity of the advert, then it is reasonable to consider that any positive impact is being negated by the decrease in advert familiarity. Whether this is the case or not, a picture begins to emerge that this is perhaps a more complex relationship than first imagined and that a fine balance

exists to create the best and most positive outcome in terms of both website and advert appeal and success.

As expected, adverts which were experimentally manipulated using rating data from the pilot study to be more appealing were indeed perceived as more appealing by participants, with similar effects being demonstrated with brand familiarity, confirming a successful manipulation (see Figure 16). However, the relationship between advert appeal and advert familiarity on user judgements would seem to be more complex than first thought. Indeed, given previous research (e.g. Cambell & Keller, 2002; Sun & Wang, 2010), it was expected that more familiar adverts would be perceived as more appealing. However, contrary to what was expected, adverts with familiar branding were *not* rated more positively than their unfamiliar counterparts, and although not significant, generally received lower rating of advert appeal (see Figure 16*a*). This suggests that familiarity may have a different role when evaluating the appeal of an advert compared to when making judgements of website appeal. Furthermore, adverts that were manipulated to be *less* appealing were reported as *more* familiar than any other group (see Figure 16*b*), suggesting that increasing familiarity alone is *not* enough to increase appeal. A possible explanation may be found in the argument that individuals have a disposition to remember negative events, emotions or impression more strongly, and in more detail, than positive ones. These negative impressions are thought to form more quickly than positive ones, whilst also being more resistant to change (Baumeister, Bratslavsky, Finkenauer & Vohs, 2001). Hence, unappealing adverts, which leave negative impressions, are deemed more familiar. However, given the novelty of this research, further work would be beneficial in unpicking the relationship between appeal and familiarity. Certainly, when combined with previous literature on the role of brand familiarity (see Alvarez & Fournier, 2016; Keller & Lehmann, 2006;

Sprott & Liu, 2016, for reviews), the findings presented here add to the building evidence indicating how familiarity may be key in mediating positive and negative effects on advert appeal and efficacy.

As expected, when participants' eye movements were examined dwell time on appealing adverts was greater in comparison to unappealing advertisements. However, when an advert brand was more familiar then the amount of attention given to an advert *decreased*, again showing the mediating role which familiarity is playing. This also mirrors findings in the previous chapter where increased brand familiarity resulted in less time spent attending to website branding information. In the current study, the blend of appealing but unfamiliar adverts appeared to be a key combination, increasing the amount of attention given to an advert.

Furthermore, our findings show that as advert appeal increases, the amount of attention given to the website brand and main website image significantly decreases, with more attention paid to the advert itself. Conversely, attention to these aspects of a website increase when an individual perceives an advert as unappealing. Ultimately, it would therefore seem that more attention on an advert elicits less time given to the website. This may be seen positively or negatively. Web designers may fear the placement of appealing adverts on their websites as this may detract attention away from the website, while advertisers may worry about the attentional pull of appealing website. The consequences of the findings from the present study present a potential future line of enquiry in terms of understanding the implications of the relationships between websites and embedded advertising for consumer research and marketing.

The eye tracking data presented here also supports the notion of interplay between both website and advert in determining where an individual attends to and the judgements they make. It would appear that it is very much a 'two-way street'

with a complex inter-dependency between website and advertisement characteristics taking place, with further examination needed to explore this relationship in order to draw any significant conclusions on exactly how they interact with each other. Either way, using eye movements to examine the relationship between websites and online advertisements is clearly a useful technique to employ. There is a clear relationship between websites and advert partners and our findings add to the limited, but growing body of literature in this area, helping us to understand what processes may be taking place when making decisions online.

There appeared to be little effect of either website and advert appeal and familiarity on the price participants were prepared to pay for a product, and ultimately, an individual's intention to buy. A primary goal of advertisement is to lure in potential customers and increase their likelihood of purchasing the product or service advertised. With this in mind, even though the research presented here aids in bringing us a step closer to understanding website-embedded advert inter-relationships, it is not possible to relate this to real world purchase intentions.

A reasonable explanation as to why it was not possible to relate our findings to purchase intentions may lie in the methodology employed in this experiment. The issue may not be that website or advert appeal had no effects on purchase intentions as the findings suggest, but that the method used to measure these effects may not have been suitable and perhaps did not ask for the necessary information from individuals in order to establish these effects. A large amount of literature in the consumer research domain has examined online purchasing intentions (e.g. Gavilan, Avello & Martinez-Navarro, 2018; Lu, Fan & Zhou, 2016; Martins et al., 2018; see Akar & Nasir, 2015 for a review.) and perhaps what is worth examining further in future research is the different measures and/or experimental paradigms that could be

used and what would be a more appropriate, or sensitive measure in these circumstances (see Elsen, Pieters & Wedel, 2016; Pieters & Wedel, 2004; 2012).

The study presented here is a first of its kind examining the relationship between both websites and adverts and how they interact with each other. Our results clearly demonstrate how it is not a one-way street in terms of a website affecting an advert or vice-versa, but a partnership where finding the right balance is key to success. As well as appeal, familiarity appears to play a key mediating role and is not an aspect to be overlooked. As a general rule they seem to work in different ways, but combining them correctly may result in achieving optimum combinations in website marketing.

CHAPTER 5

5.1 Experiment 4: Individual differences in perceptual processing and evaluations of website appeal

Chapters 2-4 examined the nature of website appeal, how judgements were made regarding website appeal, and the effect this had on advertising placed on the websites. However, there has been remarkably little research to date which has examined the role of individual differences in judgements of website appeal. We are all different and although there may be similarities in the way typical individuals process and make decisions on given information, it is certainly not a 'one-size-fits-all' domain. This may be particularly the case for individuals with Autism Spectrum Disorder (ASD).

The German software company SAP recently announced that it was seeking to recruit people with autism as programmers and product testers, drawing on skills that include close attention to detail and problem-solving. A spokesman said "They bring a special set of skills to the table, which fits with SAP" (Reuters, 22nd May 2013). This has not been just a short-lived initiative: SAP rolled out their programme across eleven countries with the aim of employing in excess of 600 individuals with ASD (CIO, 8th May 2018). They are not alone with companies such as Microsoft following suit (BBC, 7th April 2015). Two things are remarkable about this development. The first is the welcome recognition that individuals with autism have cognitive strengths as well as weaknesses. The second is that, despite a growing knowledge of the ways in which autistic individuals process information cognitively, very little is known about how their particular profile of strengths and weaknesses shapes their use of computers, particularly the Internet.

Experiment 4 focusses on individuals with ASD bringing together research examining judgements of website appeal with possible individual differences in

processing of visual information. Websites were presented to ASD individuals and a matched group of typical participants for either 250ms or 6 seconds. Participants were asked to judge the appeal of each website as their eye movements were recorded. In addition, the spatial frequency information presented on the websites was systematically varied using different spatial frequency filters (see below for further details).

Whilst there has been limited research investigating the online needs of some specific populations, such as for individuals with intellectual disabilities (Karreman, van der Geest & Buursink, 2007) and visual impairments (Stefano, Borsci & Stamerra, 2010), there appears to be no research to date focusing on appeal evaluations of websites in minority populations. As a result, our current understanding of how these individuals perceive and cognitively process evaluations of interface usability and appeal are very limited. Understanding these processes is important for individuals with autism, not least because they are being actively recruited on the basis of an assumed cognitive strength. The use of computers as intervention methods for improving social interaction and learning in autistic individuals has already been investigated (see Ploog, Scharf, Nelson & Brooks, 2013; Wainer, & Ingersoll, 2011, for reviews) and guidelines have been provided by the National Autistic Society (NAS) regarding website design for individuals with autism. These recommendations include the use of clear, uncluttered designs and no use of animated flash content (NAS, 2016), but are based on supposition and practice rather than research. These guidelines appear at odds with the assumptions made by companies such as SAP and Microsoft which emphasise attention to detail and problem solving in this population.

5.1.1 Perceptual processing in ASD

Since autism was first identified and named (see Kanner, 1943), autism spectrum disorder has been systematically characterised and a number of theories have been proposed to explain why this disorder occurs (ASD; DSM-5, American Psychiatric Association, 2013; e.g. Wimmer & Perner, 1983; Baron-Cohen, 1989; Ozonoff et al., 1991; see Rajendran & Mitchell, 2007, for a review). One of the most influential theories - Weak Central Coherence Theory (WCC; Frith, 1989; 2003; Happé, 2013) - seeks to account for differences in cognitive processing style and particularly why autistic individuals may be better at some tasks than the typical population (Happé & Booth, 2008; Happé & Frith, 2006; Bölte et al., 2007, but see Van der Hallen, Evers, Brewaeys, Van den Noortgate, & Wagemans, 2015, for a review). According to this theory, individuals with ASD have a detail-focused cognitive style, resulting from a decreased level of global processing and an increased level of local processing. In practice, this means that they find it easier to break down complex patterns, shapes and information into its individual parts (local processing), rather than viewing it as a whole (global processing). This contrasts with typical individuals where global processing is usually much more the norm.

Given their simplicity and versatility, the use of Navon tasks and stimuli (see Figure 19; Navon 1977) have often been employed to examine local versus global processing in ASD and suggests that ASD individuals have superior local processing in comparison to typical controls (e.g. Behrmann et al. 2006; Rinehart et al. 2000; Wang et al. 2007, but see Guy, Mottron, Berthiaume & Bertone, 2016; Simmons & Todorova; 2018; Van der Hallen et al., 2015, for reviews). Their affinity for local processing has been linked to Weak Central Coherence Theory and the idea that detailed local processing predominates for ASD individuals, affecting the way in which these individuals integrate perceptual information (see Frith, 2012; Happé,

2013; Happé & Booth, 2008). Happé and Booth discuss the possibility that local and global processing are independent of one another, relying on different mechanisms and following different developmental trajectories. The possibility then arises that a deficiency in one form of processing can be present *without* impacting the other (Booth, 2006; but also see Van Eylen et al., 2017, for a discussion). Although there is much debate over the role of local versus global processing (see Simmons & Todorova; 2018; Van der Hallen et al., 2015), recent evidence from Booth and Happé (2018) indicates that global processing is reduced in ASD but that local processing is higher than the norm. As a result of this bias, these individuals often excel beyond typical individuals in tasks dealing with complex information where global processing may be more of a hindrance than a help (see Soulières et al., 2011; Chen et al., 2012, see Guy et al., 2016).

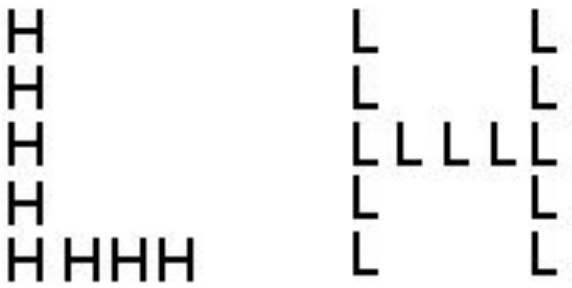


Figure 19: An example of Navon (1977) stimuli typically employed to examine global and local processing. A series of smaller 'local' Hs can form a 'global' L and vice versa.

Deruelle et al. (2008) examined this local processing bias by comparing the face categorisation strategies of ASD participants and matched controls. Participants were presented with faces to categorise and match which had been spatially filtered so that only high or low frequency information remained (see Figure 20). This is

based on the principal that global processing is associated with low spatial frequencies, whereas local processing is associated with high spatial frequencies (see Behrmann, Thomas & Humphreys, 2006; Flevaris & Robertson, 2015; Kauffmann, Ramanoël & Peyrin, 2014). Certainly, research suggesting that global processing is associated with the right hemisphere and local processing with the left hemisphere with different neural pathways associated with each type of processing supports this assumption (see Iglesias, Santos-Rodríguez, Trujillo-Barreto & Valdés-Sosa, 2015; Flevaris, Bentin & Robertson, 2010; Flevaris, Martines & Hillyard, 2014; Weissman & Woldorff, 2005). On this basis, Deruelle et al. created high frequency and low frequency face stimuli and asked their participants to match the spatial frequency filtered faces with the same unfiltered matching face. As demonstrated in Figure 2, low frequency filtering creates faces which are more blurred, where individual facial features are less readily perceived. These are assumed to stimulate global processing. In contrast, high frequency filters create faces in which facial features are more salient and are assumed to encourage local processing.

(a) Low frequency filtered stimulus *(b)* High frequency filtered stimulus

Figure 20: Sample spatial frequency filtered stimuli from Deruelle et al. *(a)* Low frequency filtering blurs faces, rendering the facial features less available; *(b)* high frequency filtering creates contrasts making facial features more salient.

Deruelle et al. found that when ASD participants were asked to match faces on the basis of identity or emotion, children with ASD showed a bias towards high frequency filtered faces in terms of the amount of choices they made (i.e. children with ASD displayed a preference for local information). Individuals with ASD made significantly less low frequency choices when matching identity and significantly more high frequency choices when matching emotions when compared to a typical control group (see also Kikuchi et al., 2013, for similar findings). Deruelle et al., however, found no indication of this bias towards local processing affecting accuracy scores in the face matching task, suggesting more of a *preference* towards this form of processing rather than a *deficit* in global processing as Booth and Happé (2018) have recently suggested. If, as these findings suggest, autistic individuals tend to process visual information locally rather than globally (either through preference or as a result of a deficit in global processing), it begs the question of whether or not this affects the way autistic individuals integrate and make sense of visual information presented on websites.

5.1.2 Spatial Frequencies, ASD and the Internet

A study by Thielsch and Hirschfeld (2010) investigated the impact of high and low spatial frequency filters on website evaluations in a typical population. They found that while ratings of website appeal in both filter conditions were significantly correlated with and predicted appeal ratings in a no filter condition, this relationship was strongest for high spatial frequencies (i.e. local processing) in comparison to low spatial frequencies (i.e. global processing, see Figure 21). Interestingly, in a later study Thielsch and Hirschfeld (2012) found that only low spatial frequencies informed appeal judgements when participants were asked to make very rapid website appeal evaluations. They explained these findings in terms of participants' limited ability to process information in a short amount of time,

arguing that when exposed to a stimulus for such a short timescale, individuals only have the capacity to process global information in the stimulus and not local information. When these findings are combined with Deruelle et al.'s research, as well as the theoretical assumptions of WCC, it seems plausible that ASD individuals may use local processing more than typical participants even when website landing pages are presented rapidly. This possibility was examined in Experiment 4.

(a) Low spatial frequency filtered website *(b)* High spatial frequency filtered website

Figure 21: Sample spatial frequency filtered stimuli from Thielsch and Hirschfeld (2010). *(a)* Low frequency filtering blurs website features; *(b)* high frequency filtering creates contrasts making website detail more apparent.

It seems likely that ASD participants will be able to process information more effectively under high frequency filter conditions and that the resulting ease, or fluency of processing, may result in higher website appeal evaluations (McDougall & Reppa, 2013; Reber, Schwarz & Winkielman, 2004) in comparison to typical participants. In the current experiment website appeal ratings obtained from individuals with ASD were compared to those of typical participants using rapid (250ms) and slower (6s) stimulus presentation times under high, low and no spatial frequency filter conditions. If, as hypothesised, ASD participants tended to rate high frequency filtered websites more favourably, then group differences between filter

conditions would be expected. Indeed, ASD participants may find it relatively difficult (i.e. processing is less fluent) under rapid presentation conditions when global processing tends to predominate. The combination of these two effects could result in a Group x Spatial Filter Condition interaction.

If individuals with ASD process information in more detail, then they may make fewer fixations under rapid evaluation conditions in comparison to typical participants. This was examined in the present experiment by tracking participants' fixations as they made website evaluations. Furthermore, the tendency to process locally rather than globally shown by individuals with ASD may mean that appeal judgements in rapid evaluation conditions are less reliable. If judgements remain similar across both presentation times, indicating that website judgements are being made rapidly and effectively using global processing, then correlations between the 250ms and 6s presentation conditions would be high. If the ASD group find it more difficult to make appeal judgements when presentation rates are rapid, then this correlation should be much reduced when compared to typical participants.

In addition to the number of fixations made during rapid presentation times, percentage dwell time on key areas of interest in the website was recorded in the longer 6s condition. These areas were the branding logo, the navigation bar, the main website image and the main website text. If participants with ASD tended to focus on detail and processing information more locally, then they may spend most time examining the website text area and possibly the navigation bar in comparison to the website image and brand logo, with group differences emerging as a result.

To summarise, Experiment 4 revisited the timescale of decision-making when evaluating judgements of website appeal, exploring potential differences between typical individuals and individuals with ASD. Furthermore, the effects of a spatial frequency filter (high vs. low vs. no filter) on the judgements of website

appeal obtained by both participants with ASD and typical participants was examined when given either 250ms (rapid decision-making) or 6s (slower decision-making) to view website landing pages. Eye tracking was also employed to examine how possible differences in cognitive style influence what individuals attend to on websites when making judgements of appeal.

5.2 Method

5.2.1 Design

A 2 x 2 x 3 design was employed in this experiment with group as a between-subjects factor (ASD vs. typical individuals/control) and presentation time (250ms vs. 6s) and spatial frequency filter (high vs. low vs. none, see Figure 4) as within-subjects factors. On this occasion, the third 'unlimited' exposure time condition was omitted because of the similarities between the 6s and unlimited conditions in Experiment 2. The effects of group, presentation time and filter were considered on the following dependent variables:-

(i) Ratings of perceived website appeal

(ii) Dwell time on website branding

(iii) Dwell time on website navigation

(iv) Dwell time on main website image

(v) Dwell time on main website text.

5.2.2 Ethics

The methods and procedures employed were reviewed and approved by the Bournemouth University Ethics Committee in line with the Ethics Code of Practice. All participants were fully informed about what to expect from the experiment. Written consent was sought from all participants and, where appropriate, from their parents and/or legal guardians before participating in the experiment.

5.2.3 Participants

In total, 15 typical individuals (M=10, F=5) and 15 individuals with a clinical diagnosis of Autism Spectrum Disorder (M=10, F=5) took part in this study between the age of 16 and 19 (M = 17.33, SD = 0.99). Participants were recruited from the local community, including Bournemouth University, Brockenhurst College and Summerwood Campus. All participants reported normal or corrected to normal vision and were regular users of computers and the internet. It is important to note that the characteristics of the participant groups were controlled as carefully as possible. Both participant groups were drawn from similar catchment areas and the age, IQ and gender of participant groups was matched in order to ensure judgements were not unaffected by these extraneous variables. The Wechsler Abbreviated Scale of Intelligence Second Edition was used to calculate participants' IQ scores (WASI-II; Wechsler, 2011; see Table 15). Participants also completed the Autism-Spectrum Quotient (Allison et al., 2012; Baron-Cohen et al., 2001). Eye tracking data from two individuals in the ASD group was omitted due to lack of reliability.

Table 15: *Mean, standard deviation and range of age and IQ for each experimental group.*

	ASD Participants	Typical Participants
Age		
Mean	17.20	17.47
SD	1.02	0.99
Range	16-19	16-19
IQ		
Mean	98.67	99.07
SD	16.46	13.33
Range	62-123	65-110

5.2.4 Materials

Three matched groups of 20 websites were used (see Appendix I for full list of websites selected). One group of 20 was manipulated using a low spatial frequency (LSF) 'low-pass' filter, one group a high spatial frequency (HSF) 'high-pass' filter and the third contained original unfiltered stimuli (see Figure 22). As with the participant groups, website characteristics were carefully matched across the three filter group so that participants' website evaluations could be directly compared, particularly in the high and low filter conditions. Each group of 20 websites was varied to ensure a diverse range of typical websites was included, whilst at the same time being carefully matched between groups in accordance with prior evaluations of appeal and familiarity from the corpus data presented in Experiment 1 (see Table 16), therefore ensuring any significant findings which emerged were a result of the manipulation of group, presentation time and filter. To ensure the three sets of 20 websites did not differ, a one-way ANOVA was conducted to analyse possible group differences in website familiarity and appeal. As expected, there were no significant differences present either in appeal, $F(2,59) = 2.45$, $p = .10$, or familiarity, $F < 1$. Spatial frequency filters were applied to the stimuli using Photoshop CS5. As in previous research (Thielsch & Hirschfeld, 2010; 2012), low-pass filters were created using a Gaussian blur filter with a 6.1 pixel kernel and the Adobe Photoshop high-pass filter was used set to a radius of 0.3 pixels to create the high-pass stimuli.

Table 16: *Mean, standard deviation, range and skew of website appeal and familiarity used in each spatial frequency filter condition.*

	High spatial frequency websites 1-20		Low spatial frequency websites 21-40		No filter websites 41-60	
	Appeal	Familiarity	Appeal	Familiarity	Appeal	Familiarity
Mean	4.26	3.77	4.47	3.60	3.99	3.80
(SD)	(.81)	(1.98)	(.59)	(1.92)	(.63)	(1.69)
Minimum	2.48	1.11	3.14	1.12	2.95	1.29
Maximum	5.57	6.45	5.65	6.70	5.00	6.15
Skew	- .47	- .12	- .14	- .01	- .11	- .15

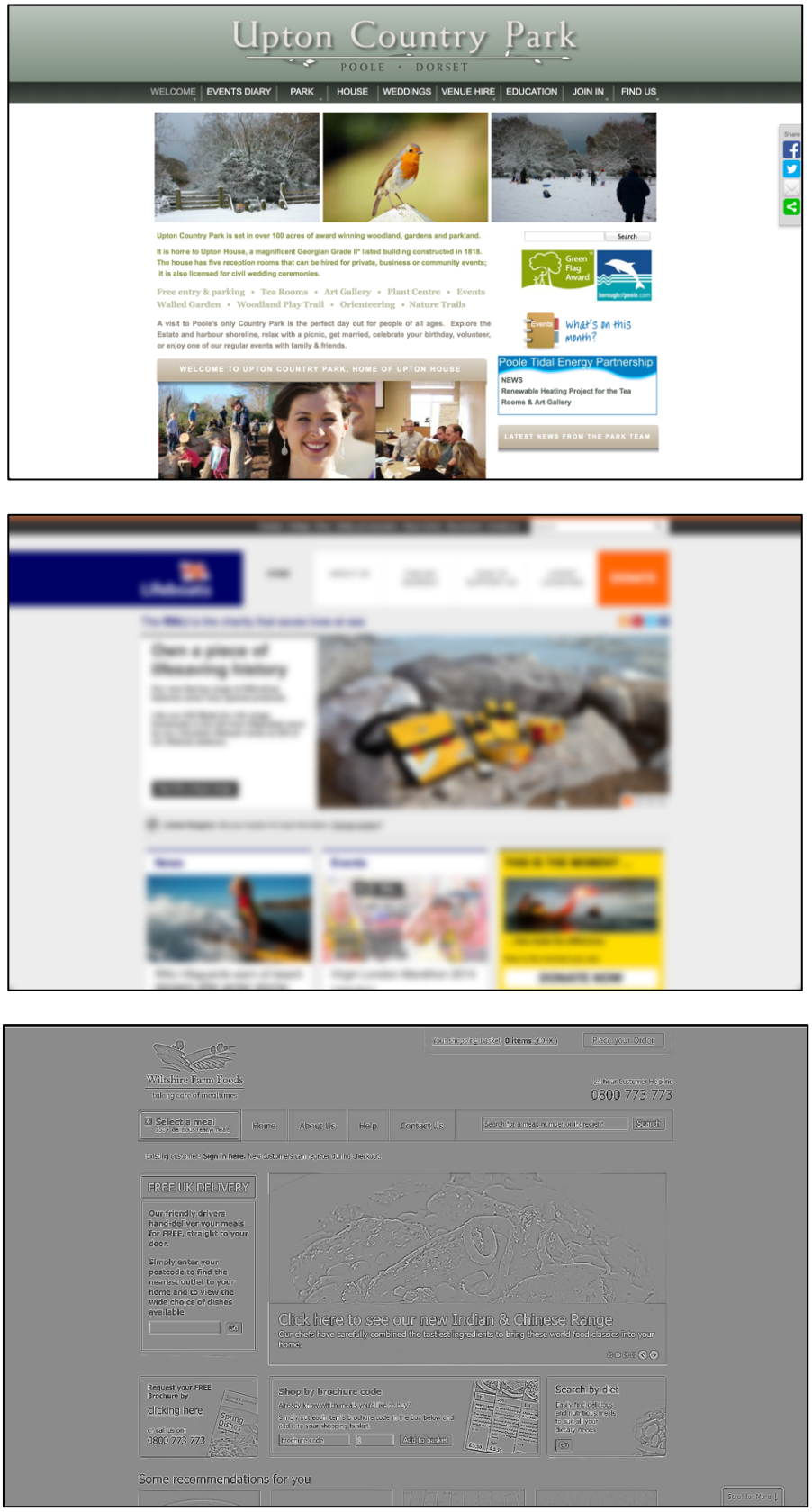


Figure 22: Examples of the effects of spatial frequency filters on website landing pages. Top: No filter. Middle: Low frequency filter. Bottom: High frequency filter.

5.2.5 Procedure

The procedure was in 3 parts: in the first, information about individual differences was obtained, including age, IQ and diagnosis. Information about diagnosis was sought from the gatekeeper responsible for overseeing access to participants (i.e. teacher and/or support worker) and, where applicable, from the participants themselves. In the second stage, participants were presented with the website stimuli with presentation displays lasting for either 250ms or 6s. Finally, participants viewed the websites again in a separate experimental session, this time using the alternate presentation duration to the one previously employed. Presentation times were counterbalanced to prevent order effects. Participants viewed websites via the Eyelink 1000+ eye tracker, positioned 90cm away from a 1024x768 flat screen monitor. Participants eye movements were calibrated with the eye tracker prior to starting the experimental session using a 9-dot calibration (Duchowski, 2007; Holmqvist et al., 2011). They were then presented with the complete website stimulus set (n=60) in a randomised order, containing a combination of filtered (HSF/LSF) and unfiltered websites (20 of each). The procedure for each trial is shown in Figure 23. Participants viewed websites via the eye tracker where the procedure for each experimental trial was:

(i) A fixation cross was presented for 500ms.

(ii) A mask was then shown for 100ms. In line with previous research (Thielsch and Hirschfeld, 2012), to create the mask a website stimulus which rated as average appeal and familiarity was selected from the corpus Chapter 2. This was transformed into greyscale and pixelated into 2x2 pixels and randomly rearranged.

(iii) The website was then presented for either 250ms or 6 seconds.

(iv) The same mask was presented for 100ms.

(v) Participants were then asked to rate the website according to how appealing they found it on a scale of 1 (not appealing at all) to 5 (very appealing). Participants were given 5 practice trials in order to familiarise themselves with the process.

5.2.6 Eye Tracking

To examine eye movements the same principals outlined in Experiments 2 and 3 were employed. As noted previously, dwell time and percentage dwell time provides the ability to not only examine where individuals are attending, but also for how long. This made it possible to directly compare groups in terms of how much attention they give to the different aspects of a website. As discussed in Chapter 3 (see Section 3.3.2), Experiment 2 analysed percentage dwell time in order to account for differences across presentation times (i.e. between 6s and unlimited times). Given the similarities between the current experiment and Experiment 2 (i.e. examining the timescale of decision-making; Chapter 3), whilst also drawing direct comparisons with an ASD population, percentage dwell time was selected as the appropriate measure. As is Experiment 2, data was extracted from four main areas of interest:

(i) The branding/logo area

(ii) The navigation menu

(iii) The main image

(iv) The main text.

All four interest areas were included given the possibility that individuals with ASD may attend to different areas of a website in comparison to typical individuals. A group of five individuals were independently asked to outline the above aspects for each of the 60 websites. Areas of common interest were selected as interest areas for each stimulus.

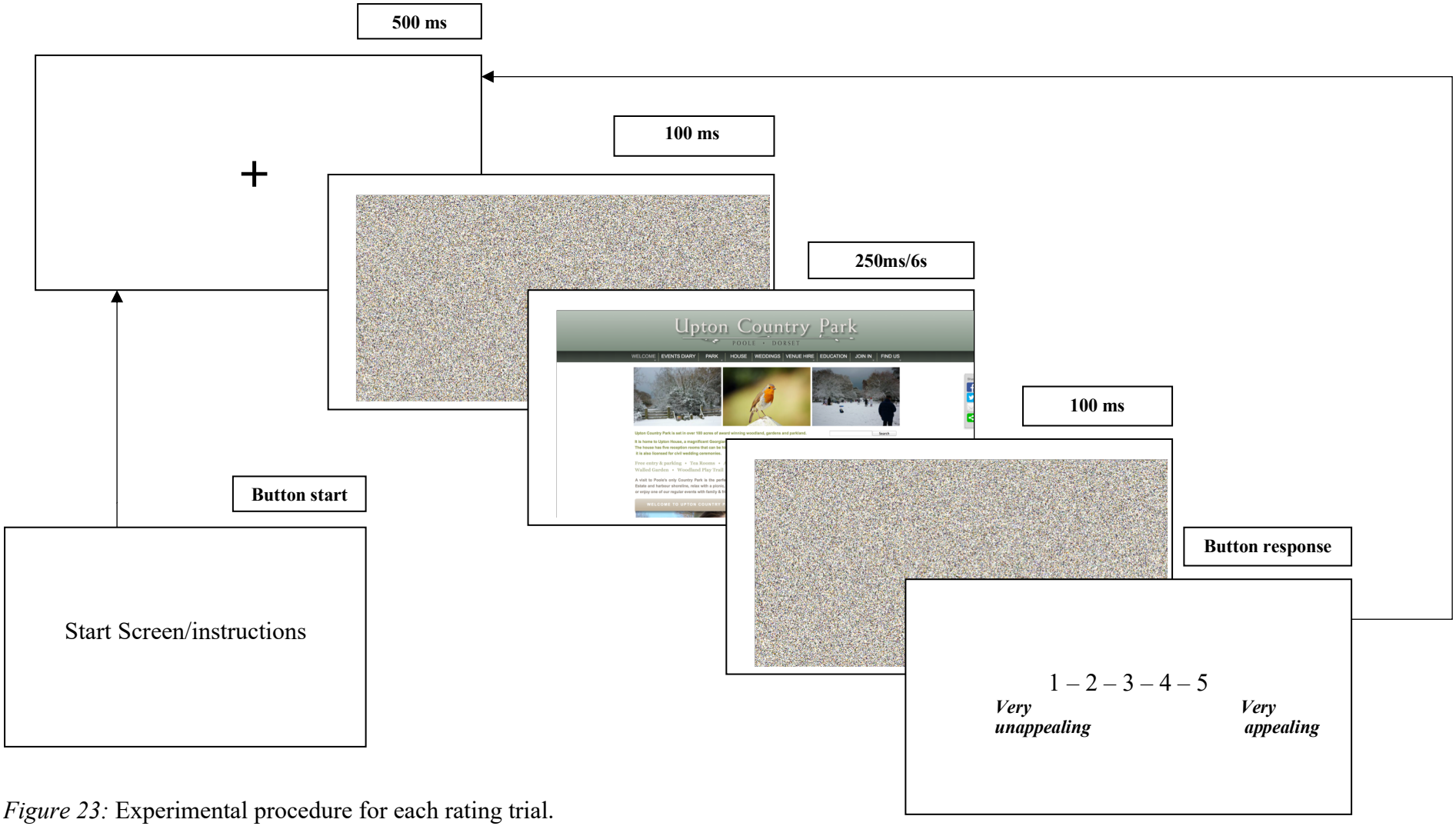


Figure 23: Experimental procedure for each rating trial.

5.3 Results

A series of analyses of variance was used to examine the effects of group (ASD vs. typical), spatial frequency filter (high vs. low vs. no filter) and presentation time (250ms vs 6s) on ratings of website appeal. To enable further comparison between groups, ratings of website appeal in the 250ms and 6s conditions were correlated in the ASD group in the same manner as for the typical population in Experiment 2 to examine the extent to which the ratings obtained were underpinned by similar processes. An analysis of variance was planned to examine the effects of group (ASD vs. typical) and spatial frequency filter (high vs. low vs. no filter) on the number of fixations to the whole website in the 250ms condition. This was to establish whether individuals with ASD reflect any differences in their ability to process websites under rapid exposure (i.e. are they able to make more fixations in a short space of time?). However, given the limited fixation data, it was decided that this analysis was not appropriate. Instead, descriptive statistics are presented for comparative purposes in this respect. Furthermore, to explore whether individuals with ASD differ in how and where they attend when processing websites and making judgements of appeal an analysis of variance was used to examine the effects of spatial frequency filter (high vs. low vs. no filter) and group (ASD vs. typical) on percentage dwell time in the 6s condition.

5.3.1 Perceived Website Appeal

Figure 24 shows the effects of presentation time and spatial frequency filter on ratings of website appeal. There is little apparent difference between groups, presentation times or filter conditions on ratings of website appeal. This was confirmed in a 2 x 2 x 3 ANOVA carried out to examine these effects. The results of this analysis are summarised in Table 17. There were no significant main effects or interactions between groups, filter or presentation time on perceived ratings of

appeal ($p > .05$). These findings contradicted the experimental hypotheses which predicted significantly higher ratings of appeal for the no filter in comparison to the filter conditions and that ASD participants would rate high frequency filtered websites more favourably. However, these findings support the assumption that autistic individuals make reliable judgements of website appeal even under restricted timescales. Ratings of website appeal in the 250ms were correlated with ratings given in the 6s condition. Highly significant correlations were observed between ratings of perceived appeal made after 250ms and those made in the longer 6s condition, $r(13) = .76$, $p = .001$. Identical findings were also observed in a typical population in Experiment 2 (see Chapter 3, Section 3.3.1)

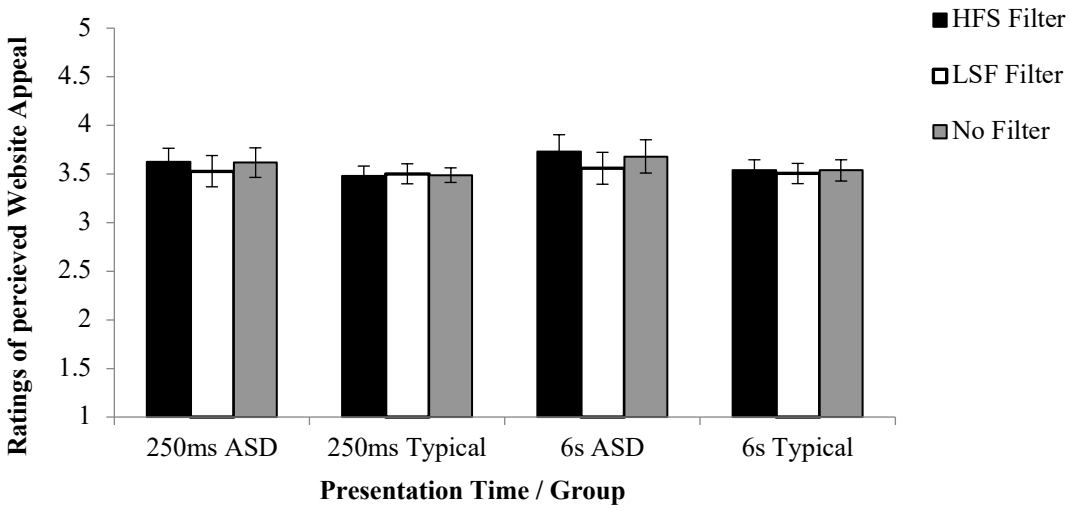


Figure 24: Ratings of website appeal in each participant group, presentation time, and filter condition.

Table 17: *The effects of group, filter, time and interest area on each dependent variable.*

	F	***df***	***p***	η_p^2
Perceived website appeal				
Group	.58	1, 28	.45	.02
Time	.55	1, 28	.47	.02
Filter	.83	2, 56	.44	.03
Group x Time	.04	1,28	.84	.002
Group x Filter	.67	2, 56	.51	.02
Time x Filter	.17	2, 56	.84	.006
Group x Filter x Time	.01	2, 56	.99	< .001
% Dwell time in each interest area *(6s condition)*				
Group	.02	1, 26	.88	.001
Filter	3.71	1, 26	.07	.13
Interest Area	161.16	1, 26	< .001**	.86
Group x Filter	.28	1, 26	.60	.11
Group x IA	3.70	1, 26	.07	.12
Filter x IA	2.30	1, 26	.14	.08
Group x Filter x IA	4.39	1, 26	.046*	.14

*p<.05; **p<.01

5.3.2 Number of fixations (250ms condition)

The number of fixations for the whole website stimulus was compared in the 250ms presentation condition because there were insufficient fixations in individual fixation areas. Figure 25 shows the effects of group and filter on the total number of fixations given to a website. Figure 25 suggests that fewer fixations were made in the HSF (M= 1.99, SD= .57) and LSF (M= 2.06, SD= .69) than in the no filter condition (M= 2.22, SD= .74). It also suggests that individuals with ASD process

content in a similar fashion to typical individuals when given a very limited presentation time and, indeed, may make slightly fewer fixations. Given the low number of fixations in this condition no further analysis of this data should be undertaken since the assumptions required for analysis of variance could not be met.

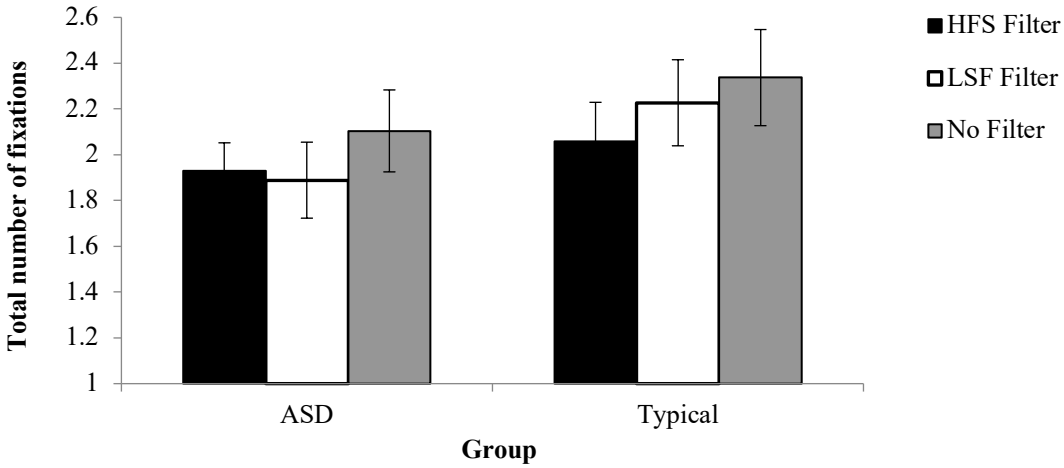


Figure 25: Total number of fixations across group and filter (250ms condition).

5.3.3 Percentage dwell time in each interest area (6s condition)

Figure 26 shows the effects of each of these factors on dwell time and the results of this omnibus analysis of variance are shown in Table 17. There was a highly significant effect of interest area. Bonferroni comparisons confirmed that the percentage of time spent examining the navigation bar (M= 4.66, SD= 4.06) and website logo (M= 7.29, SD= 5.28), was significantly lower ($p < .001$) than the time spent examining the main image (M= 22.55, SD= 6.67) and text (M= 20.94, SD= 6.51) areas. Furthermore, the percentage dwell time was higher for the main image in comparison to the main text area. However, Bonferroni comparisons revealed this was not significant There was also a small significant interaction between group, filter and interest area. Further individual analyses of variance, one for each of the 4 areas of interest, were conducted to examine this significant effect further. Table 18 summarises these findings.

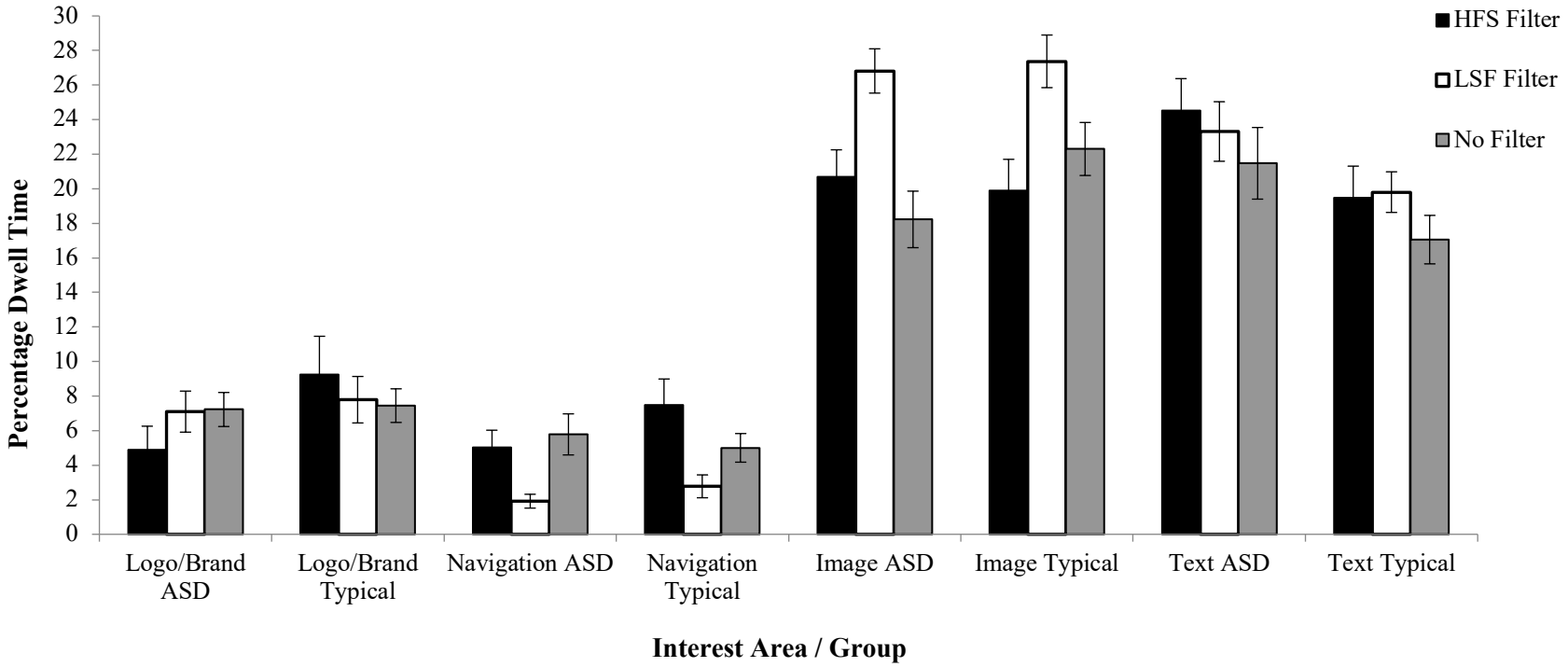


Figure 26: Percentage dwell time across group, filter and interest area (6s condition).

Table 18: *The effects of group and filter on percentage dwell time for each interest area.*

	F	*df*	***p***	η_p^2
% Dwell time on website branding/logo				
Group	.98	1, 26	.33	.04
Filter	.10	2, 52	.91	.004
Group x Filter	3.44	2, 52	.04	.12
% Dwell time on website navigation bar				
Group	.51	1, 26	.48	.02
Filter	17.15	2, 52	< .001**	.40
Group x Filter	2.64	2, 52	.08	.09
% Dwell time on website image				
Group	.50	1, 26	.49	.02
Filter	23.76	2, 52	< .001**	.45
Group x Filter	2.44	2, 52	.10	.09
% Dwell time on text				
Group	4.60	1, 26	.041*	.15
Filter	3.51	2, 52	.037*	.12
Group x Filter	.24	2, 52	.78	.01

*p<.05; **p<.01

5.3.3.1 Percentage dwell time on website brand logo.

Figure 26 shows the effect of group and filter on percentage dwell time on the logo. There were no significant effects of filter or group with respect to dwell time on the website branding logo. There were also no significant interactions.

5.3.3.2 Percentage dwell time on website navigation bar.

As shown in Table 18 spatial frequency filtering significantly affected the time spent in the navigation bar area. Bonferroni comparisons revealed that

participants paid significantly less attention to the navigation in LSF condition (M= 2.78, SD= 2.13) than in the HSF (M= 6.34, SD= 5.00) and no filter (M= 6.97, SD= 3.70) conditions (see Figure 26). There were no other significant effects or interactions.

5.3.3.3 Percentage dwell time on website image.

There was also a significant effect of filter on the dwell time on website images (see Figure 26). In contrast to the navigation bar, Bonferroni post-hoc comparisons showed that attention to the images was *higher* in the LSF condition (M= 27.11, SD= 5.26) than in the HSF (M= 20.27, SD= 6.28) and no filter (M= 20.41, SD= 6.17) conditions. This finding suggests that participants are attending more to images when processing content globally rather than locally, which was the intention of the low spatial frequency filter. There were no other significant effects or interactions.

5.3.3.4 Percentage dwell time on website text.

The effects of both participant group and spatial frequency filter on the percentage dwell time on the website text were significant. While Figure 26 suggests that dwell time less in the no filter condition (M= 19.26, SD= 1.22) compared to the HSF (M= 21.99, SD= 1.32) and LSF (M= 21.56, SD= 1.02) conditions, Bonferroni comparisons suggest that this effect is only marginally statistically reliable (p= .055). Interestingly, participants in the ASD group spending significantly more time attending to the text (M= 23.10, SD= 6.56) compared to typical individuals (M= 18.77, SD= 5.81). This suggests that ASD participants tend to spend more time examining textual detail than typical participants.

5.4 Discussion

Previous research has shown that individuals with ASD tend to process perceptual information locally, focusing on detail rather larger features (Deruelle et al., 2008; Kikuchi et al., 2013; Happé, 2013; Van der Hallen et al., 2015). In a separate branch of research, Thielsch and Hirschfeld (2010; 2012) demonstrated that rapid appeal evaluations of website landing pages were made using global processing. The paradigm employed by Thielsch and Hirschfeld was used in the present experiment to examine the underlying cognitive processing in individuals with ASD. Using low spatial frequency filters provided participants with global information because such stimuli lack detail (see Figure 4) while high spatial frequency filters provide more detail but less global information (see Figure 4). Use of these stimuli allowed possible differences which might emerge between experimental groups in processing bias.

It is clear from the current findings that spatial frequency filters had little effect on perceived ratings of appeal in both participant groups across both presentation times. This was surprising not least because of the significant distortions to some websites caused by the use of spatial frequency filters. As already noted, Thielsch and Hirschfeld assumed that global processing was primarily responsible for participants' appeal judgements in rapid presentation conditions. They concluded that high spatial frequency information starts to be utilised from 500ms onwards, beginning to shape user judgements. These conclusions were not borne out in the present experiment where neither presentation time or spatial frequency filters had any effect on judgements of website appeal. ASD participants showed high correlations between ratings in the 250ms and 6s conditions, mirroring findings from typical participants in Experiment 2 (Chapter 3), whilst providing support for the assumption that judgements of website appeal are made in the early stages of

processing and do not change even when there is more time to sample the websites and thus more time to process detail. The eye tracking data obtained in this experiment suggests that participants make a rapid appeal evaluation on the basis of 1 or 2 fixations (see Figure 7). This finding is in accord with the findings from Experiments 2 and 3 and also with previous research indicating that we tend to extract the overall gist of a visual scene quickly where there is little time to extract detailed information (Schyns and Oliva, 1994; Greene & Oliva, 2005; Oliva et al., 2004; 2005; 2006) and then begin to use this information to facilitate detailed analysis (Bar et al. 2006). Thus global processing appears to underpin judgements of website appeal irrespective of spatial frequency filtering. This process also operates in a similar manner regardless of individual differences in autistic traits. Indeed the high correlations between ratings in the 250ms and 6s conditions suggests that ASD participants' appeal ratings were just as reliable as their typical counterparts in the rapid presentation condition. Therefore, it can be assumed that for the initial stages of processing and decision-making in terms of making judgements of website appeal, typical individuals and individuals with ASD are using similar processes and heuristics.

Furthermore, these findings suggest there is no global deficiency present in ASD as suggested by the theory of Weak Central Coherence (Frith, 1989; 2003), contradicting recent work by Booth and Happé (2018). As suggested by previous research (e.g. Deruelle et al., 2008; Van der Hallen et al., 2017) it may be that individuals with ASD simply have a superior bias towards local information, known as enhanced perceptual processing, rather than a specific deficit in global processing (see Mottron & Burack, 2001; Mottron et al., 2006). There is considerable debate over whether superior local processing comes with a trade off in terms of global processing, or whether they are independent of one another with differences in

cognitive style resulting from inherent preference rather than deficit (see Guy et al., 2016; Simmons & Todorova; 2018; Van der Hallen et al., 2015, for reviews). Recent research suggests that individuals with ASD are just as adept at global processing (Stevenson et al., 2018) but may need more time to process this information compared to typical individuals (see Van Eylen et al., 2017; Van der Hallen et al., for reviews). The findings from the present study appear to provide support for the assumption that that there is no deficit in global processing in ASD.

5.4.1 Percentage Dwell Time on Key Website Interest Areas

Experiment 2 is one of very few existing studies employing eye tracking to examine how individuals sample and process websites in terms of making judgements of website appeal. The current study took this one step further by investigating whether or not individuals with ASD differ in their dwell time on key website interest areas. Although no differences emerged between the ASD and matched controls on the percentage dwell time on the brand logo, navigation bar or main image, participants with ASD spent more time attending to the text on a website compared to their typical counterparts. This is an interesting finding because it may be this 'attention to detail' which is attractive to employers and sets them apart when processing content online. Given that there are no differences between groups in terms of ratings of perceived website appeal, it is important to note that these differences in sampling *are not* shaping their ratings of appeal.

In contrast to ratings of appeal, the use of spatial frequency filters did have an effect in determining the areas of the website that participants attend to. When low spatial frequency filters were used, participants' percentage dwell time was highest on the main website image. These findings appear to be the result of participants sampling the sections of the website that are most accessible given the nature of the filter, i.e. global features (images) in the low spatial frequency filter are more

prominent, therefore attracting more attention. Again, however, this is *not* reflected in judgements of appeal where fast decision-making appears to occur prior to the beginning of systematic sampling of the website.

This experiment replicated the findings of Experiment 2 where it was found that appeal judgements were rapidly formed and that these judgements did not change even when participants had the time to sample visual information on the website more fully. The findings regarding appeal judgements given the use of spatial frequency filters was surprising but informative, suggesting that autistic individuals attend to more detail in the form of the text on the websites but that this does not affect their ratings of website appeal. To sum up, there do indeed appear to be some differences in the content being attended on website landing pages by ASD individuals but, for judgements of appeal at least, these differences seem to have little impact. Given the exploratory nature of this study and the inevitably small numbers of participants resulting from matching controls with a special population, it is important to recognise the need for replication of these findings. In conclusion, the current study presents mixed findings but indicates few differences between autistic and typical individuals in the way that they make judgements of website appeal. However, future research examining how ASD and typical users perceptions of website appeal change as they navigate through websites (rather than looking at landing pages alone) and how this interacts with usability is likely to prove fruitful, particularly if attention is given to the extent to which ASD individuals tend to focus on textual and other detail.

CHAPTER 6

6.1 Discussion

This thesis had four primary aims:-

(i) To address methodological issues regarding the lack of stimulus control and limited stimulus sets used when conducting website experiments (see Experiment 1).

(ii) To build on research examining the timescale of making judgments of website appeal (see Experiments 2 and 3).

(iii) To investigate the role of verbal information (in the form of information about the brand represented on the website) and visual information (in the form of the visual appeal of websites and the advertisements appearing on them) in framing, or influencing, judgements of web appeal (see Experiments 2 and 3).

(iv) To examine the role of individual differences in making judgements of website appeal (see Experiment 4). The focus for this experiment was the relationship between autistic traits and judgements of website appeal. This was because several companies already actively recruit autistic individuals who are perceived to have a unique skill set, particularly an eye for detail.

Each experiment will now be reviewed and discussed along with the implications of the findings obtained.

6.1.1 Experiment 1: Norms of subjective website appeal

As noted in Chapter 2, there is now a considerable literature examining the characteristics that are important in determining what makes a website appealing (see Chiou, Lin & Perng, 2010; Moshagen & Thielsch, 2010; Thielsch et al., 2014 for reviews). However, research examining judgements of perceived website appeal has often used a limited set of bespoke stimuli when investigating which

characteristics determine user evaluations of appeal (e.g. Hartmann, Sutcliffe & de Angeli, 2008; Thielsch & Hirschfeld, 2010; van Schaik & Ling, 2008). Furthermore, the stimuli used have often been chosen by the experimenters themselves, and have not been piloted before use under experimental conditions. The assumption made is that conclusions drawn from such a limited set of stimuli will be easily generalised across the wider domain, something which is not always the case.

One way around the problem of limited stimulus sets is to analyse the data obtained using statistics which are generally conservative and do not make assumptions about the representativeness of the stimuli. The problem regarding the lack of representativeness of limited stimulus sets has long been recognised in psycholinguistics. The 'Fixed-Effect Fallacy', as it became known, was initially identified by Clark (1973). He argued that when stimuli are controlled very carefully for experimental reasons, variation is restricted and should be accounted for when reporting statistics by combining both by-participants and by-items analysis to make an overall, conservative, *F* value known as *minF* (see also Brysbaert, 2007; Raaijmakers, 2003). As discussed in Chapter 2, it is now recognised that this issue is not just restricted to psycholinguistics (see Brysbaert, 2007; Hutchinson, Wei & Louwerse, 2014) and indeed applies to research examining key aspects of website design where the use of small or individually tailored set of website stimuli allow for experimental control, but reduce variation considerably.

While ensuring there is sufficient variability in a stimulus set for it to be representative, it is important to balance this with the need for appropriate experimental control. Ideally, researchers need to be able to measure website characteristics in order to systematically vary some characteristics while holding others constant, i.e. to ensure they are measuring the correct effect rather than confounding one website characteristic with another. One way of combatting this

issue is to obtain a range of subjective ratings of critical stimulus characteristics to create a corpus of stimuli, enabling them to be experimentally controlled. Despite being common practice in other research domains, no such large scale corpora containing normative ratings have been produced for website stimuli. Therefore, Experiment 1 sought to create a standardised corpus of 480 website landing pages that includes normative ratings of key website characteristics which could be used in future research. These websites were chosen through searching online and contained a wide range of brands, subject matter and products to ensure the corpus would be widely representative of the domain. Based on Moshagen and Thielsch's development of the Visual Aesthetics of Websites Inventory (VisAWI; Moshagen & Thielsch, 2013), subjective ratings using Likert scales were obtained for the 4 key website characteristics they identified; simplicity, diversity, colourfulness, and craftsmanship. In addition, ratings of overall website appeal as well as website familiarity, brand familiarity and informativeness were obtained.

In total, seven hundred participants took part in this study helping to achieve the primary aim of creating a normative database of website stimuli which could be used to ensure appropriate experimental control of stimuli in the experiments which followed. Analysis of this data revealed that the corpus of 480 websites was indeed diverse and with considerable variation in the participants' perceptions of each of the characteristics measured. Importantly, the corpus data also suggested that the 4 key website characteristics identified by Moshagen and Thielsch may not be as separable as the original factor analysis of their data might suggest (see Moshagen & Thielsch, 2010; 2013). Findings from Experiment 1 suggest that their assumptions may be specious. Subjective ratings of simplicity, diversity, colourfulness and craftsmanship obtained in Experiment 1 were also closely correlated with ratings of overall appeal. These 4 characteristics were *not* correlated, however, with ratings of

website informativeness, suggesting that ratings of simplicity, diversity, colourfulness and craftsmanship may simply be tapping overall website appeal rather than 4 separable dimensions. The difference in findings between Experiment 1 and Moshagen and Thielsch's earlier work may arise because ratings in Experiment 1 were obtained individually, from separate participants, for each website characteristic whilst in Moshagen and Thielsch's study, participants were asked to rate all characteristics at the same time. The latter is likely to act as an implicit cue to indicate that these characteristics should be rated differently whereas in Experiment 1 all ratings with few exceptions, (see Section 2.2.3) were independently obtained.

The findings from Experiment 1 raise the possibility that simpler measures of website appeal may be enough to reliably assess aesthetic appeal. Such an approach was taken by Lavie and Tractinsky (2004) who, on the basis of a factor analysis of their data, proposed only two key dimensions when evaluating websites appeal: classical aesthetics, relating to aesthetic appeal and structure, and expressive aesthetics, relating to creativeness and originality. Given how highly correlated all factors of the VisAWI were to judgements of overall appeal, as well as with each other, in Experiment 1 the possibility arises that a single question - How appealing do you find this website? - is a sufficient index of perceived website appeal. This should be taken into consideration in future research examining judgements of perceived website appeal.

Subsidiary analyses in Experiment 1 examined the role of individual differences in autistic traits in determining judgements of website appeal. There was a significant relationship between scores on the Autism-Spectrum Quotient (AQ; Allison et al., 2012; Baron-Cohen, 2001) and ratings of website appeal: as scores on the AQ increased, subjective ratings of appeal decreased. This indicates that

individuals with autism may process online content differently to typical individuals. The reasons for this relationship were examined in more detail in Experiment 4.

The website corpus created in Experiment 1 underpins the experiments which followed. However, it should be noted that website design is dynamic and the principles of design and user preferences change over time. As a result the websites in the current corpus will soon become be outdated. Nevertheless, the principles and methods employed *will* still be relevant and Experiment 1 demonstrates how it is possible to create a varied, yet well controlled stimulus set, along with the principles and paradigm through which this can be achieved. Furthermore, there are good examples where outdated corpora have been updated to reflect current design and practice. McDougall, Curry and de Bruijn (1999), for example, created a corpus of ratings for icons and signs and this has recently been updated in line with advances in icon design (Prada et al., 2015).

6.1.2 Experiment 2: The effects of framing and exposure time on website appeal

Experiment 2 investigated the nature of decision-making in the initial stages of processing a website. It also examined the extent to which rapid appeal evaluations were affected by positive or negative information about the brand represented on the website, i.e. did verbal information framing affect website appeal evaluations? There is now a considerable body of evidence which shows that participants can make reliable judgements of appeal very rapidly (e.g. Tractinsky et al., 2006; van Schaik and Ling, 2009; Tuch et al., 2012). Lindgaard et al.'s (2006) seminal research first demonstrated how that participants can make reliable judgements of website appeal when given just 50ms to view each website. In terms of understanding the processes which take place when making aesthetic judgements of appeal, research often turns to Leder et al.'s model of aesthetic processing (Leder

et al., 2004; 2013) which delineates an 'automatic' unconscious stage of processing and a 'deliberative', more thoughtful stage (see Figure 27). It seems likely that it is the automatic processes outlined in this model that are responsible for the formation of our first impressions of a website (Tuch et al., 2012).

The later conscious deliberative stages of Leder et al.'s model differ from the earlier stages in that they rely on higher cognitive processes. These can be influenced by individuals' expertise and knowledge, as well as the context of the situation. The assumption was made in Experiment 2 that if individuals are given longer to process a website, these higher processes may begin to shape and change users' judgements of appeal. However, it is important to note that the current research literature tends to focus either on rapid initial evaluations *or* full scale models of aesthetic judgements, with little examination of how or where the transition between automatic to conscious deliberation occurs. The extent to which later judgements change from the initial automatic evaluations, and when this change in processing may be implemented is an open question. To examine this in more detail, Experiment 2 focused on participants' initial decision-making (after 500ms), when given longer evaluation time (after 6 seconds) and later (unlimited self-paced evaluation time). A combination of performance measures, eye tracking, and users' subjective evaluations of website appeal were used to examine these effects..

In Experiment 2, participants were also presented with information about the brand represented on the website. It was hypothesised that this information may significantly contribute to judgements of website appeal. Previous research has shown that positive and negative message framing not only shapes consumer judgements and decisions with respect to purchasing products (Chen & Chang, 2016), but also impacts more general user experience and judgements of website appeal (Hartmann et al., 2008). Brand perception is an important determinant of

consumer choice (see Alvarez & Fournier, 2016; Keller & Lehmann, 2006; Schmidt, 2006, Sprott & Liu, 2016, for reviews), and the concept of framing information is important given how brand memory and attitudes are constantly being shaped by marketing information that individuals are exposed to (Herz & Brunk, 2017; van Reijmersdal, 2009). Additionally, past research demonstrates that when participants are presented with positively framed information prior to exposure this resulted in the associated attributes and overall website quality being rated more positively, with the opposite effects when negative information was given prior to exposure (Hartmann et al., 2008). In Experiment 2, a similar paradigm was used where participants were presented with brief positive or negative brand framing messages prior to viewing the websites. There was also a no framing baseline condition where participants were given no brand information prior to viewing the website. Evidence from previous research also suggested that the time participants are able to view websites may determine the extent to which they rely on prior framing information. Furthermore, it is now well established that consumer decisions are based on a combination of fast automatic processing and more effortful top-down processing (Chaiken & Trope, 1999; Kahneman & Frederick, 2002; Mukherjee, 2010; Sloman, 1996; Stanovich & West, 2000) with the parallels to Leder's model of aesthetic judgement being readily apparent (Leder et al., 2004; 2013). This was examined in Experiment 2 by varying the evaluation time given to participants.

The findings from Experiment 2 showed that participants were able to make reliable website appeal evaluations after viewing a website for just 500m providing further support for the notion that individuals are able to make rapid, reliable decisions when making judgments of website appeal (e.g. Lindgaard et al., 2006; 2011; Tractinsky et al., 2006). These judgements did not change when participants were given longer to view websites suggesting that initial rapid appeal decisions do

indeed shape later perceptions of website appeal. The eye tracking data obtained showed that appeal decisions are not dependent on systematic sampling of interest areas in websites since those given 500ms to view the websites were able to fixate on the website only 1-2 times on average. When given further time, participants visually sampled websites systematically but this had no effect on the appeal judgements that they made. Interestingly, participants in the unlimited presentation condition did not use much more time than those in the 6s presentation condition, averaging around 7s. If seen through the lens of Leder's model of aesthetic processing it may be that there is a natural switch from automatic, unconscious processing to deliberate, more thoughtful processing, but when this change occurs is still unclear. It appears that the initial, automatic stages of processing are important in determining judgements of website appeal, shaping not only initial rapid judgements, but also longer-term judgements of appeal. However, it should be noted that by 'long-term' we are still referring to a relatively short space of time. How long lasting these initial judgements of appeal stay valid across a matter of hours, weeks or even months, is something which is yet to be examined. It may also be that the task demands and/or the nature of the interaction with the website page needs to change to facilitative a qualitative change in the nature of the processing involved.

In contrast to previous research, *positive* brand information presented prior to viewing websites had a *negative* impact on appeal ratings. Conversely, those given negative brand information or no framing information were more likely to make positive judgements of website appeal with websites in the positive condition being rated as less appealing than those in both the negative and no framing condition. This may be because the framing messages presented to participants could have been too obvious, causing individuals to see them as less 'trustworthy' so having the opposite effect to that which was intended, particularly given the 'tech savvy'

student population who took part in this study. It is interesting to note that brand placement can backfire in the same manner. Van Reijmersdal (2009) found that while brand placement generally had a positive effect on brand attitudes, where a selling attempt becomes too obvious (e.g. when the brand placement is very prominent) this generally positive effect is reversed as participants cognitive defences against persuasion come into operation (Friestad and Wright, 1999; Nairn and Fine, 2008; Russell, 2002; Wright, Friestad, & Boush, 2005). It seems plausible that a similar process could have occurred in Experiment 2. Experiment 3 therefore examined the effect of more implicit visual framing – the effect of the aesthetic appeal of adverts placed on website landing pages – reflecting current website experiences.

Finally, regression analysis which examined the role of stimulus appeal, brand familiarity and informativeness ratings in determining participants' website appeal ratings begins to tell an interesting story. Unsurprisingly, the overall appeal of a stimulus was shown to be the primary determinant of participants' perceived judgements of appeal. However, brand familiarity would appear to have a pivotal role in determining website appeal. The findings presented here indicate how increased brand familiarity results in more positive ratings of website appeal. This supports the assumptions made in previous research that what is familiar is appealing (Fang et al., 2007; McDougall et al., 2016). Furthermore, as expected the informativeness of a website is not relevant when making rapid judgements of website appeal, where there is only enough time to extract the global detail (e.g. Thielsch & Hirschfeld, 2010; 2012). However, at longer presentation times informativeness begins to play a unique role in shaping users' judgements of website appeal. This may be when the deliberate stage of Leder's model has initiated, with more thoughtful, conscious processing taking place. Here aspects such as the

content or usability of a website starts to be considered (Thielsch et al., 2014). This further supports the assumption of a natural switch from automatic to deliberative processing, whilst suggesting this begins to take place around 6 seconds into viewing a stimulus. However, this is still an open question and as noted previously, further research should be considered in order to understand how these differing processing shape our long-term judgements and what factors influence this.

6.1.3 Experiment 3: The visual framing effects of websites on embedded advertising

Experiment 3 examined the influence of website appeal on the advertising appearing alongside the website, i.e. the extent to which website appeal frames online advertising. Several factors thought to influence advertising *efficacy* have been identified, many of which have also been associated with website *appeal*, not least of which being familiarity, which appears to be pivotal in shaping judgements of website appeal (Fang et al., 2007; McDougall et al., 2016) as well as the efficacy of adverts (Campbell & Keller, 2002; Sun & Wang, 2010). While there has been a considerable amount of research examining the factors influencing the efficacy of online advertising (see Goldfarb, 2014; Ha, 2008; 2012; McCoy et al., 2007, for reviews), none to date have examined how a poorly- or well-designed website may affect advertising efficacy, with little consideration of how a website and embedded advert may influence one another. It seems plausible that some form of interaction between the website and advert may be taking place.

The literature does, however, indicate that when adverts are presented as part of a website, a form of advert priming occurs caused by implicit memory which results in individuals developing a more positive attitude toward the advertised brand, regardless of the amount of attention given to the advert (Afef & Jamel-Eddine, 2012; Lee, Ahn & Park, 2015; Yoo, 2008; Shapiro, Macinnis & Heckler,

1997). Furthermore, the congruency of the advert and website (i.e. how well suited they are in terms of theme) influences appeal with adverts displayed on 'highly congruent' websites being evaluated more positively (Flores, Chen and Ross, 2014; see Brajnik & Gabrielli, 2010; Pomirleanu et al., 2013, for reviews). Research such as this suggests that websites may influence the appeal and efficacy of an advert, but none have examined the effects of either the visual appeal or brand familiarity of a website on the adverts which appear on them. Therefore, Experiment 3 examined the concept of visual framing, investigating the influence of website appeal and brand familiarity on perceptions of advert appeal and brand familiarity. This research has obvious implications for consumer marketing, especially since current advert placement algorithms do not appear to take this into account. Experiment 3 also explored the possibility of a reciprocal relationship where advertising appeal may also affect participants' perceptions of website appeal.

Several key findings emerged from Experiment 3. It provided evidence to support the notion that visual framing occurs. When adverts appeared in appealing websites they were given higher ratings of appeal than those presented in unappealing websites. It was also clear that website brand familiarity played an important role: adverts were rated as more appealing when presented on websites with more familiar brands. Furthermore, the relationship between advert appeal and advert familiarity on user judgements differed to what was expected. Current findings suggest that increasing the familiarity of an advert alone is *not* enough to increase appeal: adverts with familiar branding were *not* rated more positively than their unfamiliar counterparts, while unappealing adverts actually resulted in increased advert familiarity. This is contrary to previous research which suggests that what is more familiar is more appealing (Cambell & Keller, 2002; Fang, Sing & Aluwahlia, 2007; McDougall et al., 2016; Sun & Wang, 2010). This may be related

to our inherent ability to remember negative emotions or impression more strongly and in more detail than positive ones (Baumeister, Bratslavsky, Finkenauer & Vohs, 2001). Whether this is the case or not, a picture certainly begins to emerge that emphasises the mediating role familiarity has in shaping judgements of appeal.

The eye tracking data was pivotal in interpreting the interaction between both website and advert. Adverts that were perceived as more appealing were attended to more than unappealing adverts. However, when an advert brand was more familiar, the amount of attention given to an advert *decreased*. As advert appeal increased, this drew users' attention away from the website and conversely when websites were appealing then this detracted attention from adverts, particularly if they were unappealing. To gain optimal attention an advert therefore hand to be visually appealing but also unfamiliar. Again, these findings have important implications for website developers and marketers. Website consumer branding may be undermined if relatively appealing adverts appear consistently on the website. The consequences of these findings need to be addressed in consumer research and could form an important line of enquiry for future research.

The contrast in the findings between Experiments 2 and 3 suggests that the attempt to manipulate judgements of perceived website appeal in Experiment 2 through the use of framing messages was in fact too obvious and that more subtle framing, rather than the priming brand messages previously used in terms of consumer research. Experiment 3 also shows for the first time that visual framing using the aesthetic appeal of the stimuli is at least as, if not more effective, than perhaps overly obvious verbal messaging. This is in accord with Van Reijmarsdahl's (2009) findings noted earlier suggesting that subtle and implicit framing of decisions is more effective than explicit verbal framing which, by being obvious, catalyses consumers' distrust. Certainly, current findings suggest that

judgements of appeal are rooted very much in *visual* cues rather than *verbal* cues, which is why visual framing would be more effective in shaping these judgements.

Unfortunately, one limitation of the current study revolves around the measure of purchase intentions used. Despite the significant effects reported in this study there were no significant results in terms of the effects on purchase intentions. This makes it difficult to ascertain how the effects demonstrated with respect to the interplay between websites and adverts may apply directly to consumer behaviour. Therefore, although the research presented here furthers our understanding in terms of the relationship between websites and adverts and how designers should not just assume that aesthetics are the only important factor, we are unable to relate this to real world purchase intentions. In hindsight, this was added as a subsidiary measure and perhaps was not as thoughtfully considered as other measures used. Given this, a follow up to this experiment should aim to review the literature with respect to purchase intention in more depth, selecting a more appropriate measure such as either a simple Likert ratings scale measuring likelihood to purchase, or a more in depth measure such as the 11 point probability scale (Juster, 1966, see also, Day, Gan, Gendall & Esslemont, 1991; Wright, Sharp & Sharp, 2002).

6.1.4 Experiment 4: Individual differences, perceptual processing and website appeal

Experiment 4 examined the effects of a spatial frequency filter (high vs. low vs. no filter) on the website appeal judgements of ASD and typical participants when they were given either 250ms (rapid decision-making) or 6s (slower decision-making) to view website landing pages. Experiment 1 showed that there were correlations between ratings of website appeal and scores on the AQ, a screening measure for autism spectrum disorders. According to the theory of Weak Central Coherence, individuals with ASD have a detail-focused cognitive style, resulting in

an increased level of local processing (Happé & Booth, 2008; Happé & Frith, 2006; Frith, 2012; Bölte et al., 2007). This bias towards local processing is thought to arise from a deficit in global processing (Booth & Happé, 2018; Frith, 1989; 2003) but often results in an ability to excel in tasks that involve high levels of detail and complexity. Indeed, research provides support for this theory demonstrating that ASD individuals tend to use local processing more (e.g. Soulières et al., 2011; Chen et al., 2012; but see Van der Hallen et al., 2015, for a review).

One paradigm which has been used to examine local versus global processing has been the use of spatial frequency filters to restrict the type of information presented in experimental stimuli (e.g. Deruelle et al., 2008). Figure 21 (see Section 5.1.2) shows that when low spatial frequencies filters are applied to stimuli they become more blurred and less detailed, encouraging global processing. Conversely high spatial frequency filters enhance the detail of the original stimulus and encourage local processing (Behrmann, Thomas & Humphreys, 2006; Flevaris & Robertson, 2015; Kauffmann, Ramanoël & Peyrin, 2014). Past research identifies how individuals with ASD have a bias towards high frequency filtered stimuli, again suggesting a tendency to process local information (Deruelle et al., 2008; Kikuchi, Senju & Hasegawa, 2013). In terms of website appeal, research by Thielsch and Hirschfeld (2010; 2012) found that *only low* spatial frequencies had an impact on rapid evaluations, where there is only enough time to process the global information that is present. Therefore, Experiment 4 examined the possibility that this tendency towards local processing may affect the way individuals with ASD process visual information on websites, especially given that this bias has been attributed to a deficit in global processing. Eye tracking was also used to examine how possible differences in visual processing influenced what participants' attended to on websites.

Here the use of spatial frequency filters had little effect on perceived ratings of appeal in both participant groups. This was despite the distortions which the spatial frequency filters (see Figure 22, Section 5.2.4) caused and contrasts with Thielsch and Hirschfeld's previous findings. This could, in part, be due to differences in website presentation durations. Thielsch and Hirschfeld found that global processing predominated only when presentations were as low as 50ms. It may be that the 500ms presentation rate using in Experiment 4 meant that participants were able to use a combination of local and global processing is already in operation. Research examining the gist perception of scenes suggests that this difference in timing may be important. Research by Oliva and colleagues (Schyns & Oliva, 1994; Greene & Oliva, 2005; Oliva et al., 2004; 2005; 2006) shows that we are able to extract the overall gist of a visual scene in 67ms on average and begin to extract categorical information even at this early stage (e.g. to be able to distinguish between country and town scenes reliably). This basic perceptual information – involving global information processing - appears to be enough to arrive at consistent judgements of website appeal (Lindgaard et al., 2006) and is consistent with other findings in this thesis. Both Experiments 2 and 4 show that participants' ratings of appeal do not change even when they are given more website viewing time (i.e. 250ms/500ms vs 6s) and are able to sample the website more systematically. The findings from Experiment 4 also suggest that individuals with autism rely on global processing in a similar way to typical individuals when making rapid judgements of appeal. This is in contrast to recent findings from Booth and Happé (2018) which provide evidence of reduced global processing in ASD. Indeed, recent years have seen an increase in the debate over whether superior local processing results from a deficit in global processing, or whether this results from an inherent preference rather than deficit (see Guy et al., 2016; Van der Hallen et al., 2015, for

reviews). The theory of Enhanced Perceptual Functioning (see Mottron & Burack, 2001; Mottron et al., 2006), suggests the latter may be the case, attributing this bias to an enhancement in perceptual processing performance and *not* a deficit in global processing. The findings from the present study join an increasing literature (e.g. Stevenson et al., 2018; see Simmons & Todorova, 2018, for a review) to support the assumption that that there is no deficit in global processing in ASD.

In contrast to judgements of appeal, the eye tracking data in Experiment 4 showed that participants with ASD spent more time attending to the text on a website compared to typical individuals. This could be the 'attention to detail' which sets autistic individuals apart when processing online content. However, it is important to note that these differences in sampling are not shaping their ratings of appeal. This is consistent with the finding that rapid judgements of appeal are based on global processing and do not rely on systematic sampling of the website.

Given the limited number of participants who took part in this study some caution is needed when interpreting null findings because of the lack of statistical power and further research replicating this work with higher numbers of participants would be valuable. In addition, the Autism-Spectrum Quotient (Baron-Cohen et al., 2001) is intended as a screening tool: it provides an indication as to where individuals were placed on the autistic spectrum but is not intended to be diagnostic although it has been similarly used by other researchers (Austin, 2005; Chiang & Lin, 2007; Wakabayashi, Baron-Cohen & Wheelright, 2006). Given that all participants in Experiments 1-4 completed the AQ, with those in Experiments 2, 3 and 4 completing the full version of the questionnaire, analysis of this data may help to shed further light on the data obtained in Experiments 1 and 4. This analysis proved to be outside the scope and the timescale of this thesis but further work is planned.

6.2 Theoretical implications

Experiments 2-4 combine literature from several domains in order to examine the timescale of decision-making and what factors may be influencing the processes which are taking place. The model of aesthetic judgement presented by Leder et al. (see Figure 27) underpins many of the assumptions made when hypothesising in this thesis. As discussed previously, this model identifies an initial automatic, unconscious phase of aesthetic processing (perceptual analyses and implicit memory integration in Leder et al.'s model), which makes way for a more thoughtful, deliberate stage of conscious processing. One of the intentions of the current research was to identify when the 'switch' between automatic, unconscious processing to conscious thoughtful processing occurs and the impact this has on evaluations of website appeal. However, the findings that emerged from these experiments was that initial rapid evaluations, and the factors that influence them, are primarily the result of the initial automatic perceptual processing (i.e. aspects of appeal) and implicit memory integration (i.e. familiarity with the website and brand familiarity).

An awareness that automatic processing underpins evaluation judgements is important in interpreting the research findings, particularly from Experiments 2 and 3. In Experiment 2, participants reacted negatively to positive framing messages. This may in part be because the verbal messages lacked the subtlety currently expected when dealing with websites and branding, especially when nudge architectures increasingly operate at an unconscious level (Thaler & Sunstein, 2008; Johnson et al., 2012). In contrast, when framing in Experiment 3 relied on the appeal of the website and the advertising appearing on it, it was clear that visual appeal positively affected participants' evaluations of both websites and advertising and that the interplay between these two factors needs further investigation

particularly given the role they may have in influencing, or nudging, consumer choices. Visual appeal may influence users' evaluations because early automatic processing depends to a large extent on perceptual analyses (see Figure 1; Kahneman & Egan, 2011; Petty & Cacioppo, 1984; Wegener, Petty, Blankenship & Detweiler-Bedell, 2010).

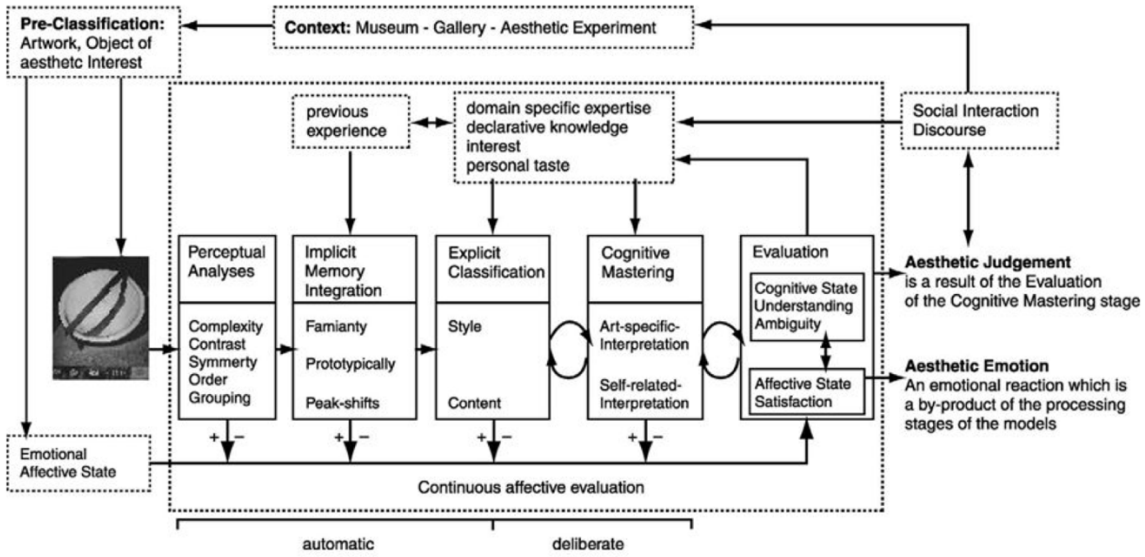


Figure 27: Model of aesthetic judgement (Leder et al., 2004).

Leder et al.'s theoretical model was originally intended to explain how judgements of aesthetic appeal are made with respect to artwork. Therefore, the later processes outlined in the deliberative stages do not relate to the judgements and decision-making processes involved with respect to websites. An adapted model is therefore proposed (see Figure 28). In this new model deliberate processing stages address the way in which website content, informativeness and usability may have a much greater impact on shaping users' judgements of appeal and their likelihood to continue using a website. Indeed, the content of a website is the main reason an individual will visit a website and has been named as one of the most important factors in determining a websites success (Palmer 2002). As outlined in a review by

Thielsch et al. (2014), like aesthetic appeal, evaluations of content are often thought of as a subjective perception but refer to how informative, interesting or useful and individual finds a website. Certainly, previous research has demonstrated the importance of website content in determining other aspects such as trust, task performance and website success. (e.g., D'Ambra & Rice, 2001; Kang & Kim, 2006; Liu & Arnett, 2000; see Thielsch et al., 2014 for a discussion).

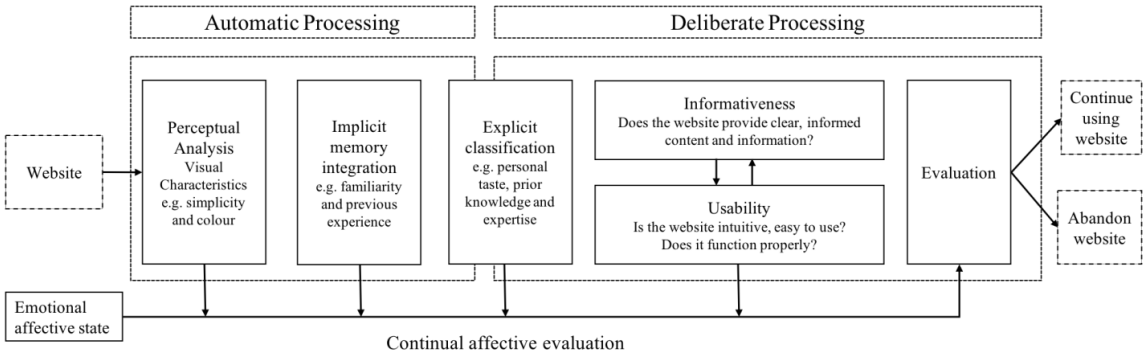


Figure 28: Processing model of website evaluations.

The usability of a website is an important determinant of appeal when individuals have longer periods to use a website. However, the interaction between appeal and usability is something that has received little attention (but see Sauer & Sonderegger, 2011; Sonderegger & Sauer, 2010; Sonderegger, Sauer & Eichenberger 2014). Even Sonderegger et al.'s work focusses primarily on the early perceptual stages of processing and not the later stages where it might be argued that long term attitudes towards a website, including likelihood to return, are formed. However, the literature is beginning to recognise the pivotal role that website content and usability have in shaping our long-term judgements towards websites and how these factors require more thoughtful, deliberate processing in order to make any meaningful judgements (Thielsch, Engel & Hirschfeld, 2015; Thielsch & Hirschfeld, 2018).

6.3 Aims, conclusions and future directions

The programme of research presented in this thesis drew together several different strands of research to examine how judgements of website appeal are determined. An initial aim was to address methodological issues regarding the use of limited stimulus sets when conducting website experiments, as well as the lack of stimulus experimental control that is often found in the literature. Experiment 1 created a corpus of 480 websites containing normative data across a range of measures of appeal, familiarity and informativeness. This provides a reliable and invaluable tool for researchers to select website stimuli with confidence, enabling the creation of varied stimulus sets which can still be experimentally controlled. Given the rapid developments in website design, the website ratings obtained in this corpus may not be appropriate for future research. Nevertheless, future research should consider the methodological implications of characterising the nature of the website in order to control and vary stimuli appropriately. This could be done by obtaining new ratings entirely or updating the corpus. For example, the corpus of symbol and icon characteristics presented by McDougall, Curry & Bruijn, (1999) has more recently been updated by Prada, Rodrigues, Silva & Garrido (2015), taking into account changes and developments in this field of research. Although somewhat tedious, this is good practice and should be maintained to uphold the aims of such corpora.

Experiments 2 and 3 examined the timescale of decision-making and processes involved when evaluating website appeal, whilst exploring how these judgements are influenced by different forms of framing. Past research has focused on either ultra-rapid evaluation of appeal (e.g. Lindgaard et al., 2006) *or* longer term models of aesthetic processing (e.g. Leder et al., 2004), with little consideration in terms of the individuals stages of such a model. Experiments 2 and 3 begin to

address this, moving away from ultra-rapid evaluations of appeal, focusing attentions towards slightly longer processing time. The findings reported here support the idea that the global features of a website predict appeal ratings and that these judgements are made very quickly and do not change over the next few seconds (such as in the 6s and unlimited, self-paced conditions in Experiment 2). Given that most users' spend no longer than a few seconds on website landing pages, either moving to the page they desire or to an entirely different website, this provides important information about website users perceptions. In order to examine appeal judgements formed over longer periods of time, the approach shown in Figure 2 would suggest that users' perceptions of informativeness and usability, along with indications of their personal taste, prior use of a website and computer expertise (see Explicit Classification in Figure 2) should be examined as they interact with complete websites rather than landing pages alone. In addition, it may be useful to examine the extent to which users continue on a website or abandon as well as their likelihood to purchase products advertised on the site.

When examining the role of framing, findings clearly demonstrate how the use of framed branding information messages given to individuals prior to viewing a website is not a reliable method when trying to influence judgements of website appeal. Experiment 3 introduced the more subtle concept of 'advert framing', and demonstrated that the characteristics of a website (appeal and brand familiarity) affects evaluations of embedded advertising. It was also apparent that the appeal of the advertising, in turn, affected appeal evaluations of the website on which they appeared. Indeed the eye tracking data obtained indicated how the appeal and familiarity of both the website *and* advert influenced where users' attend. Current findings suggest that the combination of appealing but unfamiliar adverts may be a key combination in increasing the amount of attention given to an advert.

Replicating this experiment, whilst collecting independent measures of both website *and* advert appeal, would enable more detailed analysis of this relationship.

The final aim of this thesis was to examine the role of individual differences in making judgements of website appeal. Participants with ASD were compared to matched controls to examine whether or not they differed in the way that the processed web content and make evaluations of appeal. Experiment 4 showed that autistic individuals differ in the way they sample web pages (i.e. tending to examine areas of more detail such as the text) but they *do not* differ in the judgements of appeal they make since this does not rely on visual sampling of the web page. Both individuals with ASD and matched controls processed websites in a similar way using the global features of a website to make reliable, rapid judgements of website appeal. The literature on individual differences and how these impact users' decision-making with respect to evaluating, and using, a website is still limited, despite the importance of the internet in modern society. Here we have begun to examine the impact of autism on website appeal evaluations and this adds to the growing literature recognising the importance of individuals differences in terms of the way users' judge and interact with websites with research focusing on aspects such as personality types (Oyibo, Orji & Vassileva, 2017), gender and age (Oyibo, Adaji & Vassileva, 2018; Oyibo & Vassileva, 2017), and depression (Thielsch & Thielsch, 2018). This only scratches the surface and given how we as a society are becoming increasingly more reliant on the internet, future research needs to address the role of individuals differences ensuring websites and the resources they provide can be accessed by all.

Not only are the findings presented here at the forefront of academic interest, they also provide far reaching practical contributions to industry in the fields of human-computer interaction, cyberpsychology and indeed, consumer psychology.

Key to the current work has been to further our understanding of how we process websites and make judgements of appeal, whilst also examining what factors may be influencing these decisions. These findings will help to inform further research and guidelines in website design and usability for both a typical population and for individuals with ASD, whilst demonstrating the need to account of individual differences when considering what makes a website successful, something that has largely been overlooked to date.

The current research has also shown how the general population are becoming increasingly more suspicious of online manipulations, where methods used in the past (such as message framing) now appear to be ineffective. Instead, the complex relationship between websites and embedded advertisements comes into action, demonstrating the importance of not overlooking how these two interact when shaping consumers judgements and decision-making. The way we use and interact with the internet is changing and research such as that presented in this thesis is of vital importance for web designers, advertisers and companies who represent their brand online, should they wish to stay at the forefront in consumer marketing.

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APPENDICIES

8.1 Appendix A: The Visual Aesthetics of websites inventory (VisAWI; Moshagen & Thielsch, 2013)

Participants are asked to indicate their level of agreement to each item on a seven-point Likert scale (ranging from 1 ‘strongly disagree’ to 7 ‘strongly agree’. Items indicated with an *(r)* are reverse-scored.

Factor	Item	Question
Simplicity	1	The layout appears too dense *(r)*.
	5	The layout is easy to grasp.
	9	Everything goes together on this sight.
	13	The site appears patchy *(r)*.
	17	The layout appears well structured.
Diversity	2	The layout is presently varied.
	6	The layout is inventive.
	10	The design appears uninspired *(r)*.
	14	The layout appears dynamic.
	18	The design is uninteresting *(r)*.
Colourfulness	3	The colour composition is attractive.
	7	The colours do not match *(r)*.
	11	The choice of colours is botched *(r)*.
	15	The colours are appealing.
Craftsmanship	4	The layout appears professionally designed.
	8	The layout is not up-to-date *(r)*.
	12	The site is designed with care.
	16	The design of the site lacks a concept *(r)*.

Short version of the VisAWI (Moshagen & Thielsch, 2013):

Q1. Simplicity: ‘Everything goes together on this site’.

Q2. Diversity: ‘The layout is pleasantly varied’.

Q3. Colourfulness: ‘The colour composition is attractive’.

Q4. Craftsmanship: ‘The layout appears professionally designed’.

Comparable to the full VisAWI, participants were indicated their agreement on a seven-point Likert scale (ranging from 1 ‘strongly disagree’ to 7 ‘strongly agree’) for each of the 4 items.

8.2 Appendix B: Short version of the Autism Spectrum Quotient (AQ; Allison, Auyeung & Baron-Cohen, 2012)

A selection of website landing pages from the corpus of 480 websites created in Experiment 1 (See Chapter 2). Appendix C: Short version of the Autism Spectrum Quotient (AQ; Allison, Auyeung & Baron-Cohen, 2012)

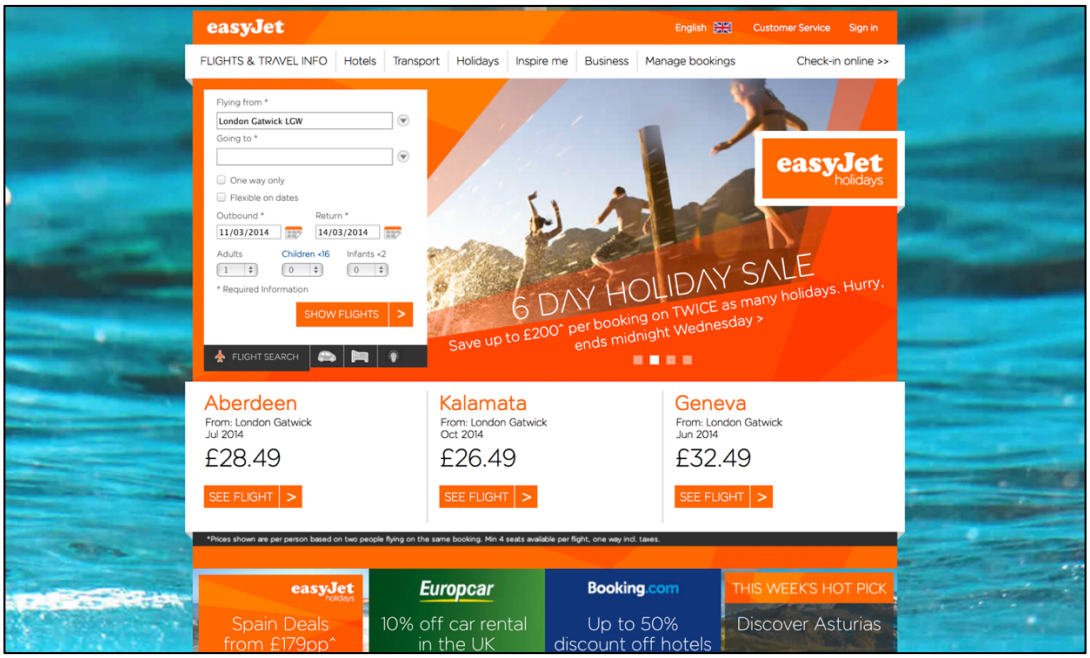
This is a brief evaluative tool only and does not indicate diagnosis. Participants are asked to tick one response for each item on the scale. Only a maximum of 1 point can be scored on each item.

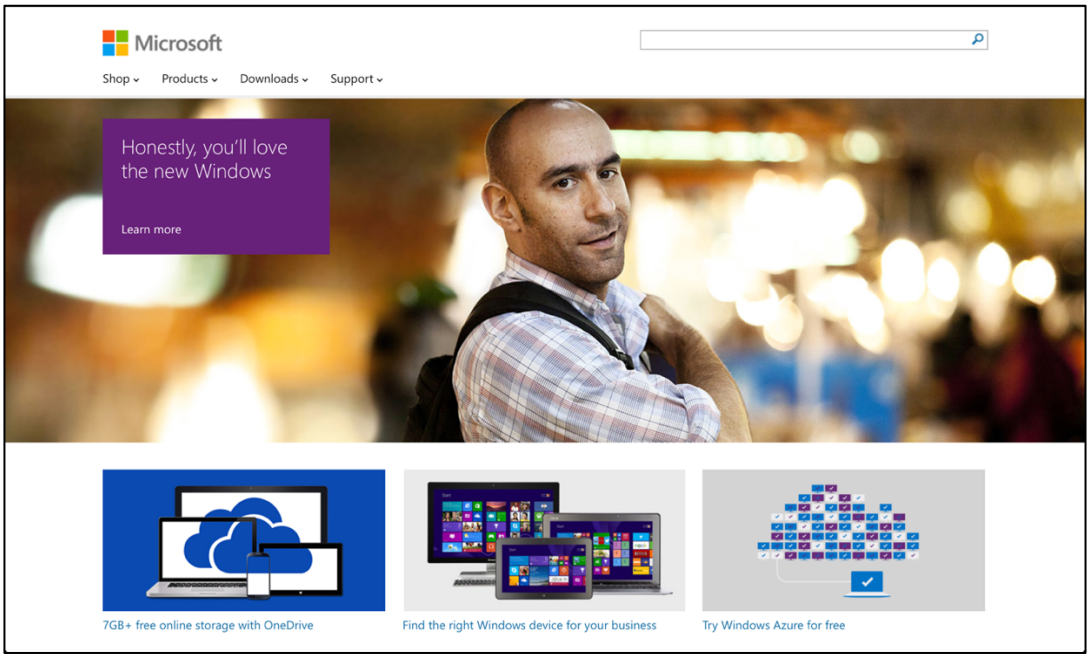
		Definitely Agree	Slightly Agree	Slightly Disagree	Definitely Disagree
1	I often notice small sounds when others do not				
2	I usually concentrate more on the whole picture, rather than the small details				
3	I find it easy to do more than one thing at once				
4	If there is an interruption, I can switch back to what I was doing very quickly				
5	I find it easy to 'read between the lines' when someone is talking to me				
6	I know how to tell if someone listening to me is getting bored				
7	When I'm reading a story I find it difficult to work out the characters' intentions				
8	I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant etc)				
9	I find it easy to work out what someone is thinking or feeling just by looking at their face				
10	I find it difficult to work out people's intentions				

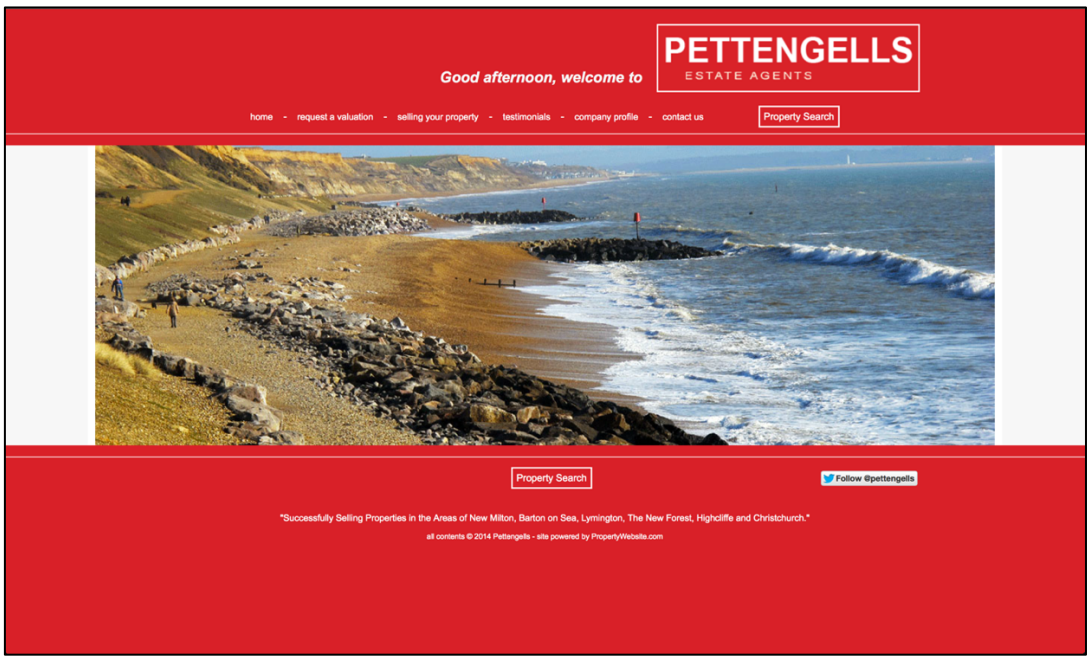
Scoring: Score 1 point for Definitely or Slightly Agree on each of items 1, 7, 8, and 10. Score 1 point for Definitely or Slightly Disagree on each of items 2, 3, 4, 5, 6, and 9. Individuals who score more than 6 out of 10 are considered to have a significant amount of traits associated with autism.

8.3 Appendix C: Website corpus example stimuli from Experiment 1

A selection of website landing pages from the corpus of 480 websites created in Experiment 1 (See Chapter 2).



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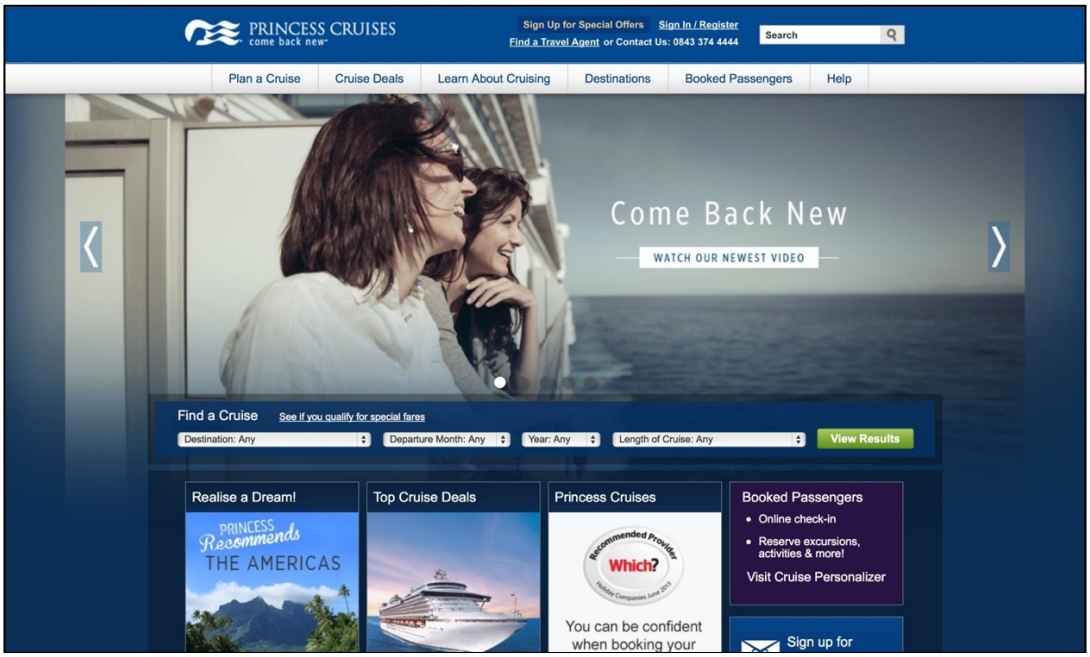
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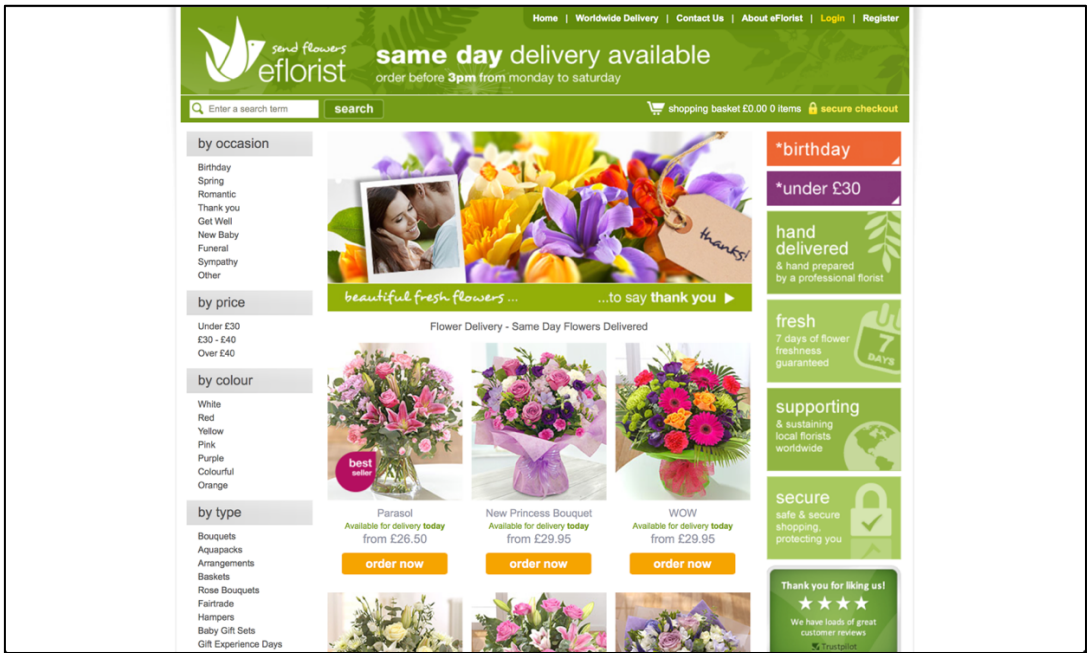
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Sympathy
Other
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£30 - £40
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by colour
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Red
Yellow
Pink
Purple
Colourful
Orange
by type
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Aquapacks
Arrangements
Baskets
Rose Bouquets
Fairtrade
Hampers
Baby Gift Sets
Gift Experience Days
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8.4 Appendix D: Normative Website Corpus Data from Experiment 1

Key	
VisAWI: Simplicity Colourfulness (Colour) Diversity Craftmanship (Crafts)	1-7 Likert scale – Moshagen and Thielsch (2013)
Overall Appeal of Website (Appeal)	1-7 Likert scale 1 = Not appealing at all and 7 = Very appealing.
Informativeness (Inform)	1-7 Likert scale 1 = Not informative at all and 7 = Very informative
Familiarity of Brand (Fam Brand)	1-7 Likert scale 1 = Not seen brand before and 7 = Very familiar with brand.
Familiarity of Website (Fam Website) - i.e. have visited website before	Yes or No 1 = Yes and 2 = No

File	Website Name	Simplicity	Diversity	Colour	Crafts	Appeal	Inform	Fam Brand	Fam Website
1	The Book People	4.57	4.52	3.67	4.10	3.90	4.10	2.45	1.88
2	Waterstones	4.29	4.38	4.10	5.05	4.29	4.05	5.66	1.47
3	P&O Cruises	5.24	5.10	5.19	5.48	4.95	3.87	4.17	1.86
4	Virgin Media	5.43	4.86	5.19	5.52	5.10	3.96	6.15	1.43
5	Facebook	5.62	4.71	4.38	5.62	5.43	2.55	6.77	1.02
6	Stewarts	4.67	3.45	3.62	3.24	2.86	3.17	1.64	1.98
7	Haskins	4.24	4.62	4.62	4.76	4.00	3.76	2.15	1.97
8	Golden Acres	3.71	3.76	3.76	3.67	3.57	3.24	1.43	1.99
9	Asda	5.95	4.24	3.95	5.57	4.45	5.24	6.84	1.18
10	Tesco	5.38	5.05	4.48	4.95	4.24	4.30	6.79	1.10
11	Nikon	5.52	5.48	4.90	5.95	5.00	2.95	5.99	1.77
12	KnitWorld	3.05	2.52	2.38	2.62	1.86	3.19	1.10	1.99
13	Sony	5.33	5.57	5.52	5.95	4.43	3.05	6.17	1.79
14	LG	5.00	4.27	3.67	5.33	4.57	3.52	5.78	1.76
15	Waitrose	5.67	4.67	4.90	5.67	4.57	4.05	6.31	1.36
16	Animal	4.48	5.19	4.95	5.29	4.67	2.35	4.79	1.76
17	Animal Planet	4.81	4.43	4.14	4.81	3.70	3.76	3.41	1.89
18	Yahoo UK	4.71	3.48	4.14	4.33	4.25	4.95	6.34	1.10
19	Ask Jeeves	4.14	3.57	3.57	4.05	3.90	3.57	4.95	1.30
20	MSN UK	4.24	4.76	3.38	4.62	3.38	3.70	6.18	1.09
21	Thomson	5.90	5.62	5.19	5.19	5.65	5.00	6.20	1.26
22	Virgin Atlantic	5.52	5.48	5.33	5.71	5.05	4.52	5.35	1.73
23	Pro-Style	2.90	2.57	2.33	3.05	2.29	3.87	1.08	2.00
24	Campaign for real ale	2.52	1.57	1.86	1.90	1.33	4.25	1.75	1.98

25	Warlington Council	3.52	1.64	1.95	2.10	2.05	4.78	1.17	1.99
26	John Lewis	5.67	5.19	5.48	6.14	5.14	3.57	6.20	1.24
27	Homebase	5.81	4.57	5.14	5.48	4.52	3.70	6.10	1.42
28	B&Q	5.62	5.05	3.57	5.81	4.19	4.13	6.20	1.43
29	Sky	5.86	5.33	4.05	5.43	4.00	2.70	6.49	1.39
30	BT	5.14	5.29	4.52	5.29	4.10	3.10	6.27	1.56
31	EE	5.62	5.10	5.71	5.71	4.38	4.33	6.10	1.42
32	Vouchercodes	4.86	4.33	4.00	4.19	3.57	3.10	3.21	1.66
33	IndyMedia UK	2.05	1.52	1.81	2.10	1.67	3.74	1.13	1.99
34	O2	6.14	5.05	5.19	5.71	5.38	3.70	6.32	1.24
35	Fred Olsen	4.33	3.81	3.71	4.10	3.62	4.00	1.42	1.98
36	Jamilin	2.19	1.95	1.48	1.62	1.33	2.87	1.06	2.00
37	Princess Cruises	4.57	4.71	4.81	5.24	4.14	3.35	2.30	1.93
38	Cunard	4.90	4.29	4.90	5.57	4.15	3.19	1.56	1.99
39	MSC Cruises	5.00	4.81	5.67	5.38	5.24	3.95	1.61	1.99
40	Barclays	6.00	4.41	4.10	5.67	3.95	4.57	6.11	1.65
41	HSBC	5.81	4.91	3.90	6.24	4.43	5.26	6.02	1.60
42	Penny Juice	2.95	1.62	2.24	1.81	2.29	2.15	1.10	2.00
43	Valley Isles Aquatics	1.95	1.95	1.57	2.10	1.57	1.38	1.06	2.00
44	RBS	4.90	3.76	4.24	4.52	3.43	4.14	4.42	1.92
45	Lloyds Bank	5.19	5.00	4.52	5.24	3.86	3.80	5.82	1.73
46	Carphone Warehouse	5.76	4.71	4.43	5.33	4.70	4.33	6.38	1.18
47	Thomas Cook	5.71	5.05	4.62	5.67	5.48	4.13	5.99	1.29
48	Iglu Cruise	3.71	2.76	3.52	3.33	2.90	5.48	1.25	1.98
49	Oceania Cruises	3.57	3.10	3.43	3.29	3.86	3.17	1.87	1.99
50	Tilbury Football Club	3.48	3.14	2.67	3.52	2.67	2.70	1.36	1.99
51	NHS	5.00	4.81	4.43	5.52	4.48	4.22	5.80	1.23
52	Wiltshire Farm Foods	4.95	3.76	3.71	4.33	3.67	3.60	2.72	1.98
53	Mayflower	4.14	3.81	3.10	3.57	2.95	3.19	2.54	1.85
54	BIC	4.48	3.90	4.14	4.48	4.67	3.50	4.95	1.58
55	Tivoli	4.29	3.86	3.05	3.33	3.05	3.30	1.46	1.99
56	Wimborne Market	3.52	2.95	2.38	2.81	2.71	3.90	1.59	1.98
57	Amazon UK	5.24	4.86	4.43	5.48	4.95	3.70	6.76	1.01
58	TomTom	5.14	4.05	4.43	5.29	4.52	3.30	5.11	1.87
59	Ebay	5.62	5.33	4.95	5.71	5.00	3.95	6.57	1.04
60	EasyJet	5.57	4.62	4.48	5.24	4.85	4.90	6.24	1.24
61	Argos	5.57	4.59	3.86	5.33	4.33	3.52	6.43	1.06
62	Applause Store	4.48	4.48	4.33	5.14	4.71	3.14	1.71	1.92
63	Sainsburys	5.76	4.67	4.33	5.33	4.70	4.86	6.67	1.29
64	Debenhams	5.14	4.62	4.38	5.62	4.48	3.35	5.94	1.31
65	WorldStores	5.00	4.52	3.86	4.19	3.05	4.00	1.30	2.00
66	Fayre & Square	6.05	4.59	4.95	5.52	4.95	4.39	2.27	1.94

67	Tiger	3.95	3.90	3.48	4.71	3.38	3.70	1.38	1.98
68	Confused.com	5.33	4.24	4.00	4.76	4.15	4.57	5.45	1.63
69	Comparethemarket	5.52	4.59	4.57	5.38	5.29	4.74	6.15	1.46
70	Pottermore	5.29	4.57	3.76	4.90	4.43	3.09	3.69	1.71
71	Autotrader	5.05	4.38	4.38	4.95	4.43	3.87	4.70	1.43
72	Avon	5.71	5.10	5.57	5.24	4.45	3.90	5.97	1.52
73	Audiable.co.uk	4.43	3.29	3.90	4.43	3.95	3.45	2.70	1.90
74	Microsoft	5.57	5.38	4.48	5.81	4.38	3.05	6.74	1.29
75	AO.COM	5.38	4.14	3.86	3.62	2.81	3.40	2.16	1.96
76	AllOutdoor	3.38	2.95	3.00	3.67	2.67	3.52	1.43	1.99
77	AA	5.33	4.67	4.62	5.48	3.90	3.75	5.94	1.56
78	Greenflag	4.67	4.10	4.10	4.29	3.10	3.81	3.67	1.94
79	RAC	5.33	4.38	4.24	5.10	4.24	4.17	4.96	1.79
80	American Express	4.90	4.09	3.10	5.33	3.95	3.17	5.09	1.97
81	British Gas	5.57	4.68	3.71	5.14	3.90	4.43	5.95	1.82
82	npower	4.90	4.00	4.67	5.29	3.52	3.22	3.44	1.89
83	Orchard	3.05	3.48	2.81	3.33	2.52	3.10	1.18	1.98
84	Broom Mill Farm	4.38	3.71	2.29	3.14	2.24	3.30	1.08	1.99
85	Wessex Water	4.10	4.10	3.43	4.48	3.24	3.80	2.88	1.95
86	British Airways	5.57	4.19	4.14	5.10	4.33	3.85	6.02	1.42
87	National Rail	5.86	4.90	4.62	5.57	4.33	3.70	6.29	1.10
88	thetrainline.com	4.90	4.33	4.10	5.00	4.24	4.45	5.62	1.12
89	NetworkRail	5.14	4.90	4.10	5.29	3.85	4.90	5.04	1.44
90	ScottishPower	4.86	4.38	4.10	4.95	3.19	3.95	2.79	1.90
91	ScotRail	4.10	3.29	3.81	4.81	3.52	3.26	1.44	1.99
92	britishrail	2.52	2.05	2.19	3.19	2.43	4.10	3.37	1.82
93	allbeauty	5.10	4.67	4.10	4.52	3.95	4.43	1.90	1.91
94	eflorist	5.10	4.33	4.95	4.95	4.43	4.26	1.83	1.90
95	ELC	5.29	4.90	4.38	5.10	4.10	3.61	5.02	1.75
96	Dulux	4.81	5.00	4.10	4.05	3.43	3.75	4.80	1.91
97	Toby	5.76	5.33	5.05	5.14	5.10	5.10	5.04	1.67
98	Sky Sports	5.67	4.33	4.33	5.81	4.10	4.05	6.26	1.55
99	PlanetF1	3.71	4.05	3.62	4.00	2.67	3.35	1.83	1.95
100	Poole Speedway	3.14	2.48	2.57	2.81	2.14	3.40	1.93	1.98
101	Gatwick Airport	5.00	5.00	5.05	6.24	5.10	2.60	5.62	1.61
102	Bristol Airport	4.67	4.00	4.14	4.71	3.90	3.96	3.38	1.89
103	Sizzling Pubs	4.43	3.90	4.38	4.67	3.86	3.75	1.59	1.95
104	Dyson	5.48	4.81	5.00	5.90	4.81	2.60	5.66	1.86
105	First Aid Warehouse	3.76	3.10	2.05	3.76	2.05	4.14	1.44	1.99
106	Game	5.38	4.86	3.71	5.33	4.33	3.15	5.74	1.45
107	ghd	5.76	5.10	4.33	5.33	5.05	3.71	5.39	1.62
108	giffgaff	4.76	4.38	4.43	4.57	4.00	3.67	4.90	1.73
109	halfords	5.57	4.43	5.05	5.33	4.48	3.83	5.88	1.46

110	Hallmark	5.67	4.82	4.19	5.33	4.38	3.30	5.48	1.75
111	Harveys	4.76	4.00	3.52	4.57	3.55	4.29	4.43	1.85
112	Hamleys	4.76	4.43	4.57	4.81	4.67	3.15	4.06	1.85
113	hungryhorse	5.52	4.67	4.76	5.29	5.10	4.38	4.74	1.52
114	isme	4.48	3.62	3.76	4.52	3.35	3.86	3.13	1.92
115	jigsaw	2.33	1.71	1.86	2.00	1.62	3.78	1.12	2.00
116	Kaleidoscope	4.71	4.81	4.29	4.62	4.43	3.55	2.09	1.92
117	Keep Me Inspired	4.67	5.00	4.38	4.67	3.90	3.10	1.22	1.99
118	millets	4.81	4.24	3.95	4.86	3.71	3.50	4.03	1.81
119	The Health Lottery	5.24	4.23	3.71	4.38	3.48	3.22	4.98	1.86
120	Gumtree	4.05	3.14	3.33	3.86	3.62	3.50	5.55	1.30
121	kids growth	2.81	1.52	2.05	1.95	1.48	4.35	1.09	2.00
122	ups	3.81	3.19	3.38	4.43	3.05	3.85	4.20	1.83
123	Northumber. council	3.24	3.33	2.57	2.86	2.05	3.81	1.38	2.00
124	PH Hotels	5.57	5.05	4.90	5.71	5.00	2.95	1.90	1.93
125	Henniepin Library	2.52	2.29	1.90	2.62	1.57	2.67	1.18	1.98
126	Trago	3.43	3.10	3.43	3.95	2.86	3.74	1.81	1.96
127	Marwell Wildlife	4.67	4.09	3.29	4.00	3.48	3.96	2.89	1.88
128	Longleat	4.29	5.00	4.76	4.48	4.86	5.24	4.50	1.72
129	CentreParcs	5.24	4.76	4.14	5.00	4.48	3.80	5.49	1.68
130	musicroom	4.00	3.76	3.43	4.00	2.80	3.48	1.81	1.91
131	nationalexpress	5.48	5.27	4.14	5.48	4.29	4.91	6.11	1.16
132	P&O Ferries	4.81	3.71	3.62	4.48	3.00	4.15	3.90	1.82
133	onlinegolf	4.24	3.62	2.76	3.67	2.62	3.80	1.28	2.00
134	pets at home	5.95	5.09	4.71	5.76	4.95	4.65	6.19	1.55
135	Vets4Pets	4.67	4.81	4.76	5.00	4.00	4.67	2.97	1.90
136	Scholastic	4.48	4.38	3.38	3.57	2.71	3.30	2.56	1.91
137	Sealife	5.38	5.05	5.76	5.81	5.30	4.43	5.05	1.53
138	WHO	4.48	3.71	3.38	3.76	3.76	4.10	4.04	1.73
139	Spafinder	4.00	3.90	3.86	3.67	3.52	3.35	1.64	1.93
140	heart	4.86	4.50	4.14	4.86	4.38	3.52	5.95	1.53
141	capitalfm	5.33	4.27	3.29	3.95	3.76	3.74	5.70	1.43
142	book depository	4.00	3.52	2.43	3.33	1.90	3.55	1.46	1.95
143	Chocolate tasting club	5.43	3.77	3.81	4.05	4.33	3.91	1.66	1.95
144	ticketmaster	4.76	4.32	3.52	4.48	4.62	3.87	5.44	1.31
145	theatrepeople	4.90	4.57	3.90	4.90	4.00	4.57	2.06	1.98
146	Yelp	3.62	2.81	2.90	3.29	2.50	3.33	2.58	1.90
147	Twinings	4.81	4.00	4.76	4.90	4.29	3.75	5.68	1.85
148	Virgin Experience Days	5.33	4.67	4.81	5.19	4.90	4.38	4.97	1.65
149	Vistaprint	4.95	4.52	3.81	4.81	3.43	3.40	4.69	1.64
150	WeightWatchers	5.00	4.62	4.86	5.10	4.52	3.65	6.04	1.83
151	Slimming World	4.76	4.48	4.71	5.00	4.00	3.70	4.41	1.88

152	LA Fitness	5.33	4.81	4.29	5.24	4.76	4.20	3.57	1.88
153	wowcher	5.00	4.52	5.00	4.19	4.05	3.95	5.06	1.61
154	Groupon	4.43	3.62	4.19	4.76	3.90	4.30	4.35	1.51
155	32Red Bingo	3.48	3.24	2.48	3.62	2.86	2.96	1.73	1.99
156	7DayShop.com	2.38	2.10	2.19	2.62	1.86	3.91	1.15	1.96
157	advanced mp3 players	3.38	3.38	2.48	2.95	2.19	3.30	1.18	2.00
158	Planet Minecraft	4.00	3.43	3.29	3.48	2.20	2.81	2.57	1.95
159	ambrose Wilson	4.33	4.76	4.05	4.38	3.38	2.80	1.32	2.00
160	Peoples republic of China	2.76	2.48	1.90	3.05	2.24	3.83	1.60	1.98
161	home.co.uk	4.05	3.62	2.62	3.00	2.24	2.70	1.36	2.00
162	Scott Baines	3.76	2.95	2.90	2.90	2.81	1.85	1.11	2.00
163	Pettengells	4.14	2.73	3.05	3.71	4.10	2.26	1.26	1.98
164	Slades	4.05	3.38	3.33	4.05	2.86	3.17	1.71	1.99
165	Denisons	3.95	3.67	3.19	3.95	3.14	4.14	1.25	1.96
166	Richard Godsell	3.67	2.95	2.76	3.76	2.29	4.15	1.23	1.98
167	PalmerSnell	4.05	3.43	3.52	4.14	3.00	3.17	2.01	1.94
168	Frost & co	4.24	3.90	3.67	4.38	3.48	4.13	1.63	1.95
169	Clifftons	3.86	3.00	2.71	3.67	2.33	4.19	3.21	1.73
170	goadsby	3.71	2.81	3.14	3.24	2.71	2.30	3.57	1.77
171	house & son	3.67	4.00	3.62	3.29	2.62	4.85	2.00	1.88
172	Blackstone	5.24	3.95	4.19	4.14	4.10	3.87	1.61	1.97
173	Julian May Opticians	3.38	2.43	3.24	2.24	2.20	2.29	1.22	1.98
174	Still & Bedford Opt.	3.95	3.48	4.05	4.00	3.24	4.17	1.20	2.00
175	Classic Eyes	4.05	3.29	3.86	4.14	3.19	3.87	1.15	2.00
176	Boots	5.95	5.27	4.43	5.48	4.86	4.09	6.72	1.14
177	GoSmile	4.90	3.76	4.29	5.00	4.19	3.35	1.24	1.99
178	Specsavers	6.19	5.18	4.19	5.71	4.81	3.70	6.27	1.53
179	Geophysical Institute	4.10	3.86	4.10	4.29	3.76	4.00	1.21	1.99
180	MetOffice	4.05	4.71	3.90	4.57	4.00	5.19	4.79	1.50
181	F1 Racing	3.48	3.24	3.19	3.76	2.48	3.33	2.89	1.96
182	Cruise International	3.67	3.62	3.71	3.76	3.95	3.83	1.42	1.99
183	Nat. History Museum	4.81	4.29	3.48	5.05	2.95	4.55	5.60	1.84
184	HistoryExtra.com	3.52	3.67	3.81	3.86	3.19	4.17	1.60	1.98
185	marie claire	4.81	4.57	4.86	4.48	4.24	2.96	3.85	1.87
186	Empire	3.29	3.76	3.52	4.19	3.48	3.19	3.18	1.81
187	Britain	4.14	3.91	2.43	4.24	3.52	3.09	1.90	1.96
188	Little Darlings	4.67	4.57	4.90	4.10	4.14	3.40	1.29	1.99
189	Yachts & Yachting	4.33	4.05	3.62	3.67	2.81	3.45	1.18	1.99
190	Sailing Today	3.71	3.86	3.76	4.05	2.76	3.14	1.19	2.00
191	Racecar Engineering	3.86	3.48	3.38	3.29	2.95	2.90	1.26	2.00
192	Indep. School Parent	4.14	3.55	2.71	4.14	3.33	3.09	1.25	2.00

193	Artists & Illustrators	4.00	3.71	3.71	4.05	2.65	3.10	1.19	2.00
194	Amature Gardening	3.24	2.81	3.05	3.10	2.45	3.81	1.24	2.00
195	Ice Watch	5.14	4.29	5.14	5.38	4.80	3.05	3.65	1.83
196	Liftability	4.14	3.57	3.52	4.67	3.50	4.38	1.60	1.99
197	activinstinct	4.76	4.38	4.52	4.71	3.76	4.05	1.32	1.95
198	aftershock	3.05	2.09	2.00	2.62	2.00	3.83	1.16	2.00
199	Cit. Advice Buereu	3.95	3.52	2.48	4.33	3.10	4.24	2.31	1.95
200	Activity Superstore	3.76	3.77	3.10	3.43	3.19	3.57	1.43	1.96
201	Dominos	6.10	4.68	4.48	5.57	5.24	3.22	6.53	1.09
202	Pizza Hut	3.62	2.67	3.38	3.76	2.90	3.91	1.10	2.00
203	Thorpe Park	5.43	5.33	5.14	5.62	5.57	4.20	6.09	1.36
204	Go Ape	5.52	4.86	4.43	4.76	4.90	4.52	4.70	1.64
205	Moors Valley	5.38	4.57	5.10	4.52	3.90	4.15	3.13	1.86
206	Cadbury	5.76	5.43	4.90	4.52	5.86	2.75	6.60	1.65
207	Legoland	5.67	4.95	4.86	5.05	4.52	4.17	5.90	1.79
208	Dorset Life	4.43	3.52	3.95	4.24	3.19	3.96	1.64	1.98
209	filoFAX	5.38	4.62	5.33	5.57	4.90	2.70	2.61	1.96
210	Garden Bird Supplies	5.14	4.57	4.57	4.76	4.00	3.90	1.15	1.99
211	quarter sweet ever	3.48	3.90	3.48	3.52	3.20	3.71	1.26	1.97
212	Hyamsnowra Florist	4.67	4.33	4.43	3.86	4.00	3.48	1.02	1.99
213	Appliance Deals	4.71	4.05	3.14	4.62	3.38	3.78	1.29	1.99
214	attractiontix	4.05	3.90	3.62	3.71	3.57	3.52	1.24	1.98
215	L'atelier des Chefs	5.29	4.90	4.67	5.48	4.52	3.35	1.18	2.00
216	AX	5.90	5.23	3.90	5.33	4.62	3.74	4.63	1.55
217	Bank Fasion	5.24	5.29	5.19	5.76	5.19	3.71	3.25	1.78
218	berghaus	4.95	4.27	2.90	5.10	4.19	3.22	3.42	1.92
219	big bathroom shop	5.19	4.95	4.67	5.48	4.24	3.60	1.67	1.97
220	blurb	4.67	4.90	4.52	5.52	4.50	4.24	1.60	1.95
221	big green smile.com	4.14	3.52	3.43	3.67	3.57	4.05	1.32	1.99
222	bunches.co.uk	5.05	4.05	4.05	4.24	4.33	4.45	1.51	1.92
223	crocus	4.43	4.62	3.57	3.95	3.10	3.45	1.13	2.00
224	coolshop	4.76	3.91	3.33	4.62	3.86	2.30	1.13	1.99
225	Cold Service	4.05	3.71	3.43	4.05	2.62	3.90	1.23	2.00
226	Darlings of Chelsea	5.14	4.68	3.52	5.10	4.14	3.04	1.37	2.00
227	DiscountTheatre.com	3.86	4.09	2.52	3.48	3.29	4.04	1.55	1.95
228	electricalexperience	4.05	3.38	3.00	3.81	2.95	3.96	1.35	1.99
229	richersounds	4.33	3.18	1.90	3.43	3.05	3.74	2.24	1.89
230	Ofsted	4.90	5.29	4.24	4.76	3.33	3.95	5.46	1.84
231	pacey	4.10	4.38	3.71	3.95	3.62	3.55	1.27	1.99
232	Ofcom	4.05	3.76	3.38	4.24	3.43	3.62	2.45	1.97
233	timetospa	4.71	3.71	4.33	4.38	3.65	4.76	1.19	2.00
234	ethical superstore	3.76	3.62	4.33	3.90	3.33	3.70	1.13	1.99

235	insurefor.com	4.10	3.48	3.33	3.95	2.86	4.30	1.30	1.98
236	Jersey Plants Direct	4.05	3.10	3.14	3.19	3.00	3.55	1.30	1.98
237	Joe Browns	4.90	4.19	4.52	4.71	4.00	3.19	2.13	1.86
238	Just Eat	5.81	4.95	5.29	5.71	5.10	4.22	5.71	1.29
239	Lakeland	4.81	3.90	4.48	5.14	4.05	3.24	3.42	1.79
240	lenovo	4.67	4.33	4.14	5.29	4.25	3.29	3.55	1.89
241	Norton	5.05	3.00	3.24	4.76	3.50	4.38	5.63	1.42
242	O'Neill	4.81	4.81	3.90	4.14	3.67	3.95	3.72	1.93
243	PetSupermarket.co.uk	4.62	4.14	3.52	3.86	3.50	4.71	2.41	1.95
244	Picstop	3.81	3.05	3.43	4.05	2.71	3.52	1.20	1.99
245	photobox	4.81	4.43	4.14	4.43	4.05	4.10	3.15	1.66
246	Starbucks	3.57	2.90	2.67	3.29	2.76	4.00	1.18	1.99
247	Costa	5.95	4.50	5.38	5.57	5.48	2.61	6.33	1.64
248	Thorntons	6.24	5.86	6.10	5.38	6.33	2.85	6.50	1.67
249	Stena Line	4.10	3.43	3.62	4.00	3.15	3.76	1.70	1.95
250	Red Funnel	3.86	3.57	3.71	4.05	2.86	3.85	2.36	1.88
251	Saxby's Opticians	3.10	2.62	2.43	2.95	1.75	4.10	1.13	2.00
252	tenpin	4.48	4.62	4.90	4.33	4.24	3.95	2.30	1.90
253	Bowlplex	5.14	3.95	4.00	4.33	4.19	3.09	3.96	1.76
254	Plowmans	3.57	2.05	2.48	2.38	2.10	4.05	1.31	2.00
255	asos	5.33	4.86	4.33	4.95	5.24	3.80	5.65	1.22
256	RSPCA	4.62	4.38	3.52	4.10	4.00	4.00	5.82	1.64
257	pdsa	5.14	4.95	5.10	5.19	4.57	4.29	4.10	1.87
258	MakeAWish	5.67	4.68	4.57	4.86	4.29	4.57	5.21	1.85
259	viking	4.05	3.29	4.10	4.43	3.14	3.87	2.02	1.96
260	flybe	5.52	4.62	4.05	4.95	4.25	5.00	4.06	1.67
261	tree2mydorr.com	3.62	3.14	2.19	3.14	2.52	3.74	1.18	2.00
262	The Entertainer	4.38	4.00	3.90	4.19	3.43	2.90	3.11	1.92
263	London Dungon	5.19	4.95	5.14	5.14	5.33	3.71	4.84	1.72
264	Swarovski	5.67	5.33	5.90	6.24	5.43	2.95	5.36	1.70
265	Speedo	5.10	4.43	4.52	5.33	4.38	2.87	5.07	1.93
266	snapfish	4.52	4.33	3.76	4.67	3.24	3.20	3.63	1.69
267	Rober Dyas	5.14	4.29	3.81	4.62	3.10	3.30	4.43	1.87
268	napster	5.10	4.71	4.10	4.71	4.48	3.81	2.78	1.90
269	gambleaware.co.uk	4.38	4.38	4.81	4.62	3.67	4.76	2.10	2.00
270	Harrods	5.57	4.64	4.86	5.90	5.48	3.04	5.78	1.70
271	Extreme Element	4.10	3.43	4.05	4.00	3.71	3.87	1.43	1.99
272	Ernest Joans	5.29	4.64	4.00	4.90	4.19	3.65	5.14	1.53
273	Guardian	4.24	4.33	4.00	5.05	3.95	4.70	5.87	1.28
274	the telegraph	4.76	4.43	3.86	5.10	3.76	5.71	5.82	1.29
275	Aviva	5.00	4.62	4.14	5.24	3.86	4.48	5.13	1.71
276	Zurich	4.57	4.14	4.14	5.05	3.76	3.48	3.40	1.95
277	superbreak	4.00	3.38	3.10	3.81	2.90	3.95	1.34	1.96

278	Travelodge	5.19	4.67	4.10	4.95	4.35	5.05	5.71	1.37
279	Nia	4.48	3.71	3.95	4.52	3.30	3.76	1.39	1.99
280	P&G	4.52	3.86	3.52	4.62	3.57	2.91	4.45	1.93
281	Space Maker	4.62	3.24	3.19	3.86	3.05	5.14	2.25	1.92
282	Laterooms.com	4.76	4.90	4.38	4.57	4.14	3.20	4.47	1.62
283	Expedia.co.uk	4.43	3.76	3.38	3.76	4.05	4.10	5.01	1.41
284	trivago	5.48	4.86	5.29	5.67	5.00	3.61	5.52	1.46
285	Hoseasons	4.19	4.10	4.00	4.71	3.43	3.96	1.81	1.98
286	Butlins	4.90	4.14	3.67	4.76	3.71	4.20	5.07	1.79
287	Helpful Holidays	4.19	2.81	2.43	3.05	2.19	4.15	1.21	1.99
288	cottages4you	4.43	4.62	4.19	4.10	3.19	3.85	1.96	1.91
289	Richmond	5.43	4.86	4.90	5.67	5.15	4.14	1.53	2.00
290	Park Leisure	4.52	4.19	4.24	4.81	3.71	3.90	1.31	1.98
291	Parkdean	4.43	4.19	4.24	4.48	4.00	3.61	1.86	1.94
292	Audi	5.57	4.32	4.24	5.67	5.19	3.35	5.71	1.76
293	Land Rover	5.19	5.38	4.57	5.48	4.57	3.40	5.68	1.84
294	Fiat	5.05	4.57	3.95	5.24	4.24	2.35	5.58	1.90
295	Alfa Romeo	5.19	5.19	4.38	6.00	4.33	3.55	4.59	1.95
296	Visa	4.81	4.62	4.00	4.76	3.48	3.15	5.67	1.89
297	Maestro	3.05	3.24	2.95	3.62	2.14	2.10	4.21	1.94
298	travelex	3.81	3.09	2.67	3.29	2.38	3.48	1.87	1.95
299	flymo	4.48	4.43	4.38	4.57	3.76	3.95	2.77	1.99
300	marine life	4.52	4.24	2.71	3.71	3.52	4.25	1.71	1.99
301	MasterCard	4.76	4.68	3.19	5.05	3.81	3.35	5.47	1.85
302	Uswitch	4.62	4.45	3.43	4.95	3.76	3.96	3.33	1.91
303	Countrywide	3.86	3.86	3.81	4.29	3.10	3.48	1.79	1.97
304	CityJet	4.48	3.81	3.67	3.95	3.52	3.70	1.67	1.99
305	Country Organics	4.76	5.00	4.14	4.86	3.62	3.00	1.44	2.00
306	FarmFoods	3.81	3.29	3.00	3.14	2.55	3.95	2.74	1.97
307	Planet Organic	4.19	4.14	2.67	3.95	4.05	3.61	1.58	1.97
308	Honeybrook Farm	3.81	3.41	2.81	2.81	2.90	4.17	1.44	1.98
309	Cool Tec	3.52	1.67	2.24	2.10	1.71	4.50	1.05	2.00
310	Jaylee	3.90	3.52	3.19	4.05	3.24	3.70	1.07	2.00
311	Honeywell	4.05	3.10	3.43	3.86	2.85	3.52	1.58	2.00
312	Space	4.19	3.62	3.81	4.43	2.95	3.61	1.38	2.00
313	Cobham	3.90	3.67	3.62	4.10	2.90	3.52	1.17	2.00
314	RNLI	5.19	4.50	3.43	4.71	4.19	3.87	4.68	1.92
315	Boeing	4.57	3.95	4.38	4.67	3.65	3.57	2.34	1.98
316	The Range	5.05	4.32	3.24	4.67	3.76	3.22	4.03	1.74
317	Dunelm	5.10	5.05	4.29	4.57	4.29	3.85	4.27	1.69
318	Exbury Gardens	4.62	4.05	3.10	3.81	3.57	3.78	1.28	1.98
319	Heritage Hunter	3.52	3.43	2.95	3.52	2.60	2.48	1.12	2.00
320	Swanage Railway	3.52	2.86	2.62	2.57	2.65	5.14	2.28	1.93

321	Julia's House	4.62	4.38	4.19	4.81	4.33	3.30	1.98	1.95
322	Advent. Wonderland	5.05	4.18	4.24	4.71	3.33	4.00	2.59	1.95
323	Farmer Palmers	4.67	4.00	4.10	4.00	2.85	3.62	1.86	1.93
324	tripAdvisor	6.14	5.55	4.81	5.62	5.38	4.43	6.06	1.16
325	Dorset	4.05	3.71	4.33	4.38	4.00	3.52	2.70	1.86
326	Orchard Park	4.19	3.67	3.14	3.38	2.67	3.70	1.22	2.00
327	Orchard Caravans	4.76	4.52	3.86	4.33	3.65	4.38	1.12	2.00
328	Otter Nurseries	4.24	3.52	3.48	3.67	3.35	3.38	1.20	1.97
329	TableTable	4.95	5.05	4.95	4.38	4.62	3.00	1.90	1.94
330	Exeter Uni	4.81	4.45	2.95	5.10	3.86	3.43	4.66	1.64
331	Edinburgh Uni	4.62	4.38	3.67	5.14	3.19	3.55	4.17	1.88
332	Thames Water	4.52	4.43	3.86	4.33	3.62	4.14	3.23	1.96
333	Affinity Water	4.71	4.24	3.43	4.33	2.48	3.95	1.41	1.98
334	WestMill	3.29	2.57	2.62	3.57	2.55	3.71	1.16	2.00
335	Co-OP energy	4.62	4.48	3.52	4.76	3.00	4.05	4.09	1.94
336	Daewoo	4.38	4.52	3.71	4.48	3.24	3.00	2.60	2.00
337	Bank of England	4.00	3.23	2.38	3.86	3.05	4.00	3.81	1.98
338	TSB	4.33	3.43	4.29	4.14	2.90	4.14	4.44	1.90
339	Euronics	4.57	2.90	3.10	3.57	3.10	3.71	2.63	1.93
340	Freeview	5.00	4.81	3.90	4.67	3.52	3.45	5.78	1.78
341	Lynwood Vets	4.14	4.29	3.19	3.67	2.90	4.20	1.73	1.98
342	Pet Practice	3.76	2.95	1.95	2.67	2.29	4.35	1.38	2.00
343	Broomhill	2.90	2.57	2.38	3.19	1.71	3.62	1.13	1.99
344	Neptune	4.76	4.95	5.62	5.24	4.48	1.86	1.18	1.99
345	newbank	4.62	4.14	4.62	5.10	3.14	3.10	1.13	2.00
346	severn valley railway	4.10	3.81	2.71	3.76	2.43	2.75	1.25	2.00
347	Bluebell railway	4.43	3.64	1.95	3.71	2.86	3.70	1.47	1.99
348	compton acres	4.19	3.81	4.76	4.57	3.43	3.52	1.93	1.94
349	highcliffe castle	4.67	2.71	3.67	3.43	3.05	4.75	2.39	1.90
350	athelhampton house	5.05	5.29	4.24	5.10	4.35	5.14	1.42	1.98
351	Highclere castle	4.33	4.24	4.24	4.24	3.90	4.14	1.74	1.97
352	Warwick Castle	3.76	4.29	4.14	4.33	3.95	4.10	3.22	1.90
353	cheddar gorge	5.10	4.81	4.76	4.90	4.30	3.76	2.72	1.93
354	Wookey Hole	4.14	3.52	3.14	3.38	3.57	2.50	2.51	1.94
355	Upton County Park	4.67	4.14	3.71	4.52	3.62	4.33	1.95	1.94
356	dartmoor	4.38	4.52	5.33	5.00	4.76	3.43	2.76	1.96
357	Lake District	5.00	4.81	5.43	5.19	4.76	3.85	3.98	1.92
358	golakes	5.38	5.19	5.00	5.19	4.19	3.55	1.53	1.99
359	Linthwaite	4.29	4.00	4.57	4.43	3.86	3.90	1.10	2.00
360	SGB	4.14	3.09	3.00	4.14	2.86	3.74	2.71	1.89
361	Coventry Speedway	4.43	3.57	3.57	4.29	3.24	3.10	1.86	1.97
362	europress	4.19	2.81	2.90	3.81	2.57	3.90	1.16	2.00
363	floors-2-go	4.05	3.29	3.24	3.57	3.00	4.00	1.39	1.98

364	webuyanycar	4.86	3.90	4.19	4.38	3.90	3.95	4.87	1.64
365	which	4.38	4.14	4.10	4.86	3.52	3.15	4.06	1.83
366	first:utility	5.29	5.18	5.29	5.38	4.76	4.04	1.35	1.98
367	Ebico	3.67	3.48	3.10	3.38	2.40	2.95	1.08	1.98
368	Sewing world	4.14	3.38	2.81	3.71	2.40	3.43	1.35	2.00
369	Ballroom Dancers	4.24	3.55	2.90	3.95	2.71	3.39	1.23	2.00
370	Dep. wildlife & fish	3.71	3.14	2.86	3.43	2.35	3.71	1.13	2.00
371	UNIS	3.90	3.57	3.48	3.10	2.67	4.15	1.31	2.00
372	Norge Polar Institute	4.29	3.71	3.52	3.76	2.90	3.80	1.18	1.99
373	Stavanger Uni	3.76	3.81	3.05	4.00	2.43	3.50	1.32	1.99
374	Bergen Uni	4.14	3.33	3.57	4.19	3.24	3.26	1.44	2.00
375	Norsk Romsenter	5.05	4.71	4.19	4.57	3.38	4.10	1.16	2.00
376	Wooden model co.	4.14	2.86	2.00	3.00	2.57	3.43	1.15	1.99
377	Clan MacDougall So.	2.67	2.33	1.62	1.62	1.43	2.85	1.05	2.00
378	Rex Cinema	3.38	3.14	2.33	3.38	3.24	2.90	1.37	1.99
379	Purbeck Film Festival	3.86	2.73	1.81	2.62	2.76	4.22	1.30	1.98
380	WhereCanWeGo.com	2.43	2.62	2.19	3.10	1.71	3.48	1.35	1.96
381	2 Heath Cottages	2.90	2.48	2.14	2.10	1.65	3.86	1.01	1.99
382	HolidayCottages.net	3.81	3.62	3.57	3.81	2.95	4.10	1.52	1.94
383	Stamp Magazine	3.86	3.00	2.05	3.33	2.10	3.95	1.30	1.98
384	Dog on the Tuckerbox	3.57	2.67	3.33	3.48	3.19	2.39	1.27	1.98
385	Gateshead Walk Club	1.57	1.38	1.29	1.52	1.24	1.57	1.13	2.00
386	Morley Folk Club	2.33	1.81	1.19	1.33	1.10	2.75	1.02	2.00
387	Core Music	4.00	2.59	2.52	2.33	2.10	4.22	1.11	1.99
388	IronBridge Runner	3.29	2.55	2.24	2.71	2.29	2.70	1.20	1.98
389	Wrekin View Vets	3.86	4.43	2.90	4.38	3.05	4.57	1.15	1.99
390	Dutchess Marketplace	4.14	3.48	3.43	3.43	3.33	2.90	1.13	1.99
391	dmp designs	4.19	3.38	4.86	4.10	3.70	2.57	1.13	2.00
392	Kinnex	3.29	2.33	2.62	2.67	2.10	2.30	1.08	2.00
393	Healthcare Advice	3.67	2.81	3.19	3.05	2.00	3.48	1.25	1.98
394	the Leeds wall	3.48	2.82	2.24	3.19	2.81	4.04	1.08	2.00
395	Chinese Lang. school	3.48	2.67	2.38	3.24	3.24	3.48	1.15	2.00
396	Hawkes tree services	3.71	2.81	3.24	3.62	2.57	4.26	1.13	1.99
397	Trusted Traders	3.95	4.57	4.38	4.19	3.29	3.29	1.73	1.97
398	F R Jones and Son	3.33	2.64	2.81	2.48	2.10	4.22	1.18	2.00
399	Arboriculture Assoc.	3.43	3.29	3.19	3.90	3.24	4.09	1.27	2.00
400	HSE	4.29	4.29	3.71	4.86	2.62	3.29	2.15	1.92
401	City & Guilds	3.62	3.33	3.14	4.10	2.62	3.95	2.14	1.94
402	Oak garden design	3.62	3.86	4.38	4.43	2.86	1.62	1.11	2.00
403	Oak graphics design	3.24	3.05	3.62	3.67	2.60	2.48	1.11	2.00

404	Advantage Environ.	3.43	3.14	2.90	3.81	2.70	4.29	1.07	2.00
405	Abels	3.81	3.29	3.00	3.38	2.48	4.10	1.11	2.00
406	Coronet	3.86	3.48	3.95	4.52	3.48	3.80	1.07	2.00
407	BJM	4.19	3.67	4.24	4.10	2.90	4.38	1.08	1.99
408	BallyClare society	2.71	1.71	1.19	1.48	1.33	2.65	1.08	2.00
409	the White house	3.33	2.95	2.57	3.24	3.00	3.70	1.39	1.99
410	knowth.com	2.76	2.52	2.86	2.43	1.71	4.05	1.23	1.97
411	island Ireland	3.14	2.05	2.29	1.90	1.86	3.80	1.10	2.00
412	Mythical Ireland	2.86	2.19	1.90	2.52	2.57	3.96	1.11	1.99
413	NewtonAbbey	3.05	2.67	2.81	2.62	1.75	3.52	1.18	2.00
414	Culture Arts Leisure	2.67	2.29	2.10	2.62	2.00	3.74	1.11	1.99
415	UlsterNet	2.43	2.19	2.19	2.48	2.10	3.61	1.08	1.99
416	National 1798 Centre	3.57	3.43	3.24	4.00	3.05	3.10	1.13	1.98
417	The Bell	4.24	3.81	3.19	3.24	2.57	4.20	1.33	1.98
418	Baptist Press	3.19	1.81	2.29	2.29	1.76	4.45	1.08	2.00
419	Philosophy	3.43	2.05	2.29	2.48	2.05	4.71	1.18	1.99
420	Jane Butel's	3.43	2.95	2.48	3.24	2.62	3.90	1.12	1.99
421	Indian Clubs for sale	3.24	3.10	1.95	2.52	1.95	3.65	1.14	2.00
422	Alaska Uni	3.10	2.71	2.57	3.14	2.19	3.70	1.33	1.98
423	Knighton Heath	4.29	3.76	3.81	4.14	2.90	4.52	1.61	1.98
424	Dudsbury	4.38	4.81	4.24	4.38	3.67	2.80	1.48	1.96
425	Meyrick Park	4.86	5.05	5.14	5.52	5.86	4.00	1.80	1.95
426	Golf Today	3.52	2.90	2.90	2.95	2.80	4.10	1.17	1.99
427	Hamworthy Heating	4.00	3.38	3.05	3.95	3.19	3.61	1.18	1.99
428	Shinty.com	3.43	3.33	3.38	3.52	2.30	3.43	1.09	1.99
429	New world Sailing	3.24	1.82	2.33	2.00	2.14	4.22	1.21	2.00
430	Yachting World	3.43	3.14	3.29	3.76	2.45	3.76	1.14	2.00
431	Yachting	4.43	3.41	3.33	3.90	3.19	3.57	1.34	1.99
432	Yachtworld	4.81	3.68	3.19	4.29	3.62	3.83	1.42	1.99
433	British Parachute As.	4.00	3.33	3.48	3.71	3.24	4.40	1.82	1.95
434	Skyline	5.43	4.57	4.29	4.67	4.76	4.40	1.75	1.95
435	Goskydive	5.71	4.32	4.38	4.90	4.57	4.22	1.90	1.92
436	uk bungee club	4.71	4.38	4.43	4.76	4.57	3.61	1.89	1.92
437	ukextremesports.co.uk	3.10	2.95	2.48	2.95	2.62	3.57	1.55	1.96
438	Gorcombe	3.48	2.76	2.81	2.81	2.75	4.24	1.18	1.99
439	England Hockey	4.14	4.00	3.57	4.81	3.57	3.91	2.54	1.98
440	NHL	3.81	3.52	3.81	4.24	2.62	3.10	1.87	1.96
441	FIH	4.00	3.62	3.67	4.14	3.33	3.55	1.23	1.99
442	FIA	3.95	3.86	3.76	4.52	3.24	3.00	1.77	1.98
443	Swanage Museum	3.19	2.62	2.86	2.24	2.10	3.96	1.37	1.98
444	Wareham Museum	2.86	2.48	1.95	2.24	1.57	3.22	1.26	1.99
445	PDC	4.24	3.33	2.95	4.00	2.62	3.10	1.75	1.99

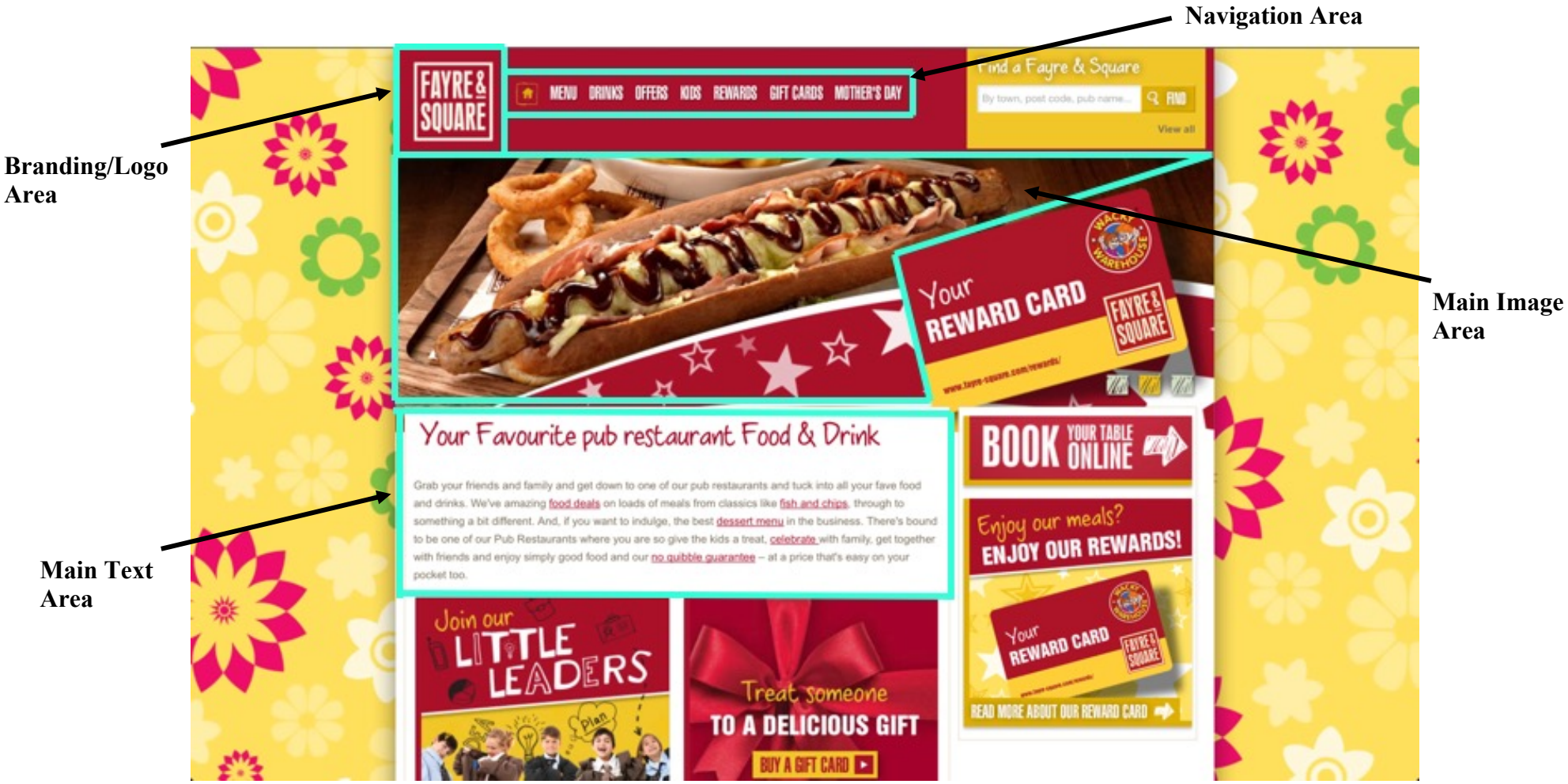
446	DK Darts	3.24	2.90	2.62	3.10	2.10	3.14	1.16	2.00
447	DRA	2.71	2.10	2.38	2.24	1.62	3.62	1.03	2.00
448	Scouts	4.81	4.43	4.19	4.71	3.62	3.80	4.01	1.95
449	World Curling	5.05	3.59	3.10	4.24	2.90	3.26	1.83	1.99
450	Iceden	3.90	3.38	2.90	3.86	3.05	4.10	1.15	1.98
451	Marriott	4.81	4.81	4.62	5.43	4.90	4.43	3.70	1.84
452	The Barrington Club	4.95	4.29	4.81	4.67	4.71	3.96	1.33	1.99
453	Renaissance Hotels	4.00	4.19	4.14	4.95	4.00	2.40	1.68	1.95
454	TSS Photography	3.67	3.27	2.62	3.57	3.05	2.83	1.19	2.00
455	Advan. Cable Comms	3.90	3.50	2.76	3.29	2.90	3.52	1.17	2.00
456	The Isle of Eigg	3.86	3.10	3.62	3.14	2.38	5.05	1.29	1.99
457	Isle of Rum	4.19	3.76	4.33	4.19	3.71	5.20	1.33	2.00
458	Knoydart foundation	3.67	3.14	2.81	3.14	2.62	4.00	1.10	2.00
459	Earth connect centre	4.05	3.57	4.57	3.62	3.00	3.95	1.21	2.00
460	Knowle country house	4.81	5.33	5.52	5.29	5.19	2.76	1.30	1.97
461	Renaissance club	5.00	5.00	5.48	4.86	4.65	2.43	1.31	1.99
462	The Rennaisance Club	4.62	3.76	3.48	4.62	3.65	4.29	1.29	1.99
463	Spitsbergen Travel	4.81	4.48	4.81	4.76	4.29	3.30	1.29	2.00
464	Shrews. Flower Show	4.19	4.00	3.81	4.52	3.76	2.91	1.50	2.00
465	Shropshire Tourism	4.24	3.52	2.71	3.43	2.05	4.45	1.18	2.00
466	Knitting Museum	3.48	2.71	2.14	2.38	1.71	4.70	1.07	2.00
467	Woolly Thoughts	3.76	3.32	2.57	2.86	2.57	3.87	1.15	2.00
468	La crosse technology	3.57	3.45	2.10	3.33	2.33	3.48	1.08	2.00
469	Watch & Clock	3.05	3.00	3.00	3.57	2.10	3.90	1.12	1.98
470	Train Collectors So.	2.19	1.62	1.62	1.71	1.50	2.76	1.07	2.00
471	hmrs	2.86	1.73	1.43	1.81	1.43	3.87	1.18	1.99
472	UK Philately	2.71	1.71	1.71	1.86	1.45	4.10	1.04	2.00
473	Book Collector	4.00	2.86	3.67	3.14	1.95	4.90	1.21	1.99
474	Peter Harrington	4.24	3.86	3.62	4.43	4.10	3.61	1.27	1.99
475	Model Airplanes	3.81	3.19	3.24	3.57	2.35	2.29	1.18	2.00
476	Flight Minitures	3.48	3.14	2.38	2.90	2.19	4.15	1.10	2.00
477	Chess & Bridge	2.81	2.29	2.29	3.05	1.52	4.38	1.14	1.97
478	cruise.co.uk	2.05	2.05	1.43	2.52	1.29	4.19	1.32	1.98
479	BeyondShips	3.10	1.81	1.81	1.86	1.57	4.50	1.04	1.99
480	Inside Lacross	4.10	4.05	3.10	4.14	3.10	3.45	1.22	2.00
	Mean	**4.38**	**3.87**	**3.67**	**4.20**	**3.46**	**3.71**	**2.79**	
	Minimum	**1.57**	**1.38**	**1.19**	**1.33**	**1.10**	**1.38**	**1.01**	
	Maximum	**6.24**	**5.86**	**6.10**	**6.24**	**6.33**	**5.71**	**6.84**	

8.5 Appendix E: Stimulus selection for Experiment 2

File	Website Name
5	Facebook
19	Ask Jeeves
28	B&Q
44	RBS
45	Lloyds Bank
47	Thomas Cook
66	Fayre & Square
80	American Express
82	npower
90	ScottishPower
92	British Rail
97	Toby
100	Poole Speedway
101	Gatwick Airport
123	Northumberland Council
131	National Express
135	Vets4Pets
138	WHO
150	WeightWatchers

File	Website Name
170	goadsby
184	HistoryExtra.com
196	Liftability
205	Moors Valley
209	filoFAX
216	AX
217	Bank Fashion
226	Darlings of Chelsea
232	Ofcom
247	Costa
248	Thorntons
301	MasterCard
306	FarmFoods
324	tripAdvisor
329	TableTable
332	Thames Water
349	highcliffe castle
352	Warwick Castle
357	Lake District
386	Morley Folk Club

8.6 Appendix F: Example of outlined areas of interest



8.7 Appendix G: Stimulus selection for Experiment 3 and matching process

Stimulus File	Website type	Website Name	Website File	Advert Type	Advert Name	Advert File	Placement of ad
1.1	Familiar Appealing	Cadbury	206	Familiar Appealing	Sephora	33	**top**
2.1	Familiar Appealing	trivago	284	Familiar Appealing	Samsung gear	48	**bottom**
3.1	Familiar Appealing	John Lewis	26	Unfamiliar Appealing	Vostok	10	**top**
4.1	Familiar Appealing	Audi	292	Unfamiliar Appealing	AMP	19	**bottom**
5.1	Familiar Appealing	asos	255	Familiar Unappealing	RelentlessA	18	**bottom**
6.1	Familiar Appealing	Swarovski	264	Familiar Unappealing	Toshiba	55	**top**
7.1	Familiar Appealing	Thomson	21	Unfamiliar Unappealing	9cases.com	6	**bottom**
8.1	Familiar Appealing	Harrods	270	Unfamiliar Unappealing	AEG	9	**top**
9.1	Unfamiliar Appealing	PH Hotels	124	Familiar Appealing	MAC	37	**top**
10.1	Unfamiliar Appealing	Richmond	289	Familiar Appealing	Microsoft Surface	50	**bottom**
11.1	Unfamiliar Appealing	Knowle Country House	460	Unfamiliar Appealing	Glams	35	**bottom**
12.1	Unfamiliar Appealing	MSC Cruises	39	Unfamiliar Appealing	Trebor	42	**top**
13.1	Unfamiliar Appealing	Meyrick Park	425	Familiar Unappealing	Michelin	61	**bottom**
14.1	Unfamiliar Appealing	The Barrington Club	452	Familiar Unappealing	Bosch	63	**top**
15.1	Unfamiliar Appealing	Fayre & Square	66	Unfamiliar Unappealing	PKZ	23	**top**
16.1	Unfamiliar Appealing	Skyline	434	Unfamiliar Unappealing	Altoids	43	**bottom**
17.1	Familiar Unappealing	Maestro	297	Familiar Appealing	TicTac	41	**bottom**
18.1	Familiar Unappealing	Gumtree	120	Familiar Appealing	Next	67	**top**
19.1	Familiar Unappealing	Norton	241	Unfamiliar Appealing	Mio	40	**bottom**
20.1	Familiar Unappealing	Natural History Museum	183	Unfamiliar Appealing	Qin	47	**top**
21.1	Familiar Unappealing	capitalfm	141	Familiar Unappealing	Monster	64	**top**
22.1	Familiar Unappealing	Ofsted	230	Familiar Unappealing	Matalan	69	**bottom**

23.1	Familiar Unappealing	MSN UK	20	Unfamiliar Unappealing	Joyroad	59	**top**
24.1	Familiar Unappealing	Visa	296	Unfamiliar Unappealing	Neocore	73	**bottom**
25.1	Unfamiliar Unappealing	New world Sailing	429	Familiar Appealing	Polo	45	**bottom**
26.1	Unfamiliar Unappealing	La crosse technology	468	Familiar Appealing	Apple case	70	**top**
27.1	Unfamiliar Unappealing	Stanvanger Uni	373	Unfamiliar Appealing	Hisense	53	**top**
28.1	Unfamiliar Unappealing	Space	312	Unfamiliar Appealing	Pooky	79	**bottom**
29.1	Unfamiliar Unappealing	BJM	407	Familiar Unappealing	Sony case	71	**top**
30.1	Unfamiliar Unappealing	TSS Photography	454	Familiar Unappealing	Debenhams	76	**bottom**
31.1	Unfamiliar Unappealing	Activity Superstore	200	Unfamiliar Unappealing	Sanyo	80	**bottom**
32.1	Unfamiliar Unappealing	cottages4you	288	Unfamiliar Unappealing	Biotherm	84	**top**

8.8 Appendix H: Normative Advert Corpus Data from Experiment 3

Key	
Overall Appeal of Advert (Appeal)	1-7 Likert scale 1 = Not appealing at all and 7 = Very appealing.
Familiarity of Advert Brand (Familiarity)	1-7 Likert scale 1 = Not seen brand before and 7 = Very familiar with brand.
Items highlighted in green were selected as experimental stimuli for Experiment 3.	

File	Product Category	Brand	Appeal	Familiarity
1	Tyres	Nokian	5.09	2.50
2	Toaster	Pierre	4.74	2.34
3	Mobile Case	more-thing	3.68	2.55
4	TV	Panasonic	2.58	7.55
5	Fit Watch	Motorola	3.76	5.93
6	Mobile Case	9cases	5.23	2.36
7	Watch	Citizen	3.25	4.64
8	Toaster	Swan	5.10	3.30
9	Toaster	AEG	5.04	2.86
10	Watch	Vostok	3.39	2.93
11	Toaster	Morphy Richards	4.25	5.23
12	Mobile Case	Olixar	4.41	2.27
16	Fit Watch	Fitbit	3.51	6.20
17	Energy	Relentless	4.20	6.05
18	Energy	Relentless	4.31	6.57
19	Energy	AMP	3.57	2.84
20	Energy	Hippo	4.03	2.34
21	Energy	Tigers Eye	3.68	2.57
22	Fashion	River Island	3.10	7.73
23	Fashion	PKZ Clothing	4.13	2.20
24	Fashion	TRU	3.99	2.39
25	Fashion	Forever 21	4.26	6.48
29	Jumper	LIU	3.43	2.98
30	Jumper	Newlook	3.22	7.61
31	Watch	Gucci	4.00	7.23
32	Energy	Lucozade	2.55	7.82
33	Makeup	Sephora	2.97	5.43
34	Makeup	BeautyBay	3.74	4.25

35	Makeup	Glam's	3.64	2.89
36	Makeup	Benefit cosmetics	2.96	5.57
37	Makeup	MAC	3.07	6.61
38	Makeup	Covergirl	3.79	4.57
39	Makeup	No.7	2.86	7.09
40	Fit Watch	Mio	3.57	2.59
41	Mints	TicTac	2.52	7.41
42	Mints	Trebor	3.61	3.59
43	Mints	Altoids	4.87	2.68
44	Mints	Frisk	4.84	2.50
45	Mints	Polo	3.35	7.75
46	Watch	Eterna	3.69	2.82
47	Mobile Case	QIN	3.74	2.36
48	Fit Watch	Samsung Gear	3.53	7.36
49	Tablet	YOGA	3.59	3.09
50	Tablet	Microsoft	2.81	7.64
51	Tablet	Samsung Galaxy	3.57	4.82
52	Tablet	Fusion	4.39	2.77
53	TV	Hisense	3.06	2.95
54	TV	Technika	2.97	4.20
55	TV	Toshiba	3.81	6.77
56	TV	KTC	3.62	2.59
57	TV	Samsung	4.12	7.68
58	TV	Bush	4.12	4.45
59	Tyres	Joyroad	3.91	2.36
60	Tyres	Goodyear	3.43	4.11
61	Tyres	Michelin	5.13	6.75
62	Tyres	Hankook	3.26	3.14
63	Toaster	Bosch	4.32	6.75
64	Energy	Monster	4.48	7.36
65	Energy	Powerade	3.96	7.25
66	Fashion	M&S	3.72	7.50
67	Fashion	Next	3.48	7.57
68	Jumper	Bank	5.52	3.80
69	Jumper	Matalan	5.54	7.27
70	Mobile Case	Apple	3.04	7.82
71	Mobile Case	Sony	4.77	7.23
72	Tablet	Apple ipad	2.63	7.68
73	Tablet	Neocore	4.71	2.70
74	Watch	Oulm	4.25	2.41
75	Watch	TIMEX	4.91	3.57
76	Lampshade	Debenhams	4.12	7.45
77	Lampshade	John Lewis	4.84	7.64

78	Lampshade	SOGO	5.46	2.25
79	Lampshade	Pooky	3.46	2.30
80	TV	Sanyo	5.15	3.75
81	TV	Benq	3.59	3.05
83	Fashion	Cara	4.31	2.34
84	Makeup	Biotherm	4.60	3.14
		Mean	3.92	4.74
		Minimum	2.52	2.20
		Maximum	5.54	7.82

8.9 Appendix I: Stimulus selection for Experiment 4

File	Website Name
5	Facebook
17	Animal Planet
19	Ask Jeeves
21	Thomson
30	BT
39	MSC Cruises
54	BIC
63	Sainsburys
64	Debenhams
66	Fayre & Square
71	Autotrader
72	Avon
75	AO.COM
86	British Airways
88	thetrainline.com
94	eflorist
95	ELC
104	Dyson
108	giffgaff
117	Keep Me Inspired
131	National Express
144	ticketmaster
149	Vistaprint
177	GoSmile
183	Natural History Museum
203	Thorpe Park
204	Go Ape
209	filoFAX
213	Appliance Deals
217	Bank Fashion
218	Berghaus

File	Website Name
226	Darlings of Chelsea
230	Ofsted
256	RSPCA
258	MakeAWish
262	The Entertainer
265	Speedo
268	napster
272	Ernest Joans
273	Guardian
283	Expedia.co.uk
292	Audi
293	Land Rover
299	Flymo
321	Julia's House
322	Adventure Wonderland
332	Thames Water
333	Affinity Water
340	Freeview
345	newbank
349	Highcliffe castle
350	Athelhampton house
355	Upton County Park
366	first:utility
375	Norsk Romsenter
434	Skyline
435	Goskydive
436	uk bungee club
460	Knowle Country House
463	Spitsbergen Travel