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Can increasing surface credibility improve e-health intervention effectiveness?

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Abstract

One way internet users determine the quality of a website is to look for so called 'credibility factors'. These factors can either be positive: the presence of a date, reference list, independent site certification; or negative: the presence of advertisements or broken links. This thesis investigates what role such factors play in the effectiveness of two e-health interventions. An e-health intervention is a health related website designed to change a person's behaviour.

Until now research into credibility has been largely theoretical. Studies have relied on **subjective** outcome measures such as Likert scales, website content recall, expressions of preference and self reported behaviour. This thesis describes two studies, the second of which investigates, for the first time, whether surface credibility manipulations change **objective** behavioural outcomes. Surface credibility is how much a perceiver believes a website on simple inspection. Based on a comprehensive literature review of credibility research, the following credibility factors were explored: presence of advertising, recognisable logos, contact details, physical address, references, third party certification, currency information, privacy statement, HTTPS encryption, top level domain and presence of a broken link.

The first study involved the assembly of an exercise promotion website. Participants were randomised to receive the site modified to contain either factors heightening credibility or those lowering credibility. Participants using the high credibility version spent twice as long browsing the site as those using the low credibility version. There was no effect on attitude to exercise or self reported physical activity.

The second study used the same methodology but with a website targeting an **objectively** measurable health behaviour (registration as an organ donor). In this study 889 university students were exposed to a website promoting organ donation. Information on the site was assembled based on theoretical domain interviewing and current research into organ donation interventions. 336 (37.79%) participants registered through the study website. The study detected no significant difference in registration rates between high and low credibility versions of the site. Of the 17 comments left on the low credibility site, only 3 were credibility related criticisms.

It is the finding of this thesis that university students are willing to submit personal information and place trust in a website contravening many current credibility guidelines. Future studies into credibility are needed to explore why this is the case. One possibility is that the website was trusted simply because it was part of a research study. Another possibility is that the high quality of the textual content compensated for the lack of credibility of the site itself.

It is the recommendation of this thesis that future studies focus on objective behavioural outcome measures and control for other forms of credibility such as participation in a research study.

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Thanks also to my parents Fred and Alison Nind and to Emma Webster for all the emotional and motivational support throughout the whole process.

"*We have to see, we have to know*" - Peter Atkins

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Chapter Summaries

Chapter 1 explains the title of this thesis starting with what credibility is; its origin in persuasive oral communication and how it applies to the Internet today. It explains what is meant by the term e-health intervention and how credibility might play a part in raising the standard of current e-health interventions. It finishes by introducing the core research question of the thesis.

Chapter 2 outlines the approach that was taken in performing a literature review on credibility and how previous papers were categorised and analysed. Each paper that contributed to the development of the studies described in this thesis is discussed. Papers reporting unique findings or innovative study methodology are described more fully and critically evaluated.

Only one paper was found which investigated credibility in an e-health context using a behavioural outcome measure; this study is described in detail. The chapter finishes by outlining how the literature review informed study development and defined the thesis research question and aims.

Chapter 3 describes the first of two studies conducted into the effects of surface credibility on e-health interventions. This intervention is targeted at student exercise habits. A description of the technology and methodology used is given together with a detailed analysis of the credibility factors being evaluated. The chapter finishes by discussing the findings and the limitations of the study which build a case for the second study.

Chapter 4 describes the second of the two studies into the effects of surface credibility on e-health interventions. This intervention is targeted at organ donation registration. The reason for changing from exercise (as used in the first study) is given and a description of the improvements made over the previous study is included. The chapter finishes with a discussion of the results.

It is important to remember that this thesis is not about exercise behaviour interventions or how best to increase organ donation registration rates in students. It is about the effect of credibility on **any** online intervention targeting a health behaviour.

Chapter 1: Introduction

Chapter 5 brings together the findings of both studies to describe new contributions to our understanding of credibility. The generalisability and possible interpretations of the study results are also explored. The chapter finishes by suggesting possible future directions for credibility research.

Chapter 1: Introduction

1.1 What is credibility?

Aristotle first discussed persuasive dialogue in his treatise Rhetoric in 350BC. He describes 3 components to persuasion known as Ethos (character of the speaker), Pathos (emotions of the argument) and Logos (logic of the argument). Concerning Ethos he wrote:

"Persuasion is achieved by the speaker's personal character when the speech is so spoken as to make us think him credible."

To be credible a speaker must convince his audience he is both knowledgeable about the topic (expertise) and can be trusted to present his knowledge truthfully and without bias (trustworthiness) (Fogg and Tseng 1999).

Credibility is closely related to concepts such as: trustfulness, reliability, accuracy, authority, lack of bias and quality. In general a credible piece of information is one for which the source is identifiable and seen as knowledgeable and impartial. In a web context this can extend to reliability of the site over time e.g, a successful shopping experience resulting in receiving the goods ordered. A piece of information can be credible to one person but not another. The measure of how a person evaluates the credibility of a piece of information is called 'perceived credibility'. The distinction between website credibility and perceived credibility is needed because viewers can interpret website cues differently e.g. a .gov domain extension may raise perceived credibility for one person but lower it for another who distrusts the government.

Credibility has been studied by a wide range of disciplines including psychology, journalism and mass communication, human computer interaction and ecommerce (Rieh, Soo Young, Danielson 2007). Research is divided between theoretical framework development (Chong and Wong 2003; Egger 2000; B Hilligoss and S. Rieh 2008) and investigations into user behaviour (Dutta-bergman 2004; Holmes and Robins 2008; Hu and S. Shyam Sundar 2008; Miriam J. Metzger, Andrew J. Flanagin, and Medders 2010).

Chapter 1: Introduction

Credibility is important in all media formats and there is a considerable amount of research looking at credibility in television, written and spoken communication (Pornpitakp 2004). This research includes topics such as how to convey credibility to an audience, how people make credibility decisions and whether some media formats are more credible than others. The Internet is unique from other media formats in a number of ways which have a direct impact on credibility, these are size, authority, self-sustaining reference system, enforcement and phishing:

Size - According to Netcraft (Netcraft 2011) there are over 348 million registered websites, the majority of which have many pages. To give this context, it is more than twice the number of books that have ever been written (Taycher 2010). This makes manually verifying the quality of each site impossible. There is no peer review of websites prior to search indexing/hosting as there is with most print and other traditional media. **The number of websites makes any comprehensive review impractical and there is little likelihood of consequences to the authors even if inaccurate or harmful information were discovered**.

Authority - Anyone can create a website at low cost without needing any formal qualifications or specialist training. In order to register a website domain name, it's author must provide contact information to the WHOIS database run by the Internet Corporation for Assigned Names and Numbers (ICANN). In practice only 23% of the websites in the database contain accurate author and physical address information. The remainder are either incomplete (48%) or 'patently false'(29%) (National Opinion Research Center 2010). This lack of authority means even when a website is harmful or inaccurate, it may be impossible to find the creator. It also means that **often users cannot make decisions about the quality of the site's information based on the qualifications of the author**.

Self-sustaining reference system - There is some concern that when attempting to corroborate the evidence of an Internet source, people rely on other Internet sources and that this can lead in circles. "When a referencing system operates only internally and has no separate external reference, the very assistance we seek merely leads us in circles within the network" (Burbules 2001). This can be compounded by plagiarism or link farms (where multiple website in a group agree to link to each other to increase search ranking) (Chung, Toyoda, and Kitsuregawa 2009).

Chapter 1: Introduction

Enforcement -. The only institutions capable of controlling website availability are Internet service providers (ISPs), domain name system (DNS) registrars and search indexers e.g, Google. ISPs can block traffic for their users to specific IP addresses, DNS registrars can redirect traffic for a domain name and search indexers can filter their results. Traditionally the only websites that have been shut down in such a manner are those engaging in phishing or spamming activities or where a court order has been issued such as for the copyright infringing website The Pirate Bay (BBC News 2012).

Phishing - Phishing websites (fraudulent websites which misrepresent their source/author) are a growing problem which is unique to the Internet. They can erode trust in Internet sources in general although they can also be a driving force in advancing technology towards greater security (Oorschot n.d.).

For these reasons there is a greater onus on users to make their own judgments about whether the information in a website is credible. Early work by Fogg and Tseng (1999) theorised four ways users make credibility judgments of websites: presumed, reputed, surface and experienced:

Presumed (or source) credibility - "general assumptions [about the source] in the perceiver's mind. For example, people assume their friends tell the truth" (Fogg and Tseng 1999). This has also been described as source credibility (Pornpitakp 2004) and trustworthiness (Fogg and Tseng 1999). This form of credibility primarily comes from the author of the website or the writer of a specific article. This category can also include preconceptions users may have based on the media itself e.g, having an innate distrust of online health information.

Reputed (or inherited) credibility - "how much the perceiver believes someone or something because of what third parties have reported" (Fogg and Tseng 1999). This can include personal or community based recommendations and credibility inherited from the referrer. Reputed credibility could come from a personal recommendation or arriving at a site via a link from a trusted site.

Surface credibility - "how much a perceiver believes someone or something based on simple inspection" (Fogg and Tseng 1999). This includes all visual indications of credibility such as a reference list, recognisable logo or presence of advertising. There is some overlap with the

other groups. For example a certification stamp such as Health On the Net (HON) (Health On the Net 2011) would be an element of surface credibility which may also convey reputed credibility i.e, if a visitor recognised the symbol they might inherit the trust that HON have placed in the site.

Experienced credibility - "how much a person believes someone or something based on first-hand experience" (Fogg and Tseng 1999). This must be determined **over time** and can come from reliability, accuracy and benefit to user. Experienced credibility could come from sustained use without any errors or upon receiving goods ordered through a shopping site.

Online credibility is an important issue and is often seen as vital in the health domain. However despite the large number of health websites that are incomplete, inaccurate, false or biased (Eysenbach and Powell 2002) there is controversy over whether this actually translates into patient harm (Crocco, Villasis-Keever, and Alejandro R. Jadad 2002).

1.2 What are e-health interventions?

The term e-health is widely used but can broadly be defined as "health services and information delivered or enhanced through the Internet and related technologies" (Eysenbach 2001).

An intervention is defined as "the act or fact or a method of interfering with the outcome or course especially of a condition or process (as to prevent harm or improve functioning)" (Merriam-Webster 1995). More simply put this means acting to change a person's behaviour to improve their wellbeing. When this is done through a website it is referred to as an e-health intervention.

A simple e-health intervention could be a website explaining the damaging effects of excessive drinking (Linke, A. Brown, and Wallace 2004). A more complicated e-health intervention could involve personalised motivational emails based on a patient's record and their psychological profile.

e-health interventions have many advantages over face to face or print interventions such as low cost, interactivity and being able to easily target larger numbers of individuals (77% of households in UK have Internet access (Office for National Statistics 2011)).

1.3 Why might credibility be important in e-health interventions?

A recent systematic review shows that e-health interventions have a small but significant effect on health related behaviours. However, effect sizes vary considerably (Webb et al. 2010). This variance is not fully understood but will be closely related to differences in the way the interventions are delivered, e.g., the design of the Internet content.

There are many guidelines available to support the design of high quality Internet content. There are guidelines that cover accessibility, usability, aesthetics and layout. However there are not yet any formal guidelines for ensuring credibility. Instead there are heuristics and checklists from agencies such as HON (Health On the Net 2011) that are based on perceived best practice rather than evidence of effect (see Chapter 2: Literature Review). This advice is seldom completely followed by web developers (Luo and Najdawi 2004b).

A particular problem with many Internet interventions is high dropout rate. For example, the successful "Down Your Drink" web intervention which aimed to reduce participant's alcohol consumption had a 38% (N=7581) dropout in the first week and only 6% of participants completed all 6 weeks of the intervention (Linke et al. 2004). Programs achieving low attrition are often costly and involve several additional modes of contact (Brendryen and Kraft 2008). The effort involved in assembling an intervention and the large numbers that are created annually mean that any process which could improve effectiveness (even a small amount) would be of widespread benefit. Surface credibility may be a candidate for affecting the initial impression visitors have of an intervention which may result in a larger number of participants and greater adherence.

What is needed is a robust evidence-based study of the effect of high and low credibility on an e-health intervention administered under natural conditions. If a difference in intervention effectiveness is present between a highly credible site and a low credibility site then it can be used as evidence of the benefit of adhering to current credibility practices. It is hypothesised that the effect size of improving credibility might be small but when implemented across a large number of e-health interventions could have a large cumulative impact.

If no difference can be found between a highly credible intervention and low credibility intervention then questions will arise as to whether current practices are ineffective and

whether new approaches to building credibility are needed. Such a finding would be dependent on demonstrating that the experiment was robustly designed, representative and generalisable.

1.4 Research question

The main research question that this thesis deals with is:

'Can increasing surface credibility improve e-health intervention effectiveness?'

This question is explored through two empirical studies. The first study is described in Chapter 3 and consisted of the development of an e-health intervention targeting exercise. The intervention was modified to have either high or low surface credibility. Site browsing behaviour and intention to exercise were used as **subjective** outcome measures of site effectiveness. This was followed by a multi-centre study targeting organ donation registration behaviour. In this second study, described in Chapter 4, a direct measure of registration was taken giving an **objective** comparison of site effectiveness. The first step, however, was to conduct a literature review. This review is described in Chapter 2.

Chapter 2: Literature Review

2.1 Review scope and methodology

The idea to investigate credibility came from the book 'Persuasive Technology: Using Computers to Change What We Think and Do' by (Fogg 2002a). This book introduces the idea of computers as persuasive agents. However, it was the chapter on credibility which was most interesting. This chapter includes a summary of its author's 2001 work exploring how web users make credibility assessments while browsing the Internet (Fogg, J Marshall, et al. 2001).

Research began with a literature review. As B.J. Fogg is a research leader in web credibility his publications and online resources list formed the start point for the literature review (79 papers) (B.J. Fogg 2007). Two other authors who have written widely about credibility are Miriam Metzger and Andrew Flanagin from the Credibility and Digital Media research centre in UC Santa Barbara. These two authors have published a large bibliography (630 papers) (M. Metzger and A. Flanagin 2010) . All papers identified as relevant in the Fogg bibliography were also present in the Metzger/Miriam bibliography. These bibliographies formed the starting point of the literature review followed by traditional methods such as web searches and reference list following.

There is a slight difficulty in terminology when discussing online credibility. There is widespread support for the theory that specific parts of a website either heighten or lower visitor credibility perceptions. This could include things such as privacy policies, recognisable brand icons, photographs etc. These have been described variously as credibility 'cues', 'factors', 'attributes', 'indicators' and 'markers'. The term 'factors' was chosen for this project as it was the most commonly encountered.

As part of the literature review, a systematic review of was conducted on the 630 paper Miriam/Metzger bibliography. 12 papers were inaccessible. The remaining papers were evaluated by title and abstract resulting in 335 being dismissed as irrelevant to this research. The remaining 283 papers were read in full, 148 of these were dismissed as not relevant in an e-health context. This left 135 papers exploring web credibility which would be useful for informing the research.

Of the papers that were dismissed, many focused on public perception of the credibility of the World Wide Web compared to traditional media (e.g. newspapers). Another common topic was development of information searching skills in young people. This reflects the wide range of disciplines that investigate credibility such as journalism/mass communication and librarianship.

The papers reviewed employed 5 broad methodologies to investigate credibility (Figure 1). Three methodologies involved user studies, the other two methodologies were literature reviews and expert evaluations.
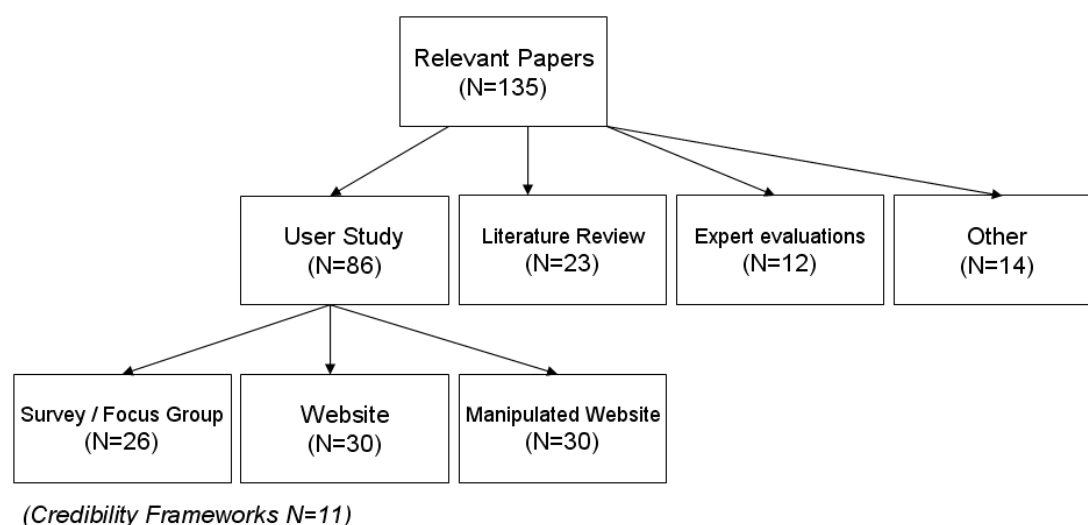
Figure 1 - Categorisation of papers reviewed

23 relevant literature reviews were found which proved useful in establishing a broad overview of current research into credibility. The most comprehensive reviews are (Pornpitakp 2004) and (Rieh et al 2007). 14 papers did not fit the methodology groups identified. This was because they were discussion pieces, editorials, letters or described software development or rating systems (without an associated study or literature review). 12 studies involved researchers evaluating the quality of Internet resources directly, these are classified as Expert evaluations.

The remaining 86 papers describe work which involved Internet users directly. The 3 methodologies encountered were:

- Questionnaire / Survey studies
- Website evaluation studies
- Manipulated website studies

Each methodology and accompanying papers are described in their own section (see below).

11 frameworks for modelling how credibility judgments are formed were encountered during the literature review. An overview of each framework is discussed below (see 2.3 Frameworks). Some of the frameworks are based on user studies in which case they are also discussed under the relevant methodology chapter.

2.2 Other literature reviews

23 other relevant literature reviews were encountered during the literature review. The largest and most directly relevant are Pornpitakp (Pornpitakp 2004) and Metzger *et al.* (Miriam J Metzger, E. Hall, and Barbara 2005). Both papers chronicle research into credibility across a variety of disciplines, beginning with early work into newspapers and mass media, followed by work on Internet credibility and then describing the various studies into the effects of credibility in practice.

2.3 Frameworks

In total, 11 frameworks were encountered (Chong and Wong 2003; Corritore et al. 2005; Egger 2001; Eysenbach 2002; Fogg 2002b; Hilligoss and Rieh 2008; Metzger 2007; Rieh, Young, Danielson 2007; Sillence, Pam Briggs, and Fishwick 2006; Y. Wang 2005; Wathen and Burkell 2002). These frameworks are described below in alphabetical order.

Chong and Wong (Chong and Wong 2003) have developed a model focussing on ecommerce transactions based on 1000 product reviews. In the framework, Seller (e.g. eBay seller) and Intermediary (e.g. eBay) are defined as separate entities that each require trusting. The end measure of this framework is intention to purchase and incorporates the covariate perceived value. The elements of trust identified by Chong include perceived integrity, perceived competency and perceived benevolence. The framework is not very applicable to behaviour change interventions other than suggesting that when including external resources (e.g.

aggregate news stories) high quality and recognisable sources are selected. In this context, an intervention could act like an intermediary.

Corritore's model of on-line trust (Corritore 2003; Corritore et al. 2005) has credibility as a sub-component of website perception (Figure 2). This framework illustrates both the iterative nature of credibility evaluation and external factors which may affect perceived credibility (e.g. if a user has been recommended to the site by a friend). Both Chong (Chong and Wong 2003) and Corritore identify risk as a key component; if nothing is at risk then trust should be easier to establish.
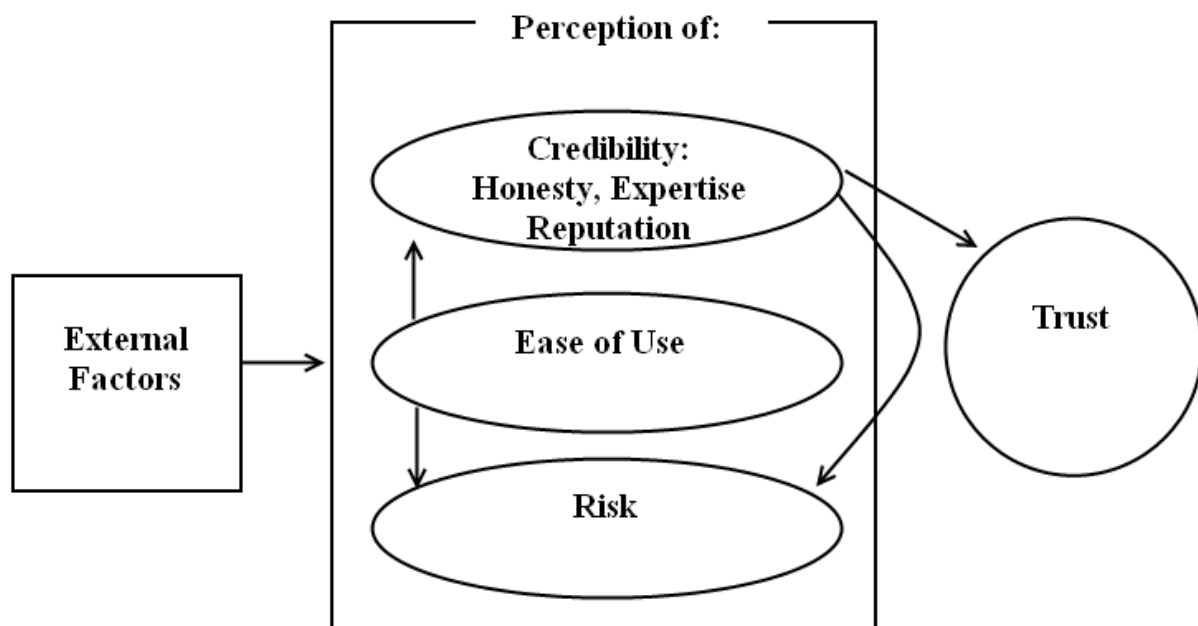
Figure 2 - Corritore's model of on-line trust (Corritore 2003)

The Egger (Egger 2001) framework is similar to Corritore in its heavy focus on ecommerce. It describes 'Pre-Interactional Filters' which are things a vendor can do to promote their site and improve brand image outside the website. The other 2 components described in the framework are 'Interface Properties' and 'Informational Content', both of which include surface credibility factors such as referencing, data policies and branding. The distinction seems to be whether it relates to customer data / information bias ('Informational Content') or usability and aesthetics ('Interface Properties'). This framework is not very useful here because of its broad categories and focus on ecommerce.

Eysenbach was the first credibility researcher to create a framework focusing specifically on health interventions (Eysenbach 2002). His theoretical framework focuses on surface

credibility and may be useful to e-health intervention developers (Figure 3). The split between 'Technical Criteria' and 'Content Criteria' is very useful for framing the research. The critical path for behaviour change in this framework is through complete, accurate and useable content. The unknown interaction in this framework is whether credible design features and disclosure of editorial policies, advertising etc also mediate behaviour change. This framework informed what credibility factors were omitted from the studies described in this thesis: any that make the website unusable, inaccessible or degrade content accuracy/completeness (**See** 2.6 Review summary and impact on research). Eysenbach does not explain how he assembled the framework or whether it was validated but it appears to be based on his considerable research experience in the area (Eysenbach 2001; Eysenbach and Kohler 2002; Eysenbach 2002; Eysenbach and Powell 2002).
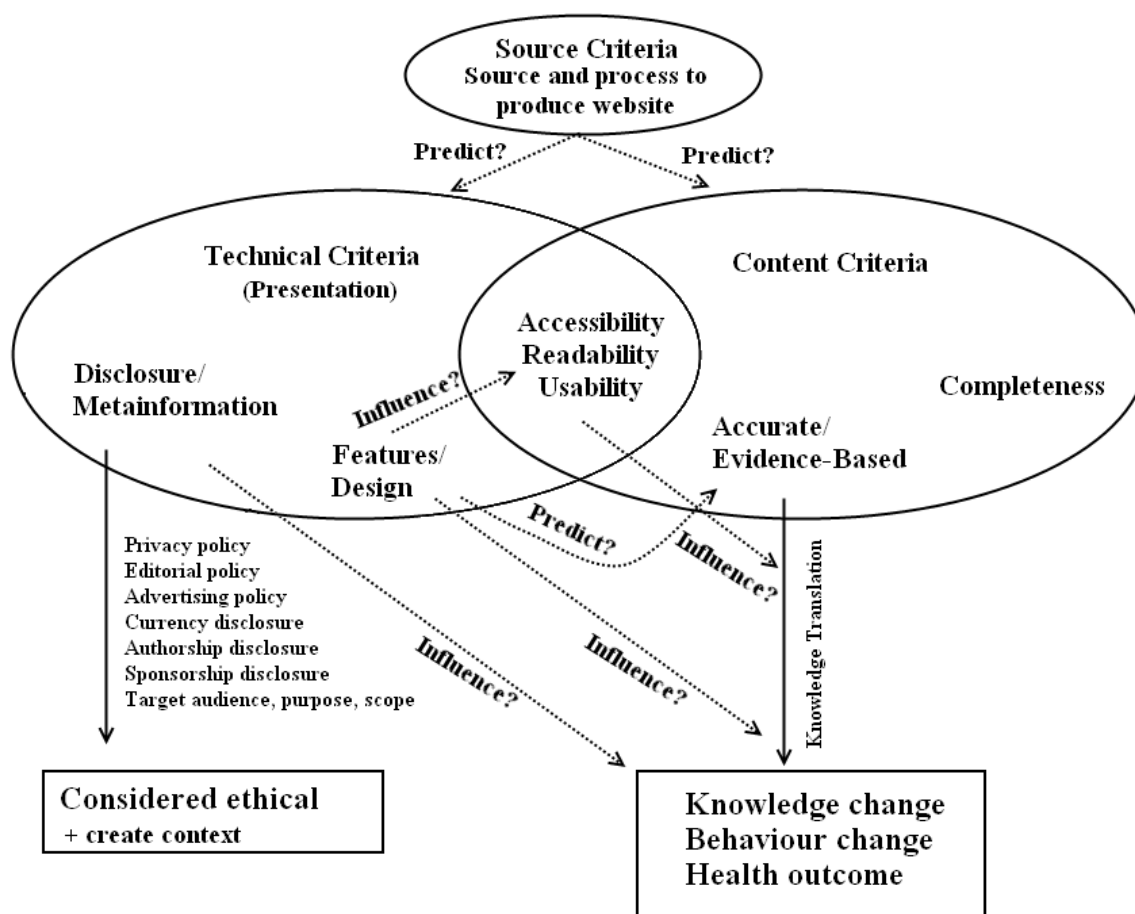
Figure 3 - Eysenbach's conceptual framework of quality markers (Eysenbach 2002)

B.J. Fogg (Fogg 2002b) hypothesizes that credibility is reliant on design factors on a website. The effectiveness of these factors is dependent on the prominence and interpretation model. Prominence is a measure of how likely a viewer is to notice an element and interpretation is a

measure of the positive or negative effect of that element on the trustworthiness of the article as a whole. This simple idea has also been expressed by Cho (Cho 1999).

Hilligos and Rieh have developed a "unified framework of credibility assessment" based on interviews with 24 students (Hilligoss and Rieh 2008). This is an attempt to define credibility assessments across all informational needs. The framework hypothesises 3 levels of credibility:

- Construct - Whether the information is considered truthful, believable, objective and reliable by the viewer.
- Heuristics - General assumptions the viewer has such as whether the media format is trusted, their assumptions about the source, attitude to endorsements/advertising and whether they favour the aesthetics.
- Interaction - Viewer's interpretation of the content and peripheral cues i.e, surface credibility.

This framework seems too high-level to be useful to website designers. The presumed / surface / reputed / experienced breakdown (see 1.1 What is credibility?) already seems sufficient for framing ways of improving website credibility. This was the first framework to be based on an empirical study; the study is discussed in Section 2.5.

Metzger has developed a "dual processing" model for credibility assessment (Metzger 2007). She hypothesises that users are either motivated to evaluate a website or not. If people are not motivated they will either make no evaluation or make a judgment based on peripheral elements and heuristics (does it look credible?). If people are motivated to perform a detailed evaluation then they will perform a systematic/central evaluation if they are able, if unable they will perform the heuristic/peripheral review. This framework is based on 5 years of online surveys totalling 2100 participants. While survey studies on credibility are very subjective, they are sufficient for the broad nature of the framework. User motivation in this framework is roughly equivalent to "perceived value" in Chong's framework and is an important point to consider when studying credibility.

Rieh *et al.* (Rieh, Young, Danielson 2007) have conducted a comprehensive literature review breaking down credibility across the various research disciplines in which it is studied (health, medicine, economics, journalism etc). This was used to inform the development of a

multidisciplinary framework. The purpose of the framework is to contextualise the areas of credibility which can be studied (Table 1).

Area	Summary
Construct of credibility	Evaluating what credibility means in a specific domain (newspaper, online etc) and how it interacts with information quality, relevance and usefulness.
Orientation toward targets of credibility assessment	Identifying what users view as source i.e. do they consider the website hosting the material to be the source or the people who created it or the origin of the specific content (e.g. in the case of a news site)
Credibility assessment processes	The traditional study of presumed, surface, reputed and experienced credibility and how it influences perceived credibility.
Situational aspects of credibility assessment	The extent to which environment affects credibility related behaviour (e.g. experimental environment, assigned task etc).
Evaluator background	How users vary in credulity, what factors influence how easily users believe content etc.

Table 1 - Summary of Reih's Multidisciplinary Credibility Framework

The relevance of this framework is similar to Eysenbach's in that it contextualises the research. In the case of the studies described in this thesis, the focus is on the 'Credibility Assessment Processes' and its impact on intervention effectiveness.

Sillence *et al.* (Sillence et al. 2006) have created a 'staged model of trust'. This model is very similar to Metzger's 'dual processing' model in that users perform a "rapid screening of sites, based on heuristic analysis" or a "systematic evaluation". In this model however web users always employ the heuristic analysis first regardless of whether they progress to a deeper analysis. An additional stage is added at the end of the diagram to describe how users utilise the site by either adding the knowledge to a knowledge pool collected across multiple sites or as a repeat source which is referred to again and again. Both heuristic analysis and systematic include only surface credibility components such as visual appeal, identity, brand, advertising, referencing, site motivation etc. The site utilisation section is influenced by

things such as update frequency, user generated content and personalisation. The framework does not add significant new knowledge over that of the other frameworks.

Wang (Wang 2005) assembled a framework of "trust-inducing features" based on an extensive literature review. These features include things such as aesthetic appeal, navigable menus, branding, privacy policies, photographs of authors etc. The framework groups these features into 4 categories: graphic design, structure design, content design and social-cue design. The grouping is not particularly relevant or useful in understanding how features contribute to users' credibility judgements or how it influences behaviour. Several of the categories have wider reaching effects than 'inducing trust'. Poor structure for example could easily make website unusable meaning the question of whether a user trusts it or not irrelevant.

Based on a literature review, Wathen & Burkell have created a useful framework for looking at online credibility (Wathen and Burkell 2002). It is similar to Sillence but considerably more detailed (Figure 4). The first section of the diagram labelled "evaluation of surface credibility" differs significantly from 'surface credibility' as described by Fogg (Fogg and Tseng 1999). A more differential title would be 'evaluation of usability and accessibility'. The framework is useful in narrowing the research focus (as described above in Eysenbach's framework) to exclude "**anything that makes the website unusable, inaccessible or degrades content accuracy/completeness**". The framework also contributes other factors to consider such as previous knowledge, information need and stress.
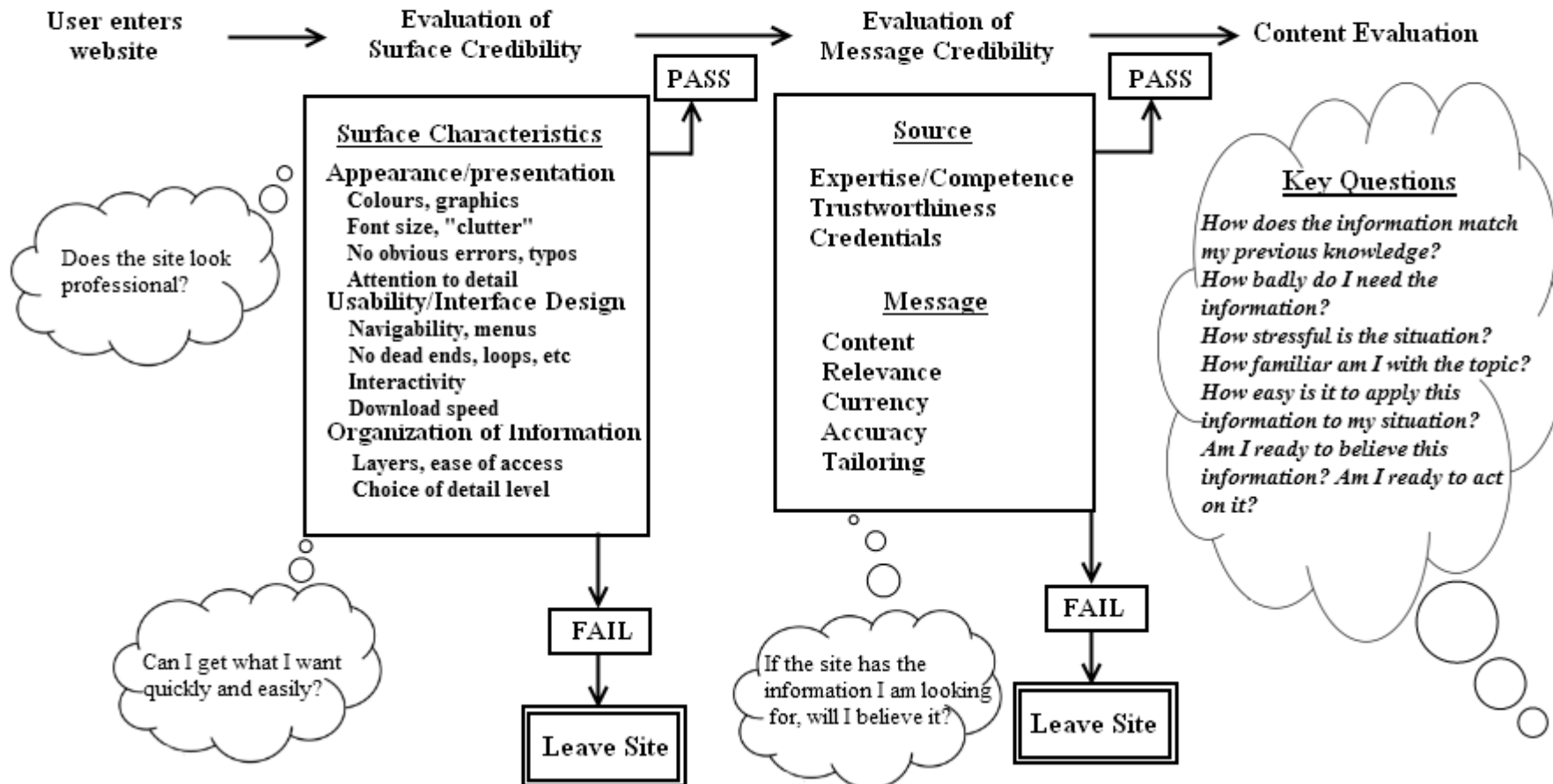
Figure 4 - Wathen *et al.* framework for on-line credibility judgments (Wathen and Burkell 2002)

When considering all the frameworks together, there are several common features which guided the research. Assessing participant's motivation (information need/perceived value) is important as it affects how they assess credibility (Chong and Wong 2003; Metzger 2007; Wathen and Burkell 2002). The idea that web users can perform site evaluations with different degrees of rigour may explain the variety of responses users give when describing how they make credibility judgements and why most users initially respond with "how professional it looks" or an analogous statement.

Common to all frameworks is the conclusion that perceived credibility is complicated and can be strengthened or weakened in many different ways. In order to deal with this complexity, the focus of research described in this thesis was restricted to surface credibility ("how much a perceiver believes someone or something based on simple inspection"). Surface credibility was chosen because it is the easiest for an e-health intervention developer to change. Evidence of the effectiveness (or otherwise) of including surface credibility factors in a web site may provide an incentive for developers to adhere to credibility guidelines. There exists a significant gap between surface credibility guidelines and implementation within the health field (Luo and Najdawi 2004a).

Most of the frameworks reviewed focus on how trust is built or how it impacts behaviour but it is also worth considering broader frameworks such as the Elaboration Likelihood Model (see Appendix 1) (Petty and Cacioppo 1986) which covers persuasion in general. This model describes two ways in which persuasion can be achieved; 'High Elaboration' is achieved when the user is interested and focussed on the message. In this situation the most convincing aspect is the content. If the message is of less interest then 'Low Elaboration' occurs in which visual appeal and credibility become persuasive factors. In general the longer someone is exposed to a message, the more likely they are to have high elaboration.

2.4 Expert evaluations

As part of the literature evaluation 12 papers were encountered which either sought to quantify the current credibility of e-health websites or investigate the tools available to users to make their own website assessments (Bernstam et al. 2005; Jadad and Gagliardi 1998; P. Kim et al. 1999; Kunst et al. 2002; Martin-Facklam et al. 2002; Mayer, Huh, and Cude 2005;

Chapter 2: Literature Review

Pandolfini and Bonati 2002; Papacharissi and Fernback 2005; Preece 1999; Resnick et al. 2000; Riel, Liljander, and Jurriëns 2001; Smith 1997).

Bernstam *et al.*(Bernstam et al. 2005) found 273 instruments for measuring website quality (of which credibility is an integral component). 65% were classified as certification companies / awards such as HON (Health On the Net 2011). These companies will assess a website according to some (often publically available) guideline and allow passing websites to display a badge indicating compliance. Such kite marks are widely used but often not recognised by web users (Cheskin Research 1999).

Of all the instruments encountered, Bernstam found only 7 which were judged to be useable by internet users. Instruments were found usable if they contained less than 10 measures and those measures constituted "objective technical quality criteria". Of these only 1 instrument (Mayo Foundation for Medical Education and Research (MFMER) 2001) had an acceptable 'Kappa' value. Kappa is a measure of evaluator agreement; when this is low it is likely that the tool is too general and leaves criteria open to interpretation. A separate tool (World Health Organization 1998) was the only one deemed useable by the public (Flesch-Kincaid readability rating > 60). Neither of these tools was available at the time of writing this thesis and had to be referenced through the internet archive. This study highlights the difficulties of developing a rating system for use by internet users and maintaining permanency let alone widespread adoption.

Peer reviewed credibility rating systems identified during the literature review include AIMQ (Lee et al. 2001) and DISCERN (Charnock et al. 1999). DISCERN involves making subjective judgments such as "Is it balanced and unbiased?" and "Does it achieve its aims?". It does have some more useful items based on common credibility factors such as "Is it clear **when** the information used or reported in the publication was produced?". The AIMQ tool is less useful because it only lists general areas that make a quality website e.g. Free-of-Error, Completeness and Security. Neither tool was specific enough to inform the selection of surface credibility factors to explore during the studies described in this thesis.

Other authors have previously investigated the effectiveness of website rating systems including Jadad and Gagliardi (Jadad and Gagliardi 1998) and Kim *et al.* (Kim et al. 1999).

Chapter 2: Literature Review

In each case no suitable existing tools were found. Smith (Smith 1997) even went so far as to recommend that librarians assemble their own personal rating tool.

In order to perform research into improving credibility it is first necessary to demonstrate that there is a lack of credibility in current internet sites. Also of interest is investigating the correlation between surface credibility and website quality. Several papers were encountered addressing these challenges. In the many cases one or more 'expert users' were asked to rate the websites being investigated.

Kunst (Kunst 2002) has looked at how strongly credibility factors correlate with the accuracy of information on medical websites (N=121). Accuracy was measured using "rigorously developed, peer reviewed, and published guidelines". The 5 reviewers were medical professionals including general practitioner, consultant and registrar. Credibility factors evaluated included source, currency and "evidence hierarchy" (prioritisation of information and indicating where there is little supporting evidence). The study found slight correlation between credibility and quality. This means that websites can appear credible but still contain inaccurate information. Unfortunately, no Kappa (reviewer agreement) statistics are presented implying that only one expert evaluated each page. This weakens the validity of the study as different experts can often disagree when rating a page (Craigie et al. 2002).

Also looking at how credibility correlates with accuracy, Martin-Facklam *et al.* (Martin-Facklam et al. 2002) focussed on websites (N=287) discussing the herbal remedy St John's Wort. This remedy is only recommended for treatment of depression (Royal Pharmaceutical Society 2001). Websites which recommended it only for this use and listed appropriate drug interactions were rated as accurate. Credibility factors evaluated included referencing, authors listed, contact details, currency, disclaimer, editorial policy, animation and financial conflict of interest. Rating was done independently with rater agreement varying from k=0.44 to k=1.00 (mean k=0.72). Disagreements were discussed and agreement reached. This is a much more robust study methodology because it focuses on a single health topic that is simple enough to categorise reliably. The study found that site referencing (to scientific material) and having "no financial interests" were strongly associated with accuracy.

Fallis and Frické have also looked at this question (Fallis and Frické 2002) and found that only HON certification, having an organisation domain (.org), and displaying a copyright

message correlated with information quality and completeness. Factors which did not correlate with accuracy included presence of a date, author qualifications and absence of advertising. Date was identified as problematic factor due to the restriction of the study to fever treatment websites. Fever treatment practice "has not changed for a considerable time". This work was later continued by Frické in the domain of carpal tunnel syndrome treatment (Frické et al. 2005). In this study none of the factors evaluated correlated with quality (including HON certification). Several external tools **were** found to correlate with higher quality including Google Toolbar rating and number of 'in links' (websites linking to source). When looking at 'in links' Rafiei and Mendelzo recommend also giving consideration to the topic / credibility of the linking site (Rafiei and Mendelzo 2000).

In contrary findings, Griffiths and Christensen (Griffiths and Christensen 2005) found that the DISCERN website evaluation tool correlated highly with site quality. DISCERN is a scoring system including credibility factors such as unbiased reporting, transparency, referencing and external linking (Charnock et al. 1999).

It is clear that current internet health websites are far from perfect with many containing inaccurate or incomplete information. The studies reviewed had mixed results when investigating how credibility correlated with accuracy. Ultimately, whether or not credibility factors are a sign of quality is less relevant for site authors than web users. The aim of this thesis is not to determine whether credible sites contain accurate information. The question is rather: can increasing surface credibility improve an e-health website's effectiveness (assuming its information is already accurate)?

Before this question could be answered, it was necessary to determine potential approaches for improving surface credibility and an experimental methodology for measuring the effects. To do this, previous user studies into credibility were examined.

2.5 Empirical studies into credibility

2.5.1 Studies using survey/focus group methodology

The first category of user study encountered during the literature review has been named 'survey/focus group methodology'. This methodology includes recruiting Internet users to an online/telephone survey or to attend focus groups or one to one interviews. Studies were

assigned to this category if they did not involve any stimulus or assigned task. The definitive paper in this category is BJ Fogg *et al.* 2001 (Fogg, Marshall, et al. 2001) due the large number of participants, early publication date and exclusive focus on credibility. In this study 1400 Internet users were asked to rate how much each of 51 credibility factors impacted their assessment of the believability of a website. An example factor is "The site makes it hard to distinguish ads from content". These factors were measured with a Likert scale from -3 to 3. Factors were identified via literature review, student interviewing and group brainstorming.

The finding was that "being rarely updated", "having typographical errors", "broken links" and "downtime" were the greatest detriment to credibility. This group was narrowly followed by commercial implications including advertisements (particularly those that were hard to distinguish from content) and subscription models. The most productive elements at increasing believability include proof of "real world" existence such as physical address, phone number and email responsiveness. The second most prevalent believability improving feature was "professional design" and being "arranged in a way that makes sense". The categories used in this study were very different from those identified in Fogg's later study (Fogg et al. 2003) where users were required to describe how they made credibility judgements without any prompts. This may indicate that users agree they should check for certain categories of credibility factor when asked directly but do not think about it when actually performing a credibility assessment task.

Telephone based surveys reviewed focused on how people view and use the Internet in general. (Abdulla et al. 2002), (Amsbary and Powell 2003) and (Nozato 2002). All these studies found that people view the Internet as equally or more trustworthy than traditional media (newspaper / television). This extended to the health area (Hesse et al. 2005) where Internet was the second most trusted source of health information after medical practitioners (GP).

The approach of asking directly about credibility factors is somewhat flawed. The main problem with this approach is that it measures what people think they do, not what they actually do. A good example of this weakness is in Treise *et al.* (Treise et al. 2003) where participants were asked "which of the four [domain (.edu .com .org .gov)] versions they would be most inclined to believe". The authors do not ask whether participants would

notice the domain during regular browsing (their question assumes this is already the case). According to Deborah *et al.* (Charnock and Shepperd 2004) only 41% of people reported ever having "applied quality criteria to online information" of which only a subset would likely have consulted domain name.

Rippen (Rippen 1998) used a group of health experts in a focus group to investigate what components make up quality in online health material. Credibility was identified as one such component, subdivided into source, currency (are dates listed for content), relevance and 'site evaluation' (who reviews content). Other credibility factors were also mentioned including disclaimers, disclosure of purpose and data collection statements. The results of this focus group were useful in informing what credibility factors to investigate in the studies described in this thesis.

Peterson *et al.* (Peterson, Aslani, and Williams 2003) found consumers (N=46) primarily describe relying on visual design to make credibility judgments when evaluating medical information online. Peterson *et al.* hypothesised that consumers have a low level of understanding of the structure of the Internet/search engine/browser relationship. Some participants did not know what search engine they used and many used suboptimal search terms or typed in whole questions. Given the increase in use of the internet since the study was conducted, internet users may be considerably more competent today. Strategies employed in evaluation of medical information by participants included questioning the author's motives (bias), spotting one-sided information and visiting multiple sites.

Within this methodology (survey/focus groups) there are more robust studies. Sillence *et al.* (Sillence et al. 2004) used a 1-hour browsing and searching session to prime users before group discussions. The advantage of this approach is that participants only had to report their recent behaviour rather than trying to recall distant past or imagine hypothetical situations. Rieh & Hilligoss (Rieh 2004; Rieh and Hilligoss 2008) further improved on this approach in two studies by using web-based diaries in which participants (N=24 and N=12) recorded their information searches. These diary studies found students were more concerned about credibility when they had a high personal stake in the searches they were performing (e.g. health/financial). The effect of risk/personal stake on site evaluation fits with several of the credibility frameworks described above (see 2.3 Frameworks).

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In 2005, Twait (Twait 2005) further improved upon the diary approach by using Think Aloud (participants describe their actions/reasoning aloud while performing an activity) and direct observation of students while they pursued research. He found that only 38% of people mentioned reputation/credibility in their criteria for selecting resources. There is evidence that different demographic groups (education level, income, health information needs and health beliefs) report evaluating credibility differently (Dutta-bergman 2003). Likewise (Liu and Huang 2005) found differing approaches to credibility evaluation in Chinese vs. American students using a paper survey. American students were more likely to identify design elements (strange fonts, broken images) and source credibility (domain, site sponsors). Chinese students were more focused on content (repetitive/biased content, not supported by data, outdated content, low usage, small website).

While direct observation may result in more accurate reporting of behaviour it will likely still provide a distorted response i.e, people may be more discerning because they know they have to report on it.

There is considerable research in librarianship and primary/secondary school education investigating how children and students seek information. Agosto (Agosto 2002a) used a focus group of 11 ninth and tenth grade students. The study findings were similar to the studies with adults described above: a focus on graphic appearance/design and quality of information. Additional factors identified included time pressure (deadlines etc) and 'machine-specific colour' (one experimental computer had altered monitor brightness/contrast settings).

Other researchers using a focus group methodology to investigate online health include Bernhardt *et al.* (Bernhardt et al. 2002) who looked at barriers to online health specifically focusing on human genetics among lay population. They asked participants questions about health website usage with a specific focus on genetics and genetic risk factors (genetic heritage). Many useful quotes came out of the research but there is no categorisation or weighting calculations. Interesting findings include a propensity for participants to remember only the most sensationalised news on the topic, general concerns about privacy/data protection and general scepticism over the quality/trustworthiness of online information i.e. presumed credibility.

An online survey by Huntington *et al.* (Huntington et al. 2004) found 45% of people reported finding misleading health information online. Misleading information was found more often by respondents who had searched for new treatments and alternative medicines. The most common reason for rejecting a site was contradiction with other findings and no sources or 'unqualified sources'. Only 49% of respondents reported checking website sources, a similar figure to that found by (Charnock and Shepperd 2004) (see above).

Murray et al conducted two telephone surveys, one of 3209 US citizens (Murray et al. 2003b) and one of 1050 physicians (Murray et al. 2003a). Participants were very positive about the role of the Internet, believing it gave patients more confidence (97%) and greater understanding (96%). While 81% of participants found it easy to find high quality information, only 35% of patients felt they were 'very good' or 'excellent' at determining whether information was reliable. The physician user group estimated 20% of patients had brought health information from the Internet to a consultation and that it had generally been a positive experience. In their estimation, most patients were either 'poor' or 'fair' at evaluating health information (84%).

While many additional studies were found that focused on comparison of online media with traditional media (e.g. newspapers), most were dismissed as being too far removed from the process of online credibility judgments.

These studies were useful for gaining a general understanding of how credibility judgments are formed and in some cases identifying potential credibility factors (e.g. including an editorial policy). This methodology however, is not suitable for assessing the potential of credibility factors to improve e-health interventions. In order to assess the effectiveness of presence/absence of credibility factors, a more robust experimental design would be needed.

2.5.2 Studies using website evaluation methodology

The second category of user study encountered during the literature review was 'website evaluation'. 'Website evaluation' is a more structured form of study in which one or more websites are used as stimulus for participants to evaluate. Often 2 websites are displayed side by side and participants are asked to describe why one is more credible than the other or which they would be more likely to use ('site preference'). There is some overlap between

this category and the survey/focus group methodology in some cases e.g. where a browsing task was undertaken prior to discussion.

This study methodology was not suitable for assessing the potential of credibility factors to improve e-health intervention effectiveness but it was critical in deciding which credibility factors to assess and which to dismiss.

The largest study using the 'website evaluation' methodology (N=2684) was conducted by Fogg *et al.* (Fogg et al. 2002). In this online study, participants were shown two websites on the same topic (ecommerce, entertainment, health etc) and asked to choose which looked more credible and explain why. The comments participants left were categorised into topics by Fogg. Looking at the topics he identified, they fall into 3 broad areas:

- topics concerned with appearance/aesthetics of the site
- topics concerned with the credibility of the content
- topics addressing other forms of traditional credibility (source, surface, inherited, experienced)

Fogg's comment topics are presented below with annotations showing the various areas of concern users had (Table 2).

	Percent (of 2,440 comments)	Comment Topics (addressing specific credibility issue)
1.	46.1%	Design Look
2.	28.5%	Information Design/Structure
3.	25.1%	Information Focus
4.	15.5%	Company Motive
5.	14.8%	Information Usefulness
6.	14.3%	Information Accuracy
7.	14.1%	Name Recognition and Reputation
8.	13.8%	Advertising
9.	11.6%	Information Bias
10.	9.0%	Writing Tone
11.	8.8%	Identity of Site Operator
12.	8.6%	Site Functionality
13.	6.4%	Customer Service
14.	4.6%	Past Experience with Site
15.	3.7%	Information Clarity
16.	3.6%	Performance on Test by User
17.	3.6%	Readability
18.	3.4%	Affiliations

(Categories with less than 3% incidence are not in this table.)

Broad Topic Area

- Related to Content Quality/Credibility
- Related to Appearance / Aesthetics
- Traditional Credibility Factors

Table 2 - Comments given by participants when asked to rate the credibility of 2 websites (Fogg et al. 2002)

This paper was an important step in narrowing the focus of the research. It has already been described how the focus was restricted to 'surface credibility'. This paper lead to further restricting the focus to **website credibility factors which would not degrade the content quality of the website or affect independent factors such as aesthetics/usability**. Understanding how information accuracy, typographical errors, information usefulness etc affect credibility judgments would be less useful to intervention developers than understanding what additional components could be added around the content to reinforce trustworthiness. No web designer deliberately misspells words. Also excluded were aesthetic and usability factors as they are already being widely studied within computing, psychology and marketing and because they are likely to have wider impacts on site perception than just building/eroding trust.

One unfortunate limitation of Fogg's study is that there is no indication whether participants who questioned one factor e.g. company motive, were the same participants who questioned

other factors. This would have given a better picture of the overall proportion of participants who were concerned with traditional credibility factors when making their assessments.

Fogg carried out a follow up study in 2002 (Stanford et al. 2002) in which he compared expert users and 'consumers' using the same paired site methodology. Categories identified were similar to the previous study but the prevalence of comments differed with experts being far more concerned by traditional credibility factors than visual factors (see Figure 5).
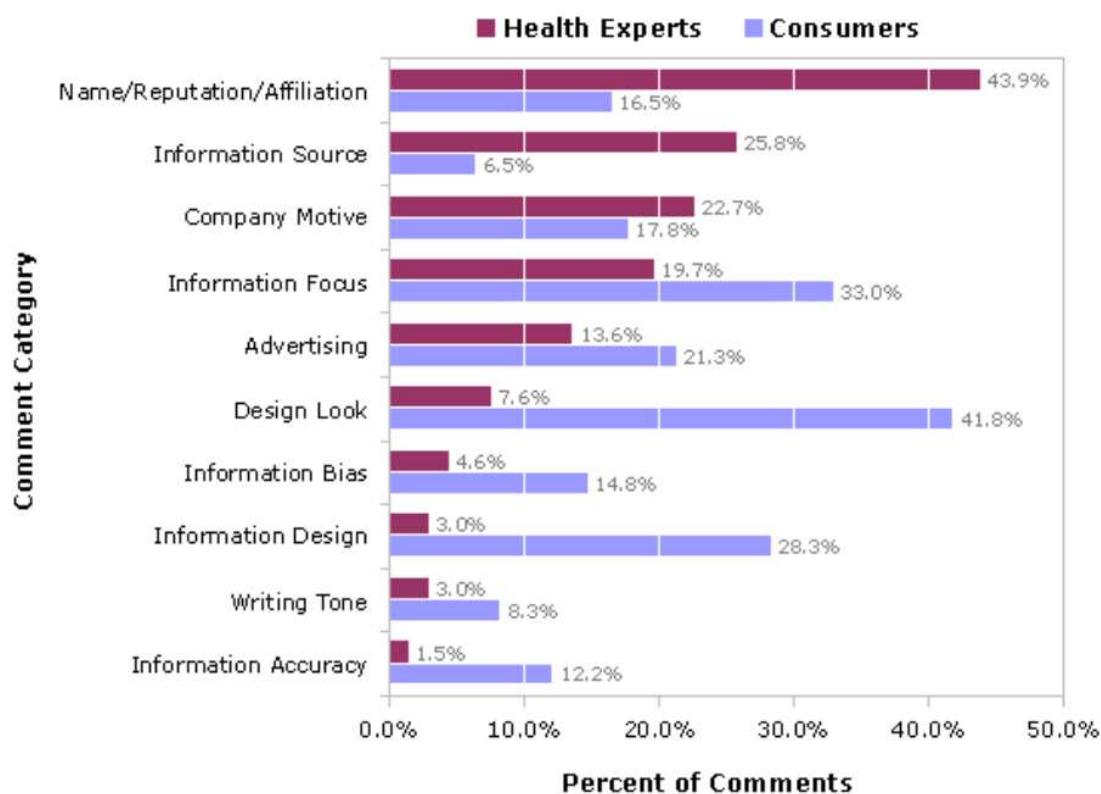
Figure 5 - The difference between how experts and consumers assess credibility (Stanford et al. 2002)

Other researchers to use the 'website evaluation' methodology include Agosto (Agosto 2002b) who directed participants (N=22) to evaluate 3 websites on the topic of NASA, hurricanes and the Boston Museum of Science. Participants were told to consider what they liked about the site or would change. This is a stronger methodology than that used by Fogg because the aim of the evaluation is not explicitly labelled as trust which may bias responses. Participants focused on the colour palette (preferring bright), font size (preferring large) and showed a preference for animation. Personal preference played heavily in the evaluations of the sites, participants who disliked meteorology rated the hurricane site negatively. This demonstrates the impact of interest on site evaluation as hypothesised in some of the frameworks discussed

earlier (see 2.3 Frameworks). Future studies should either control for attitude to content or direct participants to try to remain objective in their evaluation.

The focus of users on visual design was also found by Roberts *et al.* (Roberts et al. 2003) who conducted a study into 12 unrelated websites. The student participants (N=48) again indicated that attractiveness was the most important factor in making their credibility judgment. This was followed by consistency, ease of use and response time of the site.

Schenkman & Jonsson (Schenkman and Jönsson 2000) looked specifically at visual aesthetics/design which has come up in several studies discussed earlier. In a side by side comparison evaluation of 13 sites, the student participants (N=18) indicated a preference for graphics, overview (e.g. summary text) and beauty. Although it is useful to confirm experimentally that web users prefer attractive sites with lots of pictures, this should already be common knowledge for most website developers.

Maglaughlin and Sonnenwald (Maglaughlin and Sonnenwald 2002) investigated how students make judgments about whether academic journals and electronic resources are useful and relevant to their studies. Their methodology included having students highlight all areas of the document which informed their decision whether or not to use the document in their studies. This is a novel approach although some comparison could be drawn with eye gaze tracking (using a camera to calculate where a participant is looking). The study found time saving measures such as comprehensive abstracts to be favoured in addition to common credibility factors already encountered such as recency, citing other credible works and author academic standing and institution. Many of the points raised by the students are novel but do not directly relate to credibility. This is because intention to use is not the same as credibility but the two are closely linked (Nicolaou and McKnight 2006). In Necolaou & McKnights' model, intention, situational importance, risk propensity and disposition to trust all contribute to intention. This explains comments such as "anything... that gives sort of a broad overview... saves me a ton of time."(Maglaughlin and Sonnenwald 2002).

The consistent findings in favour of well structured and attractive resources are interesting but are already covered by good web development practice. High quality websites should already be built to be as attractive and useable as possible. It was decided to constrain the credibility factors being investigated solely to those which might not already have been

implemented by a competent intervention developer e.g. privacy policy, reference list, author contact details etc.

In addition to his work described above, Rieh has also carried out a study using the 'website evaluation' methodology. His study investigated how information quality correlated with 'intention to use' (Rieh and Belkin 2000). 15 participants performed 4 searches each for information relating to research, travel, medicine and computer purchase. Again several credibility judgments were made including currency, reliability, authority and credibility. Participants used a variety of credibility factors to inform these judgments including:

- content includes comparison
- informed by research (e.g. citation)
- visual appeal
- design structure
- use of graphics
- reliability
- URL domain(e.g. .com)
- author
- author qualifications
- reputation of source (i.e. reputed credibility)
- prior use of the site (i.e. experienced credibility)
- page rank in search

This research covers a broad range of forms of credibility (including reputed and experienced) which contrasts with other studies such as Fogg (Fogg et al. 2002). This may be related to the use of experienced scholars including 4 professors or it could be related to innate difference between a search task and an evaluation of specific websites a user may have no experience of. Interestingly no reference was made to adverts or company motive.

Some researchers have combined methodologies. For example, Briggs *et al.* (Briggs et al. 2002) combined an online survey (N=2500) which had no stimulus with a website evaluation study (N=15) looking at mortgage advice. Similarly to the findings of the studies described above, participants reported clear layout, fast responsiveness and seals of approval as improving credibility. "Opportunity for communication by other means" was a new factor

identified but can be considered equivalent to contact phone number, email or address. In the online survey an 18 question questionnaire asked participants which factors contributed to their use of online advice websites. 'Knowledgeable' and 'expert source' were identified as being most likely to lead to usage of a site followed by 'previous use of the site'. The questions are useful for ordering the relative importance of categories but there is no exploration of how participants arrive at conclusions such as whether a source is an 'expert' or not.

Cheskin Research (Cheskin Research 1999) also adopted a combined methodology comprising of various online surveys and a site comparison of well known ecommerce websites. The findings and methodology of this report are not presented clearly. However, several interesting points are discernible. The most widely recognised site award (VeriSign certification) was only recognised by 33% of participants. This demonstrates the futility of asking users directly what impact factors have on perceived credibility without first confirming they know what they are. The report ends with the conclusion that trust is not the most major predictor of product purchase (based on the correlation of participant previous use and 'would trust' rating). The most important purchase predictors were 'convenience', 'ease of use', 'good price' and 'wide product range'. One thing that can be taken from this study is that **there are likely many other ways of improving the effectiveness of e-health interventions than credibility e.g. aesthetics, usability, real world promotion of website etc. These may have a greater effect than credibility but have already been widely researched and are, in most cases, well understood by intervention developers.**

The sites used in 'website evaluation' methodology studies are not always chosen by the study designer. Both Hong (Hong 2006) and Jenkins *et al.* (Jenkins, Corritore, and Wiedenbeck 2003) instead looked at how participants searched the web when given a health related search task. They analysed the final websites selected by the participants. Hong (N=84) used a regression analysis to determine what features on selected websites were associated with high credibility rating. He divided site features into two categories: "web features" (third party endorsements, privacy policy, site authorship, contact information, navigation tools and HON certification which were associated with credibility and "message features" (quotations, statistics, authorship, references, Information currency and selection criteria). Jenkins *et al* (N=23) used a Think Aloud methodology (Lewis 1982) and found that novice users were easily distracted by images, performed very little data verification and in

some cases failed to complete the search task altogether (locate information on osteoporosis). Expert users mentioned the source credibility (site sponsor), site terminology e.g. medical language and navigated deeper on websites.

Using a search task potentially makes the evaluation process more natural. However, this comes at the cost of a higher number and potentially more diverse range of websites being viewed which makes analysis more complicated. Websites will also differ on levels other than credibility e.g. aesthetics, usability, size etc all of which may have substantial effects on participants evaluations (whether they are conscious of it or not).

Evaluation of medical information is important both on and off line. Coulter and Entwistle (Coulter and Entwistle 1999) asked patients and health experts to evaluate both print and multimedia health information. They found that the main topics raised were the same regardless of media, including the need to: indicate primary sources for articles; show currency; use appropriate tone; avoid frightening/gory images. Eysenbach has looked exclusively at online health information in a user study in 2002 (G Eysenbach and Kohler 2002) which identified several credibility factors including being linked from a trustworthy site (i.e. reputed credibility), presence of email address and picture of site owner and quality seals. Advertising was also raised as a concern. Although advertising is not isolated to online media it may be more common than in offline media patient health information.

One novel approach to looking at credibility has been taken by Dhamija *et al.* (Dhamija, Tygar, and Hearst 2006) who asked "what makes a bogus website credible?". The focus of the experiment was on domain name and HTTPS security. The phishing websites evaluated were 90% effective at deceiving users, the inclusion of credibility factors in the content of the site outweighed the warnings coming from the browser. It is true that credibility factors may be used to harm Internet users by bogus website authors but in such a case the user is still in a better position to make an assessment, having more information to draw on (date, qualifications, references etc). The more information that must be falsified, the more chance there is that a user will notice an inaccuracy.

A common problem with studies using the 'website evaluation' methodology is the use of 'expert' evaluators to provide a measure of quality, completeness etc. There is evidence of significant divergence of opinion between experts (Craigie et al. 2002). This can be

mitigated by using multiple experts and reporting the statistical agreement between the evaluators.

Another problem with these studies is framing the task so that the user exhibits as natural behaviour as possible. Tedesco and Holloway (Tedesco and Holloway 2005) found that 'priming' participants with a news story highlighting unethical practices by a medical website had a significant effect on how participants evaluated a subsequent (different) health site. If a natural judgment is to be obtained, careful consideration should be given to the phrasing of the task and the wording of any supporting materials such as information sheets and consent forms.

All studies described in this section have involved participants either rating a website/search result/print resource etc or comparing two or more and expressing preference. There are several innate problems with this is approach. Firstly the large degree of variation between real websites which makes it difficult to identify which specific factor(s) caused the preference. This lack of focus is reflected in the studies outlined above which often describe broad categories such as visual design, structure and aesthetics. Secondly, performing an evaluation of a website under experimental conditions (especially when the goal is explicitly to assess credibility) may not be representative of natural browsing.

If the goal is to investigate only surface credibility or a specific credibility factor in a real website then this methodology is insufficient. These problems can be eliminated by creating the stimulus sites from scratch or modifying an existing site to change only the specific credibility factor(s) being investigated. For the purposes of this thesis, this approach is has been called 'manipulated website methodology'.

2.5.3 Studies using manipulated website methodology

The final methodology encountered during the literature review was 'manipulated websites'. These studies involved creating two or more versions of a website or communication by manipulating specific credibly factors. This could be as minor a change as placing a donate button (Harris, Sillence, and Briggs 2009a) or as large as comparing a 3d chat avatar to a plain text interface (Qiu and Benbasat 2005). This approach is not restricted to internet studies and has been used in the past with traditional media such as leaflets and letters (Aune and Kikuchi 1992; Campbell et al. 1999; Carl and Weiss 1951). In order to be included in the

literature review studies had to either include credibility as a measure or investigate the change in behaviours/attitudes related to an established credibility factor. This approach was used with offline material as early as 1951 (Carl and Weiss 1951) when Carl and Weiss found that manipulating the source of newspaper/magazine excerpts significantly affected opinion change of participants (N=244) towards the author's point of view. Sources that caused the greatest opinion shift were attribution to a journal or 'recognised expert'.

The largest study conducted using this methodology (N=574) to date was done by Flanagin and Metzger (Flanagin and Metzger 2007). This 4x2 factorial study presented a news story about the radiation risk for pregnant mothers flying as an article on a news site / ecommerce site / a special interest group / personal site. Each site was also manipulated to have either a verifiable or non verifiable name i.e. fictitious. This was done by taking exact copies of real sites e.g. www.cnn.com and modifying them to contain the study news article. In the 'non verifiable' version, the website title was changed to a fictitious company.

Flanagin and Metzger's study highlights the importance of a natural browsing environment and of measuring behaviour directly rather than relying on self reporting. They achieved the first by directing participants to the homepage of the site rather than the news article and making 'locating the radiation story' a part of the study task. The 'behavioural measure' of the study was verification of the article contents by following offsite links that corroborated the facts presented i.e. following a reference. The term behaviour measure in this context should not be confused with an **outcome behaviour** e.g. did the site make pregnant participants less likely to fly.

The study found that participants rated the perceived credibility of the news site as the highest followed by ecommerce and special interest sites (equal in rating) and then finally the personal site. Verification behaviour (following offsite links) was found not to correlate with perceived credibility and interestingly those participants that reported verifying information more actually did so less. This demonstrates how unreliable it is to ask participants directly about how they perform credibility evaluations.

Another large study (N=523) carried out using this methodology was conducted by Sundar *et al.* (Sundar, Knobloch-westerwick, and Hastall 2007). In this study participants were shown news summaries as would be returned by a news search engine. The manipulated factors

were recency, number of related articles (NRA) and source. The manipulation is particularly interesting because the recency and NRA manipulation only involved changing values in the website text rather than adding/removing big blocks of content e.g. adding a banner advertisement. Participants were asked to rate several credibility related dimensions including credibility, importance, interest, relevance, timeliness and "well-written". The study found that both NRA and upload recency affected credibility significantly but not as might be expected. Both very new **and** very old (7/29 minute and 45/48 hours) stories were significantly more credible than those in-between (11/12 hours) when the source credibility was low. However the difference between means was only ~0.8 on a 10 point Likert scale. Number of related articles also exhibited this V shape with highest credibility when there were fewest (7/8) or most (938/944) related articles. A common criticism of studies into credibility is that the findings are obvious before they are even conducted; this study demonstrates that credibility factors are not always interpreted as might be expected.

Sundar has conducted a number of other studies using the manipulated website methodology (Sundar and Nass 2001; Sundar and Jinhee Kim 2005; Sundar 1998; Sundar and Kalyanaraman 2004; Sundar, Kalyanaraman, and Brown 2003). His first study (Shyam Sundar 1998) looked at whether quotations improved the credibility of news articles. Student participants (N=56) were asked to rate the articles for credibility, liking, quality and representativeness. The presence of quotes increased credibility and quality but no change was seen in liking or representativeness. This study is interesting because it shows that just because something is more credible it may not be 'better'. It is important for researchers to explore what effect credibility has not just what makes something credible. Sundar has also looked at reputed credibility in news articles (Sundar and Nass 2001). Although it is described as source credibility in the paper the manipulation involved telling participants the article "[was] selected by" a news editor, the computer itself, other users or none. This manipulation is more about reputed credibility than source because it depends on how credible participants perceive the referrer to be. The study found no difference in credibility of referrers but small differences in liking, quality and representativeness.

In the domain of political campaigning Sundar *et al.* has investigated the effect of 'interactivity' on impression of a political candidate (Sundar et al. 2003). Interactivity was defined as the number of levels to the navigation structure. Participants (N=60) were asked to rate the candidate's dynamism, character, competence, likeability and public and education

policies. While no reference was made to credibility in the paper, character and competence are two core concepts of credibility also referred to as trustworthiness/expertise (Fogg and Tseng 1999). Participants in the medium interactivity group gave the most favourable view of the candidate. From the way the manipulation is described it is likely that the high interactivity group suffered from a usability barrier. This is because after selecting a section to read they had to subsequently select a further subheading before receiving content. The unexpected cognitive effort of selecting a subheading from a navigation page with no content may be responsible for the negative opinions of the site.

Sundar has conducted two studies into advertising that were interesting (Sundar and Jinhee Kim 2005; Sundar and Kalyanaraman 2004) but not directly related to credibility. They demonstrate that when including advertisements in a website, the structure and design of the advert affect perception of the hosting page. A summary of this work is that participants have more favourable attitudes towards slow/static adverts which are square and contain hyperlinks. These studies informed the choice of format of adverts to include as a credibility manipulation in the studies outlined in this thesis. The decision was made to use Google Adverts because they are the most prevalent on the Internet (Attributor Research 2010) and least likely to draw attention away from the host page.

Fogg has conducted two studies using the 'manipulated website' methodology, both reported in a short paper in 2001 (Fogg, Jonathan Marshall, et al. 2001). The first study (N=164) was into the effects of advertising on a variety of credibility measures (believable, trustworthy, component, credible, unbiased, expert). There are few details of exact implementation, the subject of the articles or whether advertisements were clearly distinguished from content. Two adverts were used, an advert for a car and an advert for gambling. The gambling advert significantly reduced the perceived credibility of the website it was hosted in. The second study looked at including an author photograph, finding that formal pictures did improve credibility. Varying the authors name had no effect. Despite the lack of detail in the paper, it is a good example of the manipulated website methodology and provides a description of how it can be achieved for those with limited technical experience.

Choi and Rifon (Choi and Rifon 2002) have looked at the credibility of internet advertisements in relation to hosting website credibility (N=294). The focus of the study was advertisement credibility and whether a highly credible advertisement leads to improved

attitude towards brand and purchase intention. The study found that recognisable advertising brands led to more credible advertisements but that the hosting website's credibility was less relevant (increasing credibility of the advert but not brand attitude or intention to purchase). The relevance of the advert to the website content was not found to affect advert credibility. This work is interesting but only explores the relationship in one direction i.e. does hosting credibility affect advertisement credibility not the other way around. This study demonstrates that when including an advertisement as a credibility factor in a 'manipulated website' study, it is important to consider the credibility of the advert itself. Future researchers should be sure to make mention of this when including adverts as an experimental condition.

Although it is important to note the credibility of adverts used in a study, Greer (Greer 2003) found that the perceived credibility of adverts did **not** have an effect on the perceived credibility of the hosting web page. This suggests that adverts erode credibility with their presence but that the actual credibility of the content may not matter. While advert **credibility** may not matter, the **relevance** of the advert to the hosting site may still affect host website perceived credibility (Rodgers 2004).

In contrary findings to the work of Fogg, Riegelsberger *et al*. (Riegelsberger, Sasse, and Mccarthy 2003) found that the content of author photographs (gender / trustworthiness) had no effect on perceived credibility of ecommerce sites (N=115) . The actual presence of photographs, however, did impact on assessments of the site with 'bad reputation' sites gaining credibility because of the presence of a photograph but 'high reputation' sites losing credibility. Credibility rating was determined by the participant's willingness to gamble their participation fee on the site being in the 'high reputation category'. Because real sites were used, customers' assessments of reputation were available from online sources (www.bizrate.com and www.epinions.com). The use of public opinion data to categorise high and low quality sites is useful and may be a better approach than to have experts categorise the sites. This is a very robust study using real world stimulus and a measure that is more representative than the Likert scales and preference indicators described up to now. A qualitative study that seems to be the groundwork for this study is reported in (Riegelsberger and Sasse 2002).

Gender has also been looked at by Flanagin and Metzger (Flanagin and Metzger 2003). Using a personal website annotated with a photo of either a male or female, students (N=156)

were asked to rate the credibility of the author, the page content and the site as a whole. There was no difference in credibility evaluations between male and female photographs when looking at the whole sample. However when split by participant gender they found participants rated opposite-sex authors as significantly higher than same sex.

In a health context (Eastin 2001) has looked at manipulated source. Two websites were attributed to either a doctor, a patient or a university student. Participants (N=125) were asked to rate the accuracy, believability, and 'factualness' of both sites. The choice to use two sites (on different topics) is interesting; one was selected to contain well known information about HIV/AIDS and the other with little known information on syphilis. The study found that when participants were unfamiliar with the site content then the author manipulation significantly affected perceived credibility but when participants were familiar with the content then there was no difference. This research implies that web users only use author to judge credibility when they are unable to make a judgment based on their own knowledge. As might be expected the doctor had the largest positive effect followed by the patient then the student.

Eastin expanded on his previous research in 2006 (Eastin, Yang, and Nathanson 2006) by looking at the effect of source, advertising and "dynamism" on websites as measured by elementary school children's credibility assessments. In addition to several Likert scale measures of perceived credibility, the authors measured website memory recall. This was the first study encountered which incorporated a measure beyond directly asking participants what they think and began to explore the practical effects of credibility. The study design is interesting and involves some elements of deception: participants were asked to use a search engine to research pugs (a breed of dog). The search engine was actually a study construct and returned the same results regardless of keywords. Furthermore each search result went to the same place, the manipulated page. This approach has the potential to create a more natural browsing experience at the cost of transparency. The study found that dynamism (presence of graphics and use of colour) and advertising both reduced information recall. The implication is that despite improving perception of a site, credibility factors do require additional cognitive effort to analyse which would otherwise be devoted to the content (which would aid recall). Whether this cognitive effort would also be required from adults is unknown.

Another study with an interesting outcome measure is Bengtsson *et al.* (Bengtsson et al. 1999). This study used the 'desert island survival task' as an outcome measure. The 'desert island survival task' involves participants (N=70) ranking a list of items in order of importance for survival on a desert island. A computer program would then attempt to persuade them to make a change to the rank order. In addition to success rate of persuasion, traditional credibility measures were also recorded. The computer program ran within a website and consisted of a simple onscreen message, a chat avatar image, an animated chat avatar image or an audio voice. Two control conditions were also included in which a human being attempted persuasion either using or not using the computer's persuasion script. The study found that human partners were rated as more credible but were actually less effective persuaders. There was no statistically significant difference between types of computer interface in the credibility measures but a higher rate of persuasiveness was found with text compared to voice.

Most studies described up to this point have involved relatively minor changes such as editing the title or adding adverts. However, some authors have investigated more extensive changes to website content. Dutta-bergman (Dutta-bergman 2004) for example looked at 'completeness' in an article explaining whether tea is good for your heart (N=246). The incomplete version of the site contained irrelevant arguments such as "tea is growing in popularity". The complete site contained a balanced argument. There was also a 'jargon' arm to the study which contained the complete site but with scientific jargon terms used. Unsurprisingly, the complete article was rated as most credible, the jargon containing and incomplete sites were rated roughly the same. If credibility research is to lead to improvements in how we build websites then it is important that the factors being investigated are ones which web developers are not already doing. Web authors are unlikely to consider whether or not to present a complete argument in the same way they might wonder if it was worth their effort to include a privacy policy or personal photograph. The actionable output of this research is really only that jargon reduces credibility and should be avoided.

Within the health domain Freeman and Spyridakis (Freeman and Spyridakis 2004) have looked at the effect of 'presence of street address' and 'presence of external links' on perceived credibility (N=150). This is one of the few studies which used members of the public rather than students. The study found that the presence of physical addresses

increased the articles credibility but reduced the perceived credibility of the author. No participants made reference to the presence of the address in the qualitative discussion.

Walther *et al.* (Walther, Wang, and Loh 2004) looked at the effect of domain name (.gov .org .edu .com) and presence of advertising on perceived credibility (N=156). The study found that participants rated .org and .gov websites as significantly more credible than .edu and .com. Advertising lowered the rating of every site except .com. The greatest reduction was in the .org domain, implying adverts have varying effect based on the nature of the website (organisation / governmental / educational / commercial). One criticism of this study is the prominence of the manipulation. The domain extension (.gov .org .com .edu) of the site was included in the title of the page and the main header on the page. The first question in the questionnaire even asked participants what the name of the website was. Whether domain name would have an effect at its natural level of prominence in modern browsers (address bar) is worthy of further exploration.

When assembling stimulus most authors select factors based on previous credibility literature or qualitative research e.g. focus groups. Kim (Kim 1998) describes an alternative approach to assembling stimulus (in this case banking terminals). This approach involved several iterative experiments in which participants were shown a large number of real interfaces and asked to rate their trustworthiness (amongst other metrics). Based on interface commonalities, two gestalt interfaces were assembled containing the most highly rated design features e.g. symmetry. This approach would be fine if the outcome measure of the main study was behavioural but in this case the outcome measure was perceived trustworthiness leading to a rather self-referential study design. The finding that the resultant interfaces were more credible than the initial interfaces demonstrates only that credibility factors can be transplanted from one interface to another without losing their effect and that their effect is additive.

While most outcome measures described up until now have been **subjective** e.g. site preference, willingness to gamble participation fee, Likert scale etc, there were a few studies using more **objective** measures. Shon *et al.* (Shon, Marshall, and Musen 2000) used retention of site content in a similar manner to Eastin (see above). In this online study (N=137), two versions of a webpage describing the use of shark cartilage in alternative therapy were presented. One site contained an award stamp, the other did not. The study

found no difference in ability to recall the contents of the site when comparing conditions. One reason that there was no effect may be due to the fact that the certification was invented by the authors rather than from a real certification organisation such as Health on the Net (HON). The recommendation of the authors that future studies use real certification stamps was adopted for both studies described in this thesis.

All the studies described so far have used either **subjective** measures such as Likert scales, site preference and intention to purchase or have used **objective** measures such as site content recall and browsing behaviour. Of the two, the objective measures are certainly better but are still not ideal for measures the effectiveness of a site i.e. just because a participant remembers the content of a site, it doesn't mean he will be persuaded by it to change his behaviour. When considering e-health interventions specifically, the ideal measure would be the targeted health behaviour. For example if the intervention encouraged exercising, the measure would ideally be 'amount of physical exercise taken' as recorded by direct observation.

Only a single study was identified which measured the effect of credibility on outcome behaviour. This study (N=85) by Harris *et al* (Harris, Sillence, and Briggs 2009b) measured self reported alcohol consumption, one week after reading a health intervention website describing the association between excessive drinking and breast cancer risk. Half of participants received an intervention with advertisements, a donation button and pharmaceutical sponsorship. The other participant group received an intervention with HON certification and the TRUSTe seal (TRUSTe 2012).

In addition to measuring alcohol consumption, the authors used eye tracking, visit duration and intention to reduce alcohol consumption. Eye tracking results confirmed that participants spent significant time focusing on the credibility factors but found no difference in total duration spent on the site. They found a significant difference in self reported alcohol consumption in the high credibility group (average decrease of 1.3 units) vs. low credibility (average increase of 0.6 units) despite having no difference in intention to reduce consumption (measured immediately after the study). Harris *et al* concluded that credibility factors implemented had a "subtle and delayed effect".

There are a number of weaknesses in this study. The use of self reporting to measure alcohol consumption has been found to be unreliable (Knibbe and Bloomfield 2001). Despite having

85 participants, only 22 reported alcohol consumption rates above the UK Government's recommended maximum. The website used was small (3 pages) which is not representative of the size of most e-health interventions. Finally, the study was conducted in a highly structured environment that is not representative the conditions under which a participant is likely to engage with a behaviour change web site.

2.6 Review summary and impact on research

From the literature review it is clear that a great deal of research has been done into what makes a website credible and specifically into the surface credibility of sites. Unfortunately, many of the studies examined employed **subjective** measures that were reliant on the introspective abilities of participants and their ability to articulate how they made credibility judgements. The use of Likert scales, for example, is highly subjective e.g. is a rating of 6/10 for trustworthiness from one participant the same as a rating of 6/10 for a different participant? What does 10% more trustworthy actually mean?

A small number of studies were encountered which used **objective** measures such as site content recall and browsing behaviour e.g. following off-site links to verify content. None of the studies encountered in the initial literature review went beyond such measures and looked at the effect of credibility on the actual purpose of the website e.g. did credibility manipulations make the website sell more products or convince more people to change their behaviour?

The objective of the two studies described in this thesis was to advance current knowledge by investigating the effect of surface credibility manipulations on health outcome behaviours. The purpose of these studies was to determine whether there is a demonstrable case for all web designers to implement current credibility guidelines.

It was decided that the strongest case could be built by demonstrating whether implementing credibility factors into a website would make it more effective at its stated goal. The review indicated that this would be a novel approach that had never been done before. The study aims were to measure the effect of surface credibility using:

  A1. An objective health behaviour measure.
  A2. A large participant group so that it would be possible to detect even a small effect size.

A3. All credibility factors which a web developer could feasibly implement without considering factors which harm usability or degrade site content e.g. completeness / dynamism.

From the literature review, the 'manipulated websites' approach emerged as the most reliable way to detect difference between a website with/without credibility factors. This methodology was used for both the studies described in this thesis.

From the literature review, it was clear that the easiest way to recruit a large number of participants (A2) was to conduct an online study. This would also provide more natural circumstances for browsing (Flanagin and Metzger 2007).

Ideally all trials should use a control. A control is an unedited / normal condition from which manipulations can be differentiated. It provides a baseline for participant behaviour if no manipulation is conducted. Because credibility factors can be both positive and negative (e.g. a date may be positive when present and negative when missing), it is difficult to assemble a representative control site. It would be possible to run a 3 arm study with positive factors vs. negative factors vs. no surface credibility elements but this would alter the layout and visual appearance of the site e.g. what would fill the visual space of advertising/certification stamps? For this reason the 'manipulated website' design can be described as a double-blind, parallel group randomised trial (Schulz, Altman 2010) and not a true randomised control trial (RCT).

In choosing which credibility factors to implement and how to present them, the work of several authors proved useful.

Many studies have explored credibility factors which fundamentally alter the content of the site e.g. jargon, completeness, spelling etc (Dutta-bergman 2004). These factors do not represent real world practices i.e. a web developer is unlikely to release a website without verifying the quality of the content, grammar and typography etc. It was decided that such factors should not be implemented.

Another practice has been to artificially increase the prominence of credibility factors e.g. Walther *et al.* (Walther et al. 2004) who incorporated the domain extension (.edu / .com etc)

into the website title. As far as possible, credibility factors in the studies described in this thesis were implemented exactly as they are likely to be encountered in normal web pages on the Internet. In striving for realism of credibility factors (Shon et al. 2000) it was decided to seek certification from real institutions such as HON rather than inventing a fictional certification authority. For the same reason, advertising was explored only in its most representative form (Google Adsense).

While the studies described in this thesis were being conducted, Harris *et al.* (Harris et al. 2009b) published a study exploring the effect of credibility on a health behaviour using the 'manipulated website methodology'. This study is described in full in the 2.5.3 Studies using manipulated website methodology. The paper was published after the first experiment described in this thesis (Nind et al. 2009) had already been completed so did not inform its design. However, Harris *et al.* did inform the design of the second study. The second study presented in this thesis improves on the work of Harris *et al.* by:

- Allowing participants to explore the intervention under more natural circumstances.
- Measuring the health behaviour directly rather than relying on self reporting.
- Using a larger sample size

This chapter has described the literature review methodology and findings. It has described how the literature review informed the thesis studies methodologies and the selection criteria for credibility factors to evaluate. A full description of each credibility factor selected and how it was implemented is presented in the methodology sections of the study chapters.

Chapter 3: Credibility in an e-health Exercise Intervention

This chapter describes the first of two studies into the effect of surface credibility on e-health interventions effectiveness. In the previous chapter, 'manipulated website methodology' was identified as the most effective way of measuring the differences between a highly credible site and a low credibility site. In order to carry out a study based on this methodology, a health behaviour was needed upon which to build an intervention. What follows is a description of why exercise was chosen; how the 'manipulated website methodology' was implemented; the measures used to assess the effectiveness of each intervention and a discussion of the differences in website browsing patterns of participants using the high credibility web site compared to those using the low credibility site.

Although the initial aim of this study was to use 'attendance at university sports facilities' as an **objective** behavioural outcome measure, this proved impossible. It was not until the second study described in this thesis that an objective behavioural outcome measure was used.

3.1 Introduction

As described in the previous chapter, most studies into credibility so far have focused on self reporting and **subjective** measures such as Likert ratings and site preference. Where **objective** measures are used they are not necessarily representative of the effectiveness of the site e.g. site content recall / browsing behaviour. Studies have also often been conducted under artificial circumstances.

The aim of this study was to investigate for the first time whether surface credibility manipulations change the effectiveness of an e-health behaviour change intervention. In order to do this, a health behaviour was needed with an **objective** outcome measure. An **objective** measure is one that can be directly recorded and is not open to interpretation e.g. number of steps taken as recorded by a pedometer.

3.1.1 Why exercise?

Exercise promotion was selected as the intervention topic because of the growing concern over obesity in the UK - "[it is] one of the most serious and widespread public health challenges for economically advantaged nations in the new millennium" (McInnis 2003).

It is recommended that adults take at least 30 minutes of moderate physical activity five times a week or 20 minutes of vigorous physical activity three times a week. There are many benefits to regular exercise in addition to maintaining a healthy body weight. These include reduced risk of premature age related chronic health conditions, maintaining skeletal health and mental wellbeing (Haskell et al. 2007). Despite these health benefits only 20% of the UK population were taking the recommended amount of physical activity at the time of this study (Anon 2006).

e-health interventions aimed at increasing exercise have been effective in the past but with mixed results (Norman et al. 2007). A key concern was to develop as effective an intervention as possible that would be representative of other leading research interventions targeting exercise. This would ensure the findings would be applicable to front line researchers in behaviour change.

The decision to target physical activity was also influenced by the ease of recruiting student participants and by the support of the Dundee University Institute of Sport and Exercise. Exercise promotion interventions have several easily measurable outcomes (sports participation / attitude towards exercise) and provide a lasting benefit to participants. Participation in exercise would be an ideal **objective** behavioural measure.

Most e-health interventions are based on psychological theories such as the Trans-theoretical Model (TTM) or the Social Cognitive Theory (SCT) (Norman et al. 2007). The study website was built to support the stages of change in the TTM with motivational material to support intention forming, timetabling information to support planning and location information for participants ready to begin taking exercise. The TTM was selected because of its popularity with past physical activity intervention developers (Marshall and Biddle 2001). Since the focus of the study was on measuring the effect of credibility, the intervention creation process had to be representative of current intervention development practices.

3.2.2 Hypothesis

The hypothesis of this study was that:

'An exercise promotion intervention with factors which heighten surface credibility will be more effective than the same intervention with factors which lower surface credibility'

It was initially intended that the effectiveness of the intervention be measured by attendance at the university sports facilities via each participant's student card which is swiped whenever they attend. Unfortunately this measure was unavailable due to database access problems including system migration. An alternative measure of 'time spent on the site' and 'intention to exercise' was used. While 'time spent on the site' is an objective behaviour measure, it is not a **health outcome** behaviour. Intention to exercise is a self reported, subjective measure.

3.2 Methodology

3.2.1 Technology platform

The manipulated website study methodology (see 2.5.3 Studies using manipulated website methodology) was used. This methodology was chosen because it provides the most direct comparison between credibility conditions and the most natural study condition for participants. In a manipulated website methodology, participants are randomised to receive either a website with credibility enhancing factors or one with credibility eroding factors. Participants should not be aware that there are multiple versions of the site.

Building two versions of a website normally means investing twice the programming effort and increases the likelihood of concurrency errors (when a content change is made to one version but accidentally omitted from the other). In order to avoid these problems, the content management system Drupal was used to build the site. Drupal allows web developers to store website content in a MySql database rather than traditional HTML files. Drupal then presents this content using its 'modules' and 'themes'.
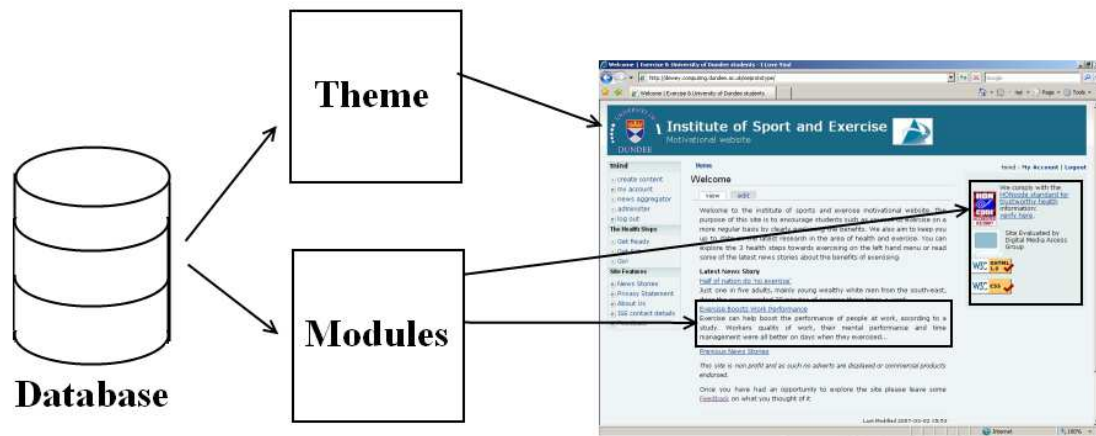
Figure 6 - Overview of Drupal content management system structure

The theme component of Drupal determines the layout and appearance of the web page delivered to the visitor. The module components determine the appearance of each of the blocks within the page (news articles, menus and side blocks).

Two themes were created, one for 'high credibility' and one for 'low credibility'. This allowed adjustments to logo, website title, page footers etc for all pages at the same time. Modules were modified to either render news articles with or without references, side blocks with adverts or certificates and menus with privacy policy or a broken link.

Once these structural changes were made to Drupal, the site content was assembled and stored in the database. Each visitor's browser had a session variable set indicating whether they were in the high or low credibility intervention group. Drupal would then automatically render content using the appropriate theme/modules combination.

This approach is an improvement over using two different websites or using cascading style sheets (which only allow for minor alterations). An added benefit of this approach is that updating the content for the second study (see Chapter 4: Credibility in an e-health Organ Donation Intervention) only involved modifying the content in the database and redesigning icons.

A static page was created to allow students to enter their email address and student card number. This prevented repeat visitors from having to read the information sheet or initial questionnaire again (Figure 7). After the questionnaire, participants were sent to the Drupal

website containing the intervention. After 4 weeks had passed, students were emailed an exit questionnaire which was used to calculate how their attitudes to exercise had changed.
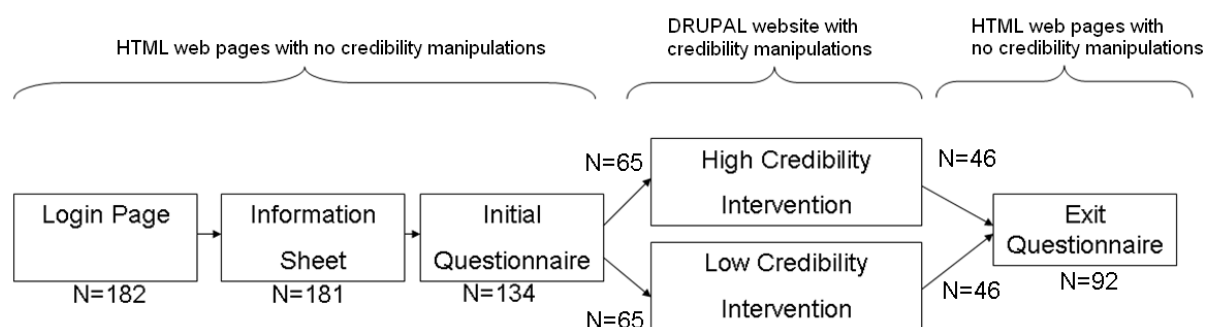
Figure 7 - Exercise study intervention flow and webpage structure including the number of participants progressing through each stage.

Credibility manipulations were only present on the Drupal site i.e. the login page, information sheet and questionnaires all appeared the same regardless of participant group. This was an area that was improved in the second study (see 3.4 Discussion and limitations).

3.2.2 Site content

The content of the website consisted of a selection of stories from mainstream news sites about the benefits of regular exercise and the current exercise habits of the UK population. Potential articles were suggested by the research team (Thomas Nind, Ian Ricketts, Falko Sniehotta and Jeremy Wyatt) and assessed for inclusion by Paul McPate, Assistant Director of the Institute of Sports and Exercise, University of Dundee.

A specific focus was placed on swimming as an easy activity that exercises the whole body and provides significant health benefit. The swimming pool timetable and a specific article focussing on the benefits of swimming were added to the site.

To ensure that both versions of the site were of equivalently high usability, a member of the Digital Media Access Group (DMAG) was asked to perform a usability analysis. DMAG confirmed that the usability of both sites was high and that the only difference in usability came from a single broken navigation link (see 3.2.3 Credibility factors).

The reading level of website pages was evaluated using SMOG Grading. The main website had an average reading age of 12.5, well below the average age of the expected audience.

The SMOG grading of the news stories was higher at 15.5 but still well within acceptable limits for university students.

3.2.3 Credibility factors

Credibility factors were compiled from the results of the literature review. Each factor identified in the literature was evaluated for inclusion. When selecting whether to implement a factor, careful consideration was given as to whether it would negatively affect the quality of content being delivered. It was felt that an experimental result indicating the negativity of misspellings or slowing site access, for example, would be less useful than one focussing on the less obvious factors such as article referencing, recognisable branding and third party certification stamps. For this reason, only the credibility factors which would not directly affect content accuracy, bias or completeness were implemented.

Figures 8 and 9 (overleaf) show screenshots of the homepages of each version of the intervention website. The screenshots contain annotations which highlight the credibility manipulations and can be used as a key for the credibility factors discussion that follows. These credibility factors were present on every page participants could visit. The 'referencing' and 'interactivity' credibility manipulations were only present on the news stories page.

Advertising

Google Adverts were added to the low credibility site. Google is the largest Internet advertising firm and therefore most representative of the adverts that might be encountered during normal browsing (Attributor Research 2010). These adverts are dynamically created and context sensitive and so can be considered "relevant to the content of the vehicle in which the ads appear" (Choi and Rifon 2002). The exact content of the adverts was decided by Google when the page was loaded but was usually focused on exercise, diet management or higher education and learning. It would be possible to use a static image of the Google advert for finer control but this would have been less representative of normal adverts and would have increased the possibility of participants noticing the manipulation. The adverts were placed so as to occupy the same visual space as the third party certifications (in the high credibility version) in order to minimise structural differences in appearance.
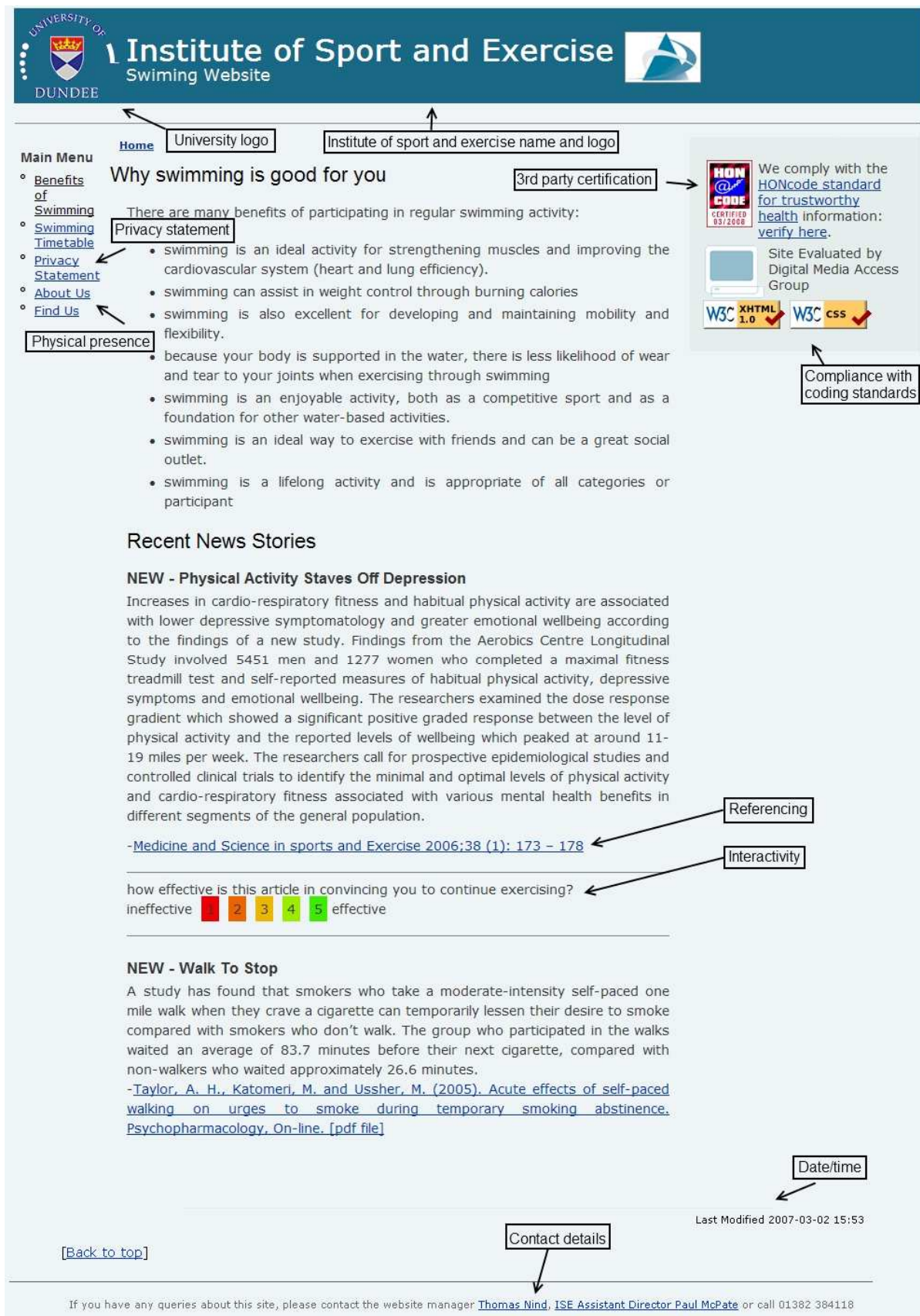
Figure 8 - Screenshot of the homepage of the high credibility exercise intervention

Figure 9 - Screenshot of the homepage of the low credibility exercise intervention

Broken Link

A single broken link was added to the low credibility site. This occupied the same visual space as the privacy policy and 'about us' sections (in the high credibility site). The only content denied by the presence of the broken link is additional information about the organisation and not any of the motivational intervention content. .

Visual Design

The high credibility site implemented the css template of the University of Dundee Sports Union. This design may be recognisable to students and therefore reinforce source identity.

Chapter 3: Credibility in an e-health Exercise Intervention

The css template used in the low credibility site was a default template offered by Drupal. Although professional appearance is widely reported as the most important credibility factor (see Chapter 2: Literature Review), it had previously been decided not to include it as a manipulation. This manipulation may have created a difference in professionalism or aesthetics, a topic which is discussed later (see 3.4 Discussion and limitations).

University Logo

The University of Dundee logo was added at the top left of the high credibility site in order to remind users of the source of the site. The logo occupying the visual space in the low credibility site was a generic image of a ball and net obtained through a Google Images search for 'sports clip art'.

Institute of Sports and Exercise Logo

The source of the website (Institute of Sport and Exercise) was clearly identified in the title of the high credibility site along with the ISE logo. The same visual space in the low credibility site was occupied by a generic title 'Sport and Exercise'.

Physical Presence

The high credibility site included an additional page entitled 'about us'. This page contained pictures of the university's sports facilities and of Assistant Director Paul McPate. An editorial policy was also included on this page.

Privacy Statement

The high credibility site included the University of Dundee privacy statement which describes what data is routinely stored by web servers, the policy on cookies and when information will be disclosed to third parties. The navigation links to these pages occupied the visual space of the broken 'Additional Information' link on the low credibility site.

Contact details

Both sites contained contact details for the Institute of Sports and Exercise as it was considered core functionality of the site for students considering taking up new exercise habits. This choice was made in keeping with the decision not to erode the quality of the intervention content. The high credibility site included an additional footer to remind participants who was responsible for the site (Thomas Nind) and provided contact details. In

compliance with ethical procedure, this information had already been made available to all participants in the information sheet (see Figure 7).

Date/Time

Knowing the currency of Internet pages is an important indicator of relevance and quality and is a credibility factor. It was automatically generated by Drupal and included on all pages of the high credibility site.

Third Party Certification

Certification for the credible site was obtained from HON. This required submitting the site for review after which it was certified compliant with the HON code (Health On the Net 2011). Once compliant, a site can add a certification stamp. The HON stamp is widely considered by health experts to be a symbol of quality and credibility but may not be widely recognised by web users (Cheskin Research 1999). After review, the site was approved and the certification stamp was added.

Compliance with Coding Standards
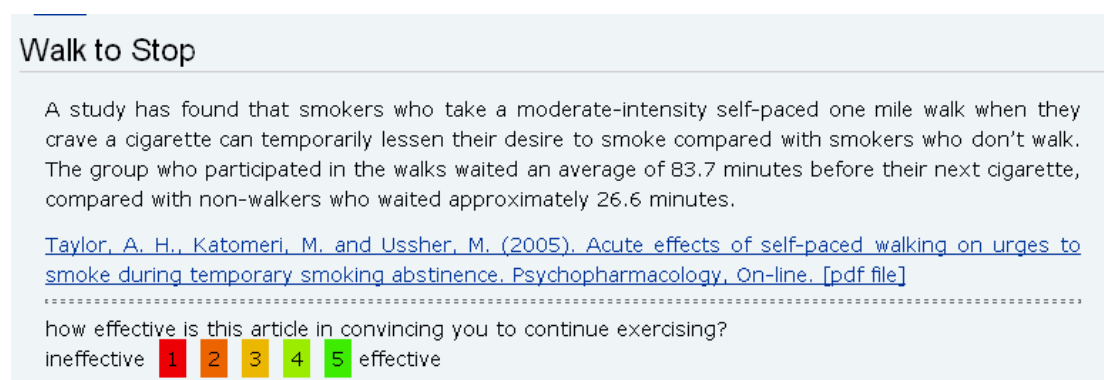
A cornerstone of web accessibility is adherence to programming standards. Adhering to the W3C XHTML 1.0 and W3C CSS specifications (W3C HTML Working Group 2002) ensures that a website is compatible with all standards compliant web browsers including mobile browsers and assistive technologies. W3C provides a tool for testing whether web pages comply with this specification. Both sites were written to comply with this specification but the certification stamp (indicating adherence to site visitors) was only displayed on the high credibility site.

Referencing

News stories in the high credibility site were given full references to source as a hyperlink (Figure 10 and Figure 11).

Interactivity

'Interactivity' or 'dynamism' has been identified in credibility literature as being a significant factor for web users. It was decided to include an article rating facility to represent this factor. This factor is potentially problematic because it is by definition content that is accessible only to one user group and so may contravene the intention to "not directly affect content completeness".

Figure 10 - A news article from the high credibility exercise intervention

Walk to Stop
A study has found that smokers who take a moderate-intensity self-paced one mile walk when they crave a cigarette can temporarily lessen their desire to smoke compared with smokers who don't walk. The group who participated in the walks waited an average of 83.7 minutes before their next cigarette, compared with non-walkers who waited approximately 26.6 minutes.

Figure 11 - A news article from the low credibility exercise intervention (border added for clarity)

3.2.4 Measures

The initially planned outcome metric was to be attendance at the University of Dundee Institute of Sport and Exercise (ISE) sporting facilities. The student card barcode number of each participant was recorded when they registered for the study. When students attend ISE facilities their card is swiped and automatically recorded in a database. Unfortunately a lack of direct access to the ISE database combined with a database migration to a new platform during the study meant that the information was not available. Instead, the backup metrics, attitude towards exercise and self reported physical activity had to be used.

An exercise questionnaire was provided by ISE. This questionnaire was routinely used by the ISE for measuring attitudes to exercise and is a short form created from a variety of psychological measures such as self efficacy and stages of change. The questionnaire was administered at the beginning of the study to assess participants' baseline attitudes towards exercise and current physical activity habits. The questionnaire was repeated at the end of the study to assess any change in attitude towards exercise or increase in physical activity.

The questionnaire consisted of 8 questions relating to participant's exercise habits and attitudes, each measured by Likert scale as follows:

1. People in general approve of participation in regular physical activity (strongly disagree / strongly agree)
2. Most people who are important to me would like me to be physically active (strongly disagree / strongly agree)
3. If I wanted to I could easily be active on a regular basis. (strongly disagree / strongly agree)
4. How much control do you have over the number of times you are physically active? (very little control / complete control)
5. For you to be physically active on a regular basis is (extremely difficult / extremely easy)

6. Engaging in regular physical activity is (harmful / beneficial)
7. Engaging in regular physical activity is (un-enjoyable / enjoyable)
8. Engaging in regular physical activity is (unpleasant / pleasant)

And one question that was categorical and assessed current participation in physical activity:

9. Please read through all statements listed below and tick ONE box for the statement that best describes your physical activity over the last 6 months.
   o I am not regularly physically active and do not intend to be so in the next 6 months
   o I am not regularly physically active but am thinking about starting to be so in the next 6 months
   o I do some physical activity but not enough to meet the description of regular physical activity given above
   o I am regularly physically active but only began in the last 6 months
   o I am regularly physically active and have been so for longer than 6 months

In addition to these metrics, browsing behaviour on the website was recorded. According to the Elaboration Likelihood Model of behaviour change, a critical component in persuasion is the volume of material absorbed by the reader (Petty and Cacioppo 1986). An indication of this may be duration of time spent reading the material on the site. To capture this information, a number of server-side scripts were added which recorded: each page a given user requested, time of request and time of leaving the page.

All interactions with the credibility factors were also recorded. This included:

- When a user of the low credibility site clicked on the broken link and the time they clicked it
- When a user of the high credibility site clicked on any of the references in the news stories
- Whether a user of the high credibility site clicked on any of the "site award" stamps
- Ratings given to the news articles of the high credibility site

3.3 Results

The study invitation email was sent to 1584 postgraduate students with a reminder sent 2 weeks later. 233 students responded to the email and visited the site. 130 completed the baseline questionnaire and were randomly assigned to one of the two sites (4 completed the baseline questionnaire but exited before being exposed to the intervention). 92 completed the exit questionnaire which was sent 4 weeks after the initial invitation (See Figure 7). The 4 week duration was selected because it was felt to be long enough for participants to consider changing their behaviour but not so long so as to cause a high dropout rate from participants forgetting about the study.

What follows is a description of how the credibility manipulation affected the browsing patterns of the 130 participants who were exposed to the intervention. This is followed by a comparison of the baseline and exit questionnaire answers for the 92 participants who successfully completed the study.

Complete anonymised results are included in the Digital Appendix. Analyses were performed using Microsoft Excel, GraphPad online calculator (GraphPad Software 2005) and Leon Avery's Mann-Whitney U Test Calculator (Avery and Virginia Commonwealth University 2007).

3.3.1 Participant browsing patterns

An initial investigation into browsing patterns is presented in (Nind et al. 2009). This paper reports a statistically significant effect of credibility on the **number of pages requested** (3.7 pages in high credibility site vs. 2.6 in low credibility site) and **visit duration** (1m28s in high credibility site vs. 54s in low credibility site $p=0.0077$ using the students t-test) of participants. This analysis was restricted only to users who completed the exit questionnaire (N=92). During the writing of this thesis, a secondary analysis of this data was performed which identified a number of weaknesses in the initial analysis. The secondary analysis used more appropriate statistical methods but found the same outcome: **a significant effect of credibility on site browsing behaviour but not on attitude towards exercise or self reported physical activity**. The following sections describe how the secondary analysis was performed and why it differed in approach from the initial analysis.

The first problem encountered in the initial analysis was in investigating the effect of credibility on the total number of pages requested by each user. In the initial analysis the count of pages requested included those for the privacy policy and 'about us' pages. These pages were only available in the high credibility version of the site. Since these pages were inaccessible to visitors of the low credibility site, it was decided to repeat the analysis without them. It was also decided to include all participant browsing data in the calculations instead of only those that completed the exit questionnaire.

A t-test was used to calculate the difference in number of page requests between the high and low credibility versions of the site when including 'about us' and 'privacy policy' (see Table 3) and when excluding them (Table 4). The effect of credibility on the number of pages requested by participants was only significant when 'about us' and privacy policy pages were included (p= 0.0292). This means that participants explored more of the site in the high credibility condition but possibly because there was more available to explore.

Group	High Credibility	Low Credibility
Mean pages requested	3.06	2.46
SD	1.83	1.21
SEM	0.23	0.15
N	65	65

Table 3 – t-test of 'number of pages requested' by each participant including 'about us' and 'privacy policy' requests (two tailed p= 0.0292)

Group	High Credibility	Low Credibility
Mean pages requested	2.52	2.46
SD	1.13	1.21
SEM	0.14	0.15
N	65	65

Table 4 – t-test of 'number of pages requested' by each participant excluding 'about us' and 'privacy policy' requests (two tailed p= 0.7655)

Potentially more important than the extent of the site participants explored is the **length of time they spent reading each page**. An in-depth analysis of the duration that participants spent viewing pages was conducted.

In total 825 page requests were recorded, page request durations were available for 649 of these requests (N=339 high credibility, N=310 low credibility). There are many reasons why page leaving times might not be available, for example JavaScript might not be supported by the participant's browser or they might close a page before it had finished loading. 13 participants had no page leaving times for any of their requests (N=8 high credibility, N=5 low credibility). These users were omitted from the data set for visit duration calculations.

A histogram and box plot of page view times was created (Figure 12 and Figure 13). From the histogram it can be seen that there is an approximate log-normal distribution in page viewing times. This distribution is characterised by a sharp peak followed by a slow tail off.
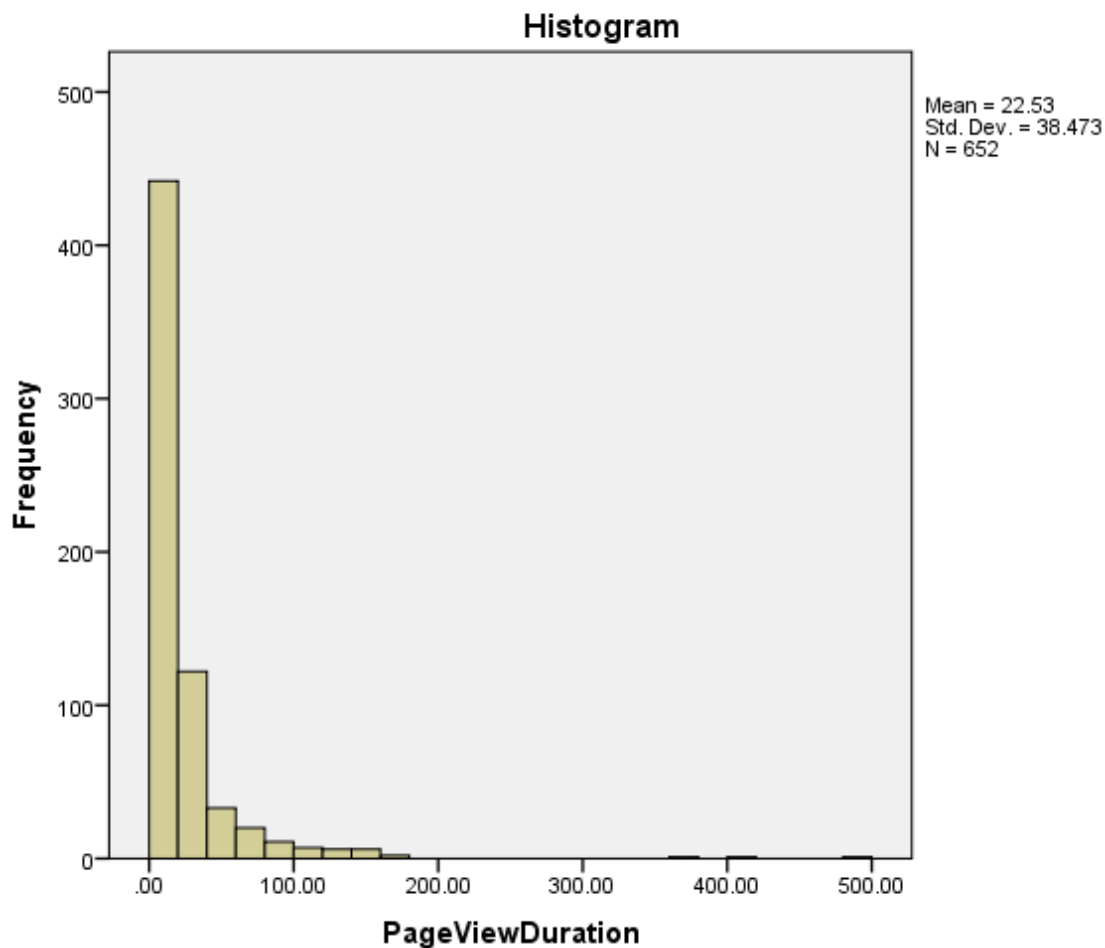
Figure 12 - Histogram of page view durations (in seconds)
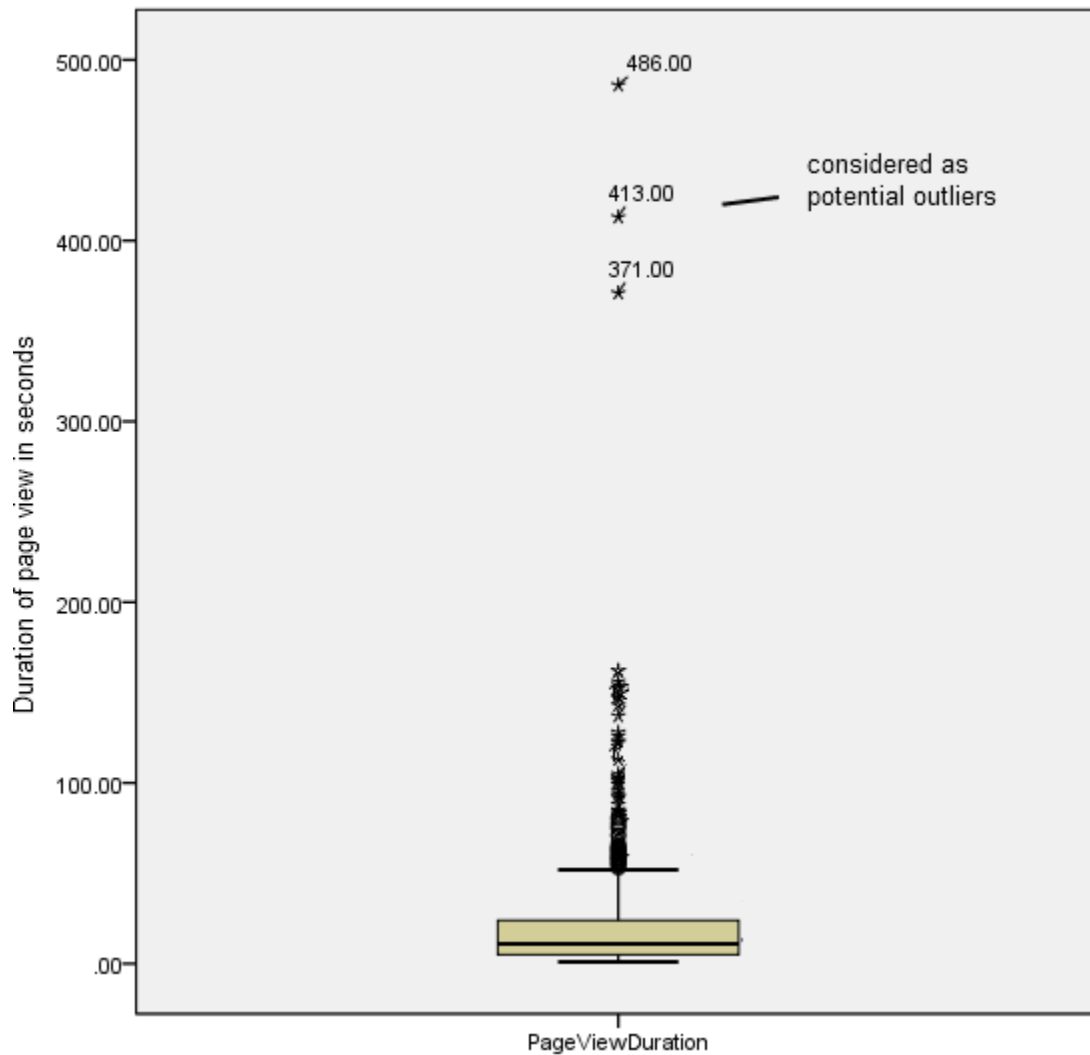
Figure 13 - Box plot of page view durations (in seconds)

The box plot (Figure 13) shows page view durations with 19 values outside 3 standard deviations (the threshold for investigating outliers in a normal distribution). In the initial analysis (Nind et al. 2009) a maximum page view time of 30 seconds was imposed. In the repeat analysis it was decided to instead set a more tolerant outlier threshold of 6 minutes given the log-normal nature of the distribution. It was presumed that the 3 outliers above 6 minutes came from participants leaving the site open after they had finished reading. An example of one such outlier can be seen in Figure 14. This user spent 6 minutes on the front page of the website then exited without exploring any more of the site. Given the limited volume of content on the front page, it is unlikely that the entire 6 minutes was spent reading the site.

All calculations of visit duration and page view duration were performed both **with and without the 3 outliers**.

Arrival date/time	2007-08-30 11:59:44
Card number	20115005587433
Name (encrypted)	AF319A06 2A5FD19E D18E1F85 19DA4007 ACD997EF
Page	Main
Date	2007-08-30 11:59:36
IP address	134.36.14.68
Left date/time	2007-08-30 12:06:29
Duration on page	00:06:53

Table 5 - Page request record for a user who spent over six minutes on the main page then left the website

Microsoft Excel was used to produce a graph showing page view duration difference between credibility groups (Figure 14). This graph presents view durations as if all pages were being viewed simultaneously (excluding the 3 outliers). The graph shows the percentage of pages still being viewing after elapsed time. Because the number of page requests varied between groups (N=339 high credibility, N=310 low credibility), 'number of pages being read' is expressed as a percentage. Similar graphs were created to explore visit durations of users (see Figure 15).

Percentages of pages still being read after elapsed time
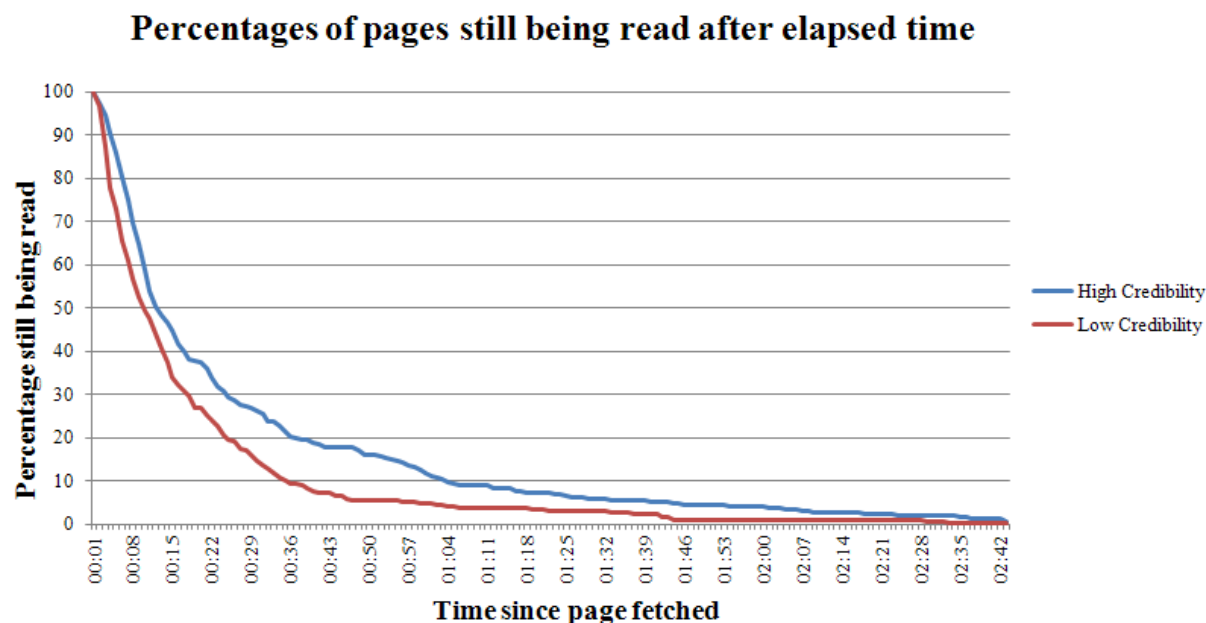
Figure 14 - Comparison of page view durations in the high and low credibility exercise sites

Figure 14 shows that pages were viewed for longer by participants in the high credibility group. There appears to be an initial sharp drop-off between 0 and 20 seconds as participants evaluate a page for relevance followed by a more gradual decline as users spend varying amounts of time absorbing material.

Figure 15 shows drop-off in **visit** duration. It can be clearly seen that participants in the high credibility group spent longer visiting the site than those in the low credibility group.

Percentage of participants still exploring after elapsed time
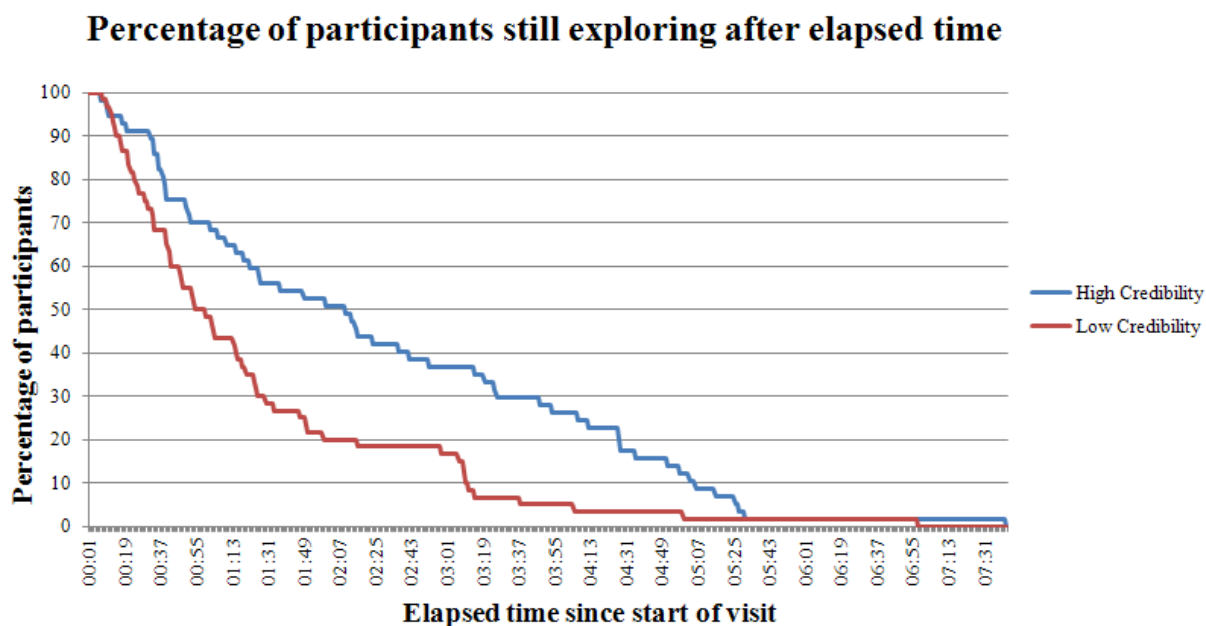
Figure 15 - Comparison of visit durations in the high and low credibility exercise sites

In order to verify statistically what appears visible in the graphs, a statistical analysis was conducted. Because of the non-normal distribution of the page view data, a Mann-Whitney U test was used (in the initial analysis a t-test was used). The Mann-Whitney U test is a non-parametric significance test so can be used with non-normal distributions.

A Mann-Whitney U test was used to measure the statistical significance of both time spent on each page and visit duration (see **Error! Reference source not found.**). The calculation was performed using all participants in the study for whom 'page left data' (the time the last page they viewed was closed) was available (N=117). The results of the Mann-Whitney U test are given both with and without outliers (page view durations over 6 minutes). The results of both calculations were highly significant indicating that **participants spent longer on pages when they had high surface credibility which led to longer total visit durations.**

Significance of time spent on each page P = 0.000028 (P=0.00004 with outliers)		
Group	High Credibility	Low Credibility
N	339	310
Median	12 seconds	9 seconds
U	62480.5	
Significance of visit durations excluding users who have no page left dates p= 0.023572 (p=0.00156 with outliers)		
N	57 (8 users no left date)	60 (5 users no left date)
Median	124 seconds	61 seconds
U	2083.5	

Table 6 - Mann-Whitney U results for total time spent on the exercise intervention site

It is possible that credibility had a bigger effect in some parts of the site than others e.g. the section with news stories. Page requests were divided by page and analysed separately.

3.3.2 Page view durations - Main page

The main page was the first page encountered on the intervention web site. It explained the purpose of the website and provided two line summaries of the exercise promotion news stories. Since all participants viewed this page, no evaluation of 'number of participants viewing' was performed. When looking at page viewing durations (Figure 16) there is little difference between the participant groups' times spent viewing this page.
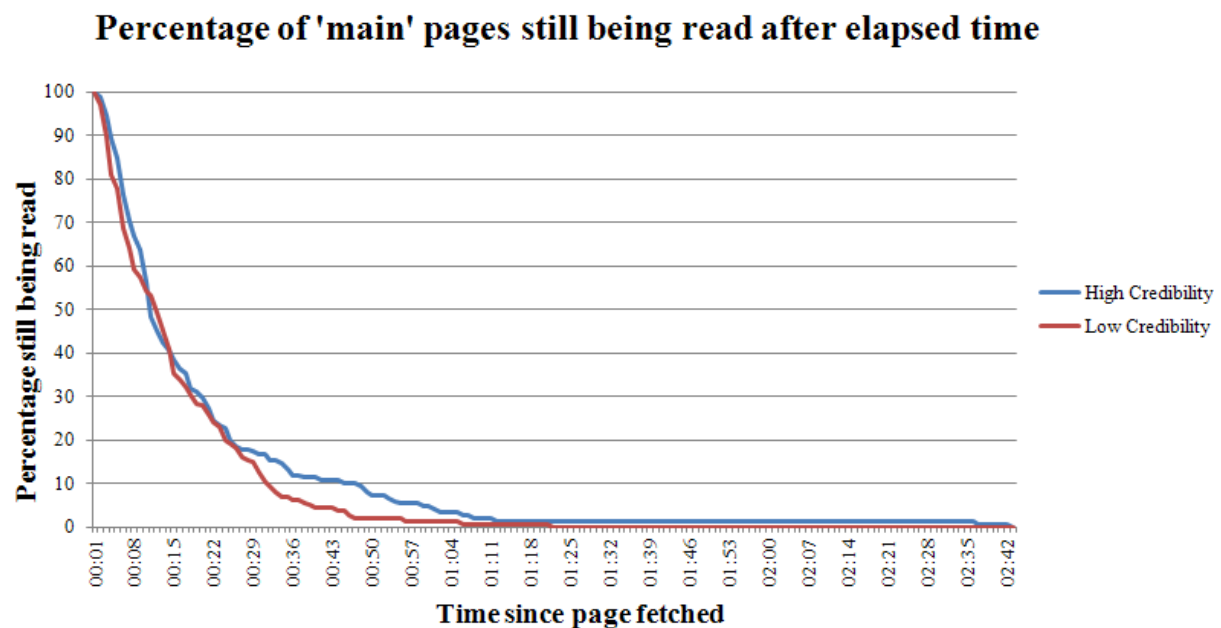
Figure 16 - Comparison of 'main' page view durations in the high (N=162) and low (N=151) credibility
exercise sites

As expected from the graph, a Mann-Whitney U test confirmed there is no statistically
significant difference between the lengths of time participant groups spent on this page.

Significance of time spent on each page P = 0.282122 (p=0.2059 with outliers)		
Group	High Credibility	Low Credibility
N	162	151
Median	10 seconds	11 seconds
U	13087.0	

Table 7 - Mann-Whitney U results for time spent on the main page of the exercise intervention site

3.3.3 Page view durations - Why swimming is good for you

The 'why swimming is good for you' page contained a bullet list of health benefits that
swimming has and a list of news stories on the benefits of exercise in general. This page was
viewed by the same number of participants in each group (39 out of 65). Although the same
number of participants visited this page, the duration they spent viewing that material was
very different (see Figure 17).
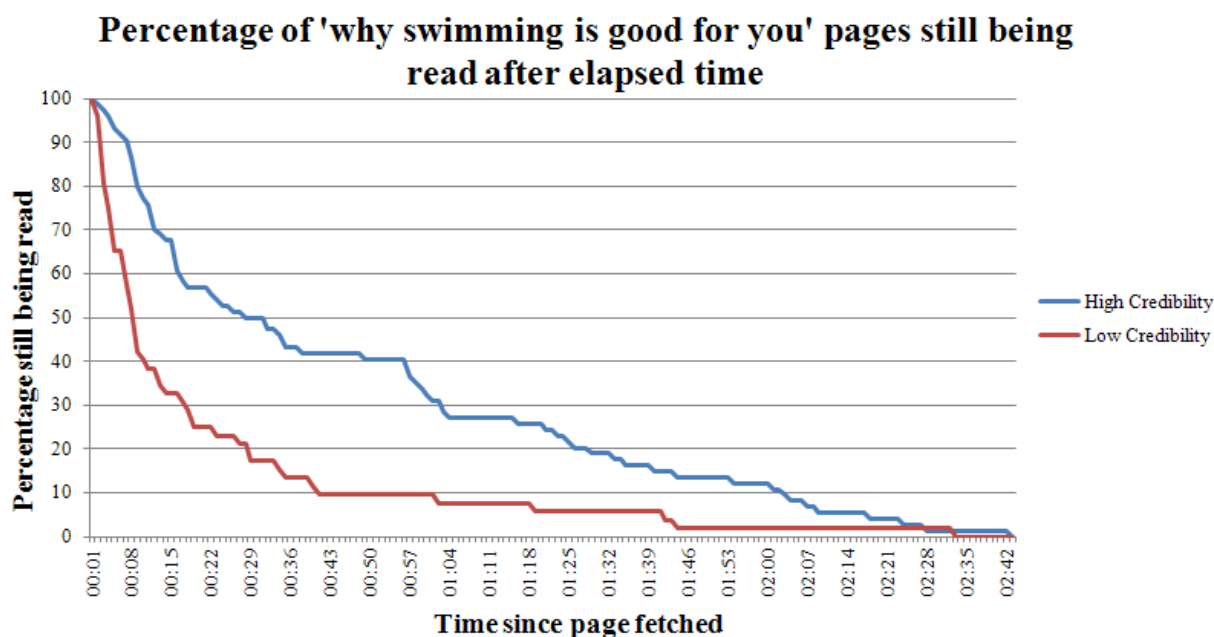
Figure 17 - Comparison of 'why swimming is good for you' page view durations in the high (N= 74) and low (N = 52) credibility exercise sites

Participants in the high credibility group spent on average twice as long viewing the 'why swimming is good for you' page than those in the low credibility group (high credibility mean= 46.8s and low credibility mean=19.2s). As expected, the Mann-Whitney U test showed that this was a highly significant difference.

Significance of time spent on each page P = 0.000002 (P=0.000006 with outliers)		
Group	High Credibility	Low Credibility
N	74	52
Median	29 seconds	8 seconds
U	2850.5	

Table 8 - Mann-Whitney U results for time spent on the 'why swimming is good for you' page of the exercise intervention site

Although only 39 participants from each group visited this page, the number of total requests for the page (including repeat requests) was higher in the high credibility group (74) compared to the low credibility group (52) indicating that many participants returned to this page more than once. The difference in total requests is not explained by the article rating facility (see 3.2.3 Credibility factors) which was built using JavaScript so did not cause a page refresh.

3.3.4 Page view durations - Swimming timetable

The 'swimming timetable' page contained a table showing what classes were running at the Institute of Sport and Exercise swimming pool and when it was open for 'general swimming'. While the page was requested by slightly more participants in the high credibility group (high = 41, low=35) there were more total requests in the low credibility site (high= 56, low= 73).
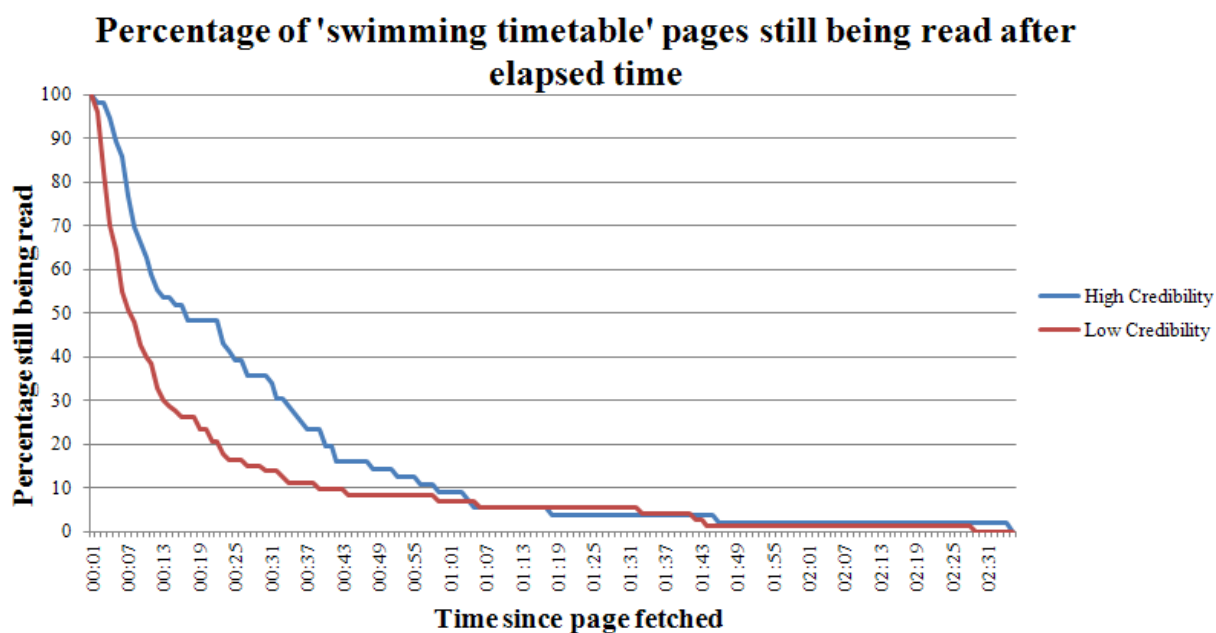
Figure 18 - Comparison of 'swimming timetable' page view durations in the high (N=56) and low (N=73) credibility exercise sites

Despite the larger number of page requests in the low credibility group, the actual view times were significantly less:

Significance of time spent on each page P =0.000178		
Group	High Credibility	Low Credibility
N	56	73
Median	16 seconds	7 seconds
U	2800.0	

Table 9 - Mann-Whitney U results for time spent on the 'swimming timetable' page of the exercise intervention site

3.3.5 Page view durations - Find us (privacy policy and about us)

The 'find us' page contained a map of how to reach the university sports facilities as well as contact details for ISE departments (general enquiries, swimming pool, children's

programmes etc). This page was requested more by the low credibility group and more time was spent on the page by this group (although not significantly more).
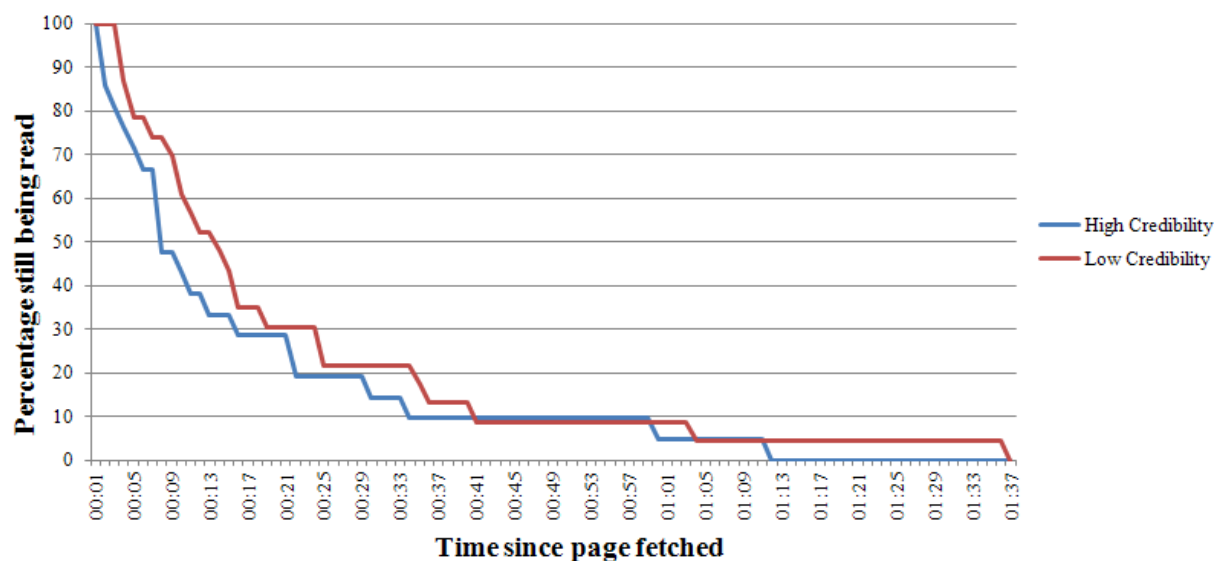
Figure 19 - Comparison of 'find us' page view durations in the high (N=21) and low (N=29) credibility exercise sites

The difference in time spent on this section may reflect behaviour of 'looking for source information'. Participants exhibiting this behaviour could navigate to either the 'privacy policy', 'about us' or 'find us' pages if they were in the high credibility group while the low credibility group could only access 'additional information' and 'find us'. Because 'additional information' was a broken link, the only section where users could obtain (limited) source information in the low credibility site was the 'find us' page.

Significance of time spent on each page P =0.216		
Group	High Credibility	Low Credibility
N	21	23
Median	7 seconds	13 seconds
U	295	

Table 10 - Mann-Whitney U results for time spent on the 'find us' page of the exercise intervention site

3.3.6 Questionnaire answers

After the 4 week study period was completed, participants were emailed a link to the exit questionnaire. The exit questionnaire was an exact duplicate of the baseline questionnaire (see 3.2.4 Measures). Of the 134 participants, 92 completed the exit questionnaire. Mann

Whitney-U tests were used to compare participants' baseline and exit questionnaire answers. There were no significant changes of the values in any of the questions asked either in the high or low credibility groups (see Table 11).

The lack of significant changes in questionnaire answers in either credibility group implies that the content of the intervention was not sufficient to alter exercise attitudes of study participants or encourage uptake of physical activity. Full questionnaire results are contained in the Digital Appendix.

Question	High Credibility		Low credibility	
	Pre/Post Difference in Mean	Mann Whitney U result	Pre/Post Difference in Mean	Mann Whitney U result
People in general approve of participation in regular physical activity (strongly disagree / strongly agree)	- 0.217	U = 1173 p = 0.369	+ 0.022	U = 1075.5 p = 0.890
Most people who are important to me would like me to be physically active (strongly disagree / strongly agree)	+ 0.00	U = 1073.5 p = 0.903	+ 0.174	U = 1197.5 p = 0.274
If I wanted to I could easily be active on a regular basis (strongly disagree / strongly agree)	- 0.283	U = 1240.5 p = 0.151	- 0.304	U = 1294.0 p = 0.063
How much control do you have over the number of times you are physically active? (very little control / complete control)	- 0.261	U = 1239.0 p = 0.155	- 0.022	U = 1063.5 p = 0.965
For you to be physically active on a regular basis is (extremely difficult / extremely easy)	- 0.217	U = 1228.0 p = 0.183	+ 0.022	U = 1072.5 p = 0.909
Engaging in regular physical activity is (harmful / beneficial)	- 0.196	U = 1224.0 p = 0.194	- 0.109	U = 1129.0 p = 0.581
Engaging in regular physical activity is (un-enjoyable / enjoyable)	- 0.065	U = 1088.0 p = 0.816	+ 0.152	U = 1157.0 p = 0.439
Engaging in regular physical activity is (unpleasant / pleasant)	- 0.130	U = 1128.5 p = 0.582	+ 0.065	U = 1075.5 p = 0.890
physical activity over the last 6 months	+ 0.130	U = 1122.5 p = 0.614	- 0.152	U = 1130.5 p = 0.570

Table 11 - Changes between pre and post questionnaire answers in high and low credibility groups

3.4 Discussion and limitations

Over the course of 4 weeks, 134 postgraduate students were recruited to an online study to encourage uptake of exercise. Participants were randomised to receive either an e-health exercise intervention enhanced with factors that heighten surface credibility or the same site

but with factors that lower credibility instead. 92 participants completed the exit questionnaire (at 4 week follow-up).

The use of Drupal themes and modules to assemble high and low credibility views of the intervention was highly effective and reduced development effort by alleviating the need to directly apply manipulations to each page. Use of the Drupal modules system also ensured that both positive and negative credibility factors occupied the same visual space and position on web pages. Finally, the use of Drupal allowed the intervention to be easily changed from exercise to organ donation without having to rebuild it website from scratch (see Chapter 4).

Future credibility studies using a manipulated website design should consider using a content management system (CMS) (e.g. Drupal) to display credibility factors and website content. Creating credibility factors as components in a CMS would allow large factorial studies to be assembled and displayed automatically at runtime without the need for a researcher to manually build each view themselves.

Significantly more time was spent browsing the site by participants in the high credibility group than those in the low credibility group. This extra time was mostly spent accessing the exercise motivation (news stories) and planning (timetable) areas. The effect size was largest in the news stories page which was viewed on average twice as long by participants on the high credibility site (47 seconds vs. 19 seconds). Since the majority of extra time spent by participants in the high credibility group was in the news and timetable information page, it is likely that participants were processing the content rather than being distracted by credibility components. If the increase in view time was due to distraction rather than processing the page content then the largest difference would be likely to be on the main page or on all pages equally. The longer a person is motivated to process a message, the greater the chance at persuasion (Petty and Cacioppo 1986). Demonstrating that participants spend longer viewing a high credibility website versus a low credibility website does not demonstrate that it was more effective. However, it does demonstrate that it has the potential to be more effective by increasing exposure to intervention content.

The core motivational content of the intervention was displayed on the page 'Why swimming is good for you'. This is the page that had the most pronounced difference in view times between high and low credibility groups. The sharp initial drop in view times in the low

credibility group seems to support the dual processing model of credibility assessment (Wathen and Burkell 2002) in which participants assess a page's appearance, presentation, usability and organisation first then either leave the site or proceed to perform a more in depth evaluation of the content. Figure 20 shows how 61% of participants in the low credibility group had left within 10 seconds of loading the page likely giving enough time for only surface evaluation of the page. The rate that participants leave pages in the high credibility group is far slower with only 24% leaving within 10 seconds. Wathen does not give an estimate of how long surface evaluation actually takes and it likely varies between web users and the page being evaluated but in the case of this study 10 seconds may be a good estimate.

In addition to the length of time participants viewed pages for, the number of pages viewed by participants is also of interest. A greater number of pages requested may indicate a greater willingness to explore the website and greater exposure to motivational content (particularly in a large intervention with many pages addressing different barriers and motivators). In this study participants in the high credibility group viewed more pages on the site. However, there were also additional pages that were only available in the high credibility site ('about us' and privacy policy). Removing these additional pages from the calculation resulted in non- significance for pages viewed. This may mean that participants only viewed more pages because there were more to explore. Many participants explored all pages on the site (38 out of 130). The small size of the site (4 pages) may have hidden any effect of credibility on willingness to explore the site. If the site were larger then all participants could read content until they ran out of motivation rather than running out of available pages to read.

The inability to measure participation rates at university sports facilities directly prevented the study from having an objective measure of participant health behaviour. There is substantial risk in relying on a measure stored in a database you do not have direct access to however this was not known at the start of the project and it was assumed that direct access would be possible. As a result of this experience, more easily recordable health behaviour was targeted in the subsequent study described in this thesis.

Since there was no measure of objective health behaviour the study had to rely on a subjective self-reported health questionnaire. This questionnaire detected no significant changes in attitude to exercise in any of the questionnaire questions between baseline and 4

week follow-up in either the high or low credibility groups. However, the design of the questionnaire was suboptimal and should ideally have been tailored to the present study rather than relying on the standard form provided by ISE. Question 9 particularly should have been changed since it addressed participants' long term exercise habits (6 months). Given the study only lasted 4 weeks, this question should have been rephrased.

The high participant drop-out negatively affected the power of study to detect changes in exercise attitude. The number of completing students (N=92) was sufficient to detect only large effects (d=0.7 with $\alpha = 0.05$ and p = 0.95, a-priori power calculation). Although the effect of credibility manipulations on page view times was large there may have been moderate or small effects on attitude which the study was insufficiently powered to detect. It is also possible that the intervention content was simply insufficient to alter participant's attitudes towards exercise.

The high drop-out rate was only problematic for the exercise questionnaire measure and not browsing behaviour. This was because all 134 participants browsing the website were analysed regardless of whether they completed the study. Credibility condition did not affect the drop-out rate with the same proportion of participants completing in each group. Although there was no effect of credibility on adherence there is the potential for an effect on decision to participate, this was explored in the next study by adding credibility factors to the information sheet and consent form.

There was a 10% contamination rate where, over the course of the study, participants became aware that there were two versions of the website. This was measured after completing the exit questionnaire by asking: "Over the study period, did you become aware that there were other versions of the website?". This is an acceptable rate and would not influence the study results (Friedman and Wyatt 2005).

The study targeted postgraduate students for recruitment in order to leave the remaining year groups available for the follow-up study reported in this thesis. However, postgraduate students may be more sensitive to surface credibility than undergraduates due to being more used to critically evaluating information (looking for citations, author qualifications, publication history etc).

The second study reported in this thesis followed on from this study and improved upon it in a number of ways. A new health behaviour was identified which was both easier to change and easier to **objectively** measure than exercise. This health behaviour was registration as an organ donor. The lack of an objective health measure and the difficulty of changing exercise attitudes/behaviour were the two main limitations of exercise study. Since registration as an organ donor is an immediate activity rather than one that occurs over time (e.g. exercising) participant dropout could be avoided entirely. The organ donation study also refined the credibility factors being explored and extended their implementation into all areas of the site (including the information sheet and consent form).

The organ donation study was funded by the Chief Scientists Office based on the findings of the exercise study reported in this chapter.

Chapter 4: Credibility in an e-health Organ Donation Intervention

This chapter will describe the second study undertaken to explore the effects of surface credibility on e-health intervention effectiveness. The study involves the development, testing and administering of an organ donation intervention. The chapter begins by explaining the reasons for choosing organ donation as a vehicle to explore surface credibility. It then provides a background on the current state of organ donation in the UK. The process of assembling the intervention and implementing the 'manipulated website methodology' is described including the changes in credibility factors from the previous study. The chapter then goes on to describe the results of the study and to discuss the findings.

This study was funded by the Chief Scientists Office as a 12 month small grant. Throughout study design, analysis and reporting, close attention was paid to the CONSORT statement (Schulz, Altman 2010). . CONSORT is the recommended approach for conducting health trials It ensures a common reporting format and prevents missing data / under reporting.

4.1 Introduction

The aim of this research is to investigate whether surface credibility manipulations impact the effectiveness of e-health behaviour change interventions. Because of the difficulties encountered accessing the ISE exercise attendance logs in the previous study (see 3.3 Results) and the challenge involved in altering exercise behaviour in general it was decided to find an alternative health behaviour to target. The health behaviour needed to be **objectively measurable** and relatively easy to change.

4.1.1 Why organ donation?

Organ donation was chosen as an ideal vehicle for exploring the effects of credibility because the key behaviour in organ donation (registration) can be directly performed via the Internet. In addition if successful, the intervention would provide a direct benefit to the public by increasing the number of registered donors.

Despite 90% of the population saying they support organ donation, only about 37% in Scotland and 30% of people in the UK are on the Organ Donation Register (ODR) (RBA

Chapter 4: Credibility in an e-health Organ Donation Intervention

Research - on behalf of UK Transplant 2003; Strategic Health Authority 2011). The UK has one of the lowest rates of deceased organ donation in Europe at 12.9 per million of population (pmp) in 2009. This compares poorly to, for example, Spain with 33.8 pmp. In order to perform an organ transplant from a recently deceased person, relatives must be contacted and permission obtained. The consent rate of relatives in Scotland is only 61% however in cases where the individual is known to be on the organ donors register the consent rate is 91% (Murphy 2009). Increasing the number of registrations is an essential step towards raising the number of organ donations and thereby saving lives and reducing the NHS support costs e.g. dialysis (Department of Health 2008).

There are currently 7,877 people awaiting organ transplants in the UK. 1,071 people died last year either waiting for organs or after having been removed from the list due to co-morbidity. 2,555 deceased donor transplants were performed last year. An additional 961 kidney or liver living donor transplants were also performed. The average waiting time for an organ transplant is between 230 days (heart) and 1,121 days (kidney). The UK is aiming to increase the number of organ donations by 50% by 2013 (Department of Health 2008).

A key challenge is that the vast majority of people have a positive attitude to organ donation but only 37.7% (Strategic Health Authority 2011) have proceeded to sign the ODR. There have been many campaigns to promote organ donation, offering a variety of avenues to register (telephone, web site, via their Family Doctor or when renewing a driver's license). However, most promotional material is not based on psychological theory and is generic in nature, i.e. is not tailored specifically to the audience being targeted. For example at the time of writing, a visitor to the NHS organ donation website (NHS Blood and Transplant 2012) faces 9 navigation menus and 10 content frames each advertising a different service from blood donation requests to a "teacher's zone". This high visual complexity may cause cognitive overload if all a user wants to do is register (Harper, Michaildou, and Stevens 2009).

4.1.2 Aims

The aims of this study were to:

A1. Develop an organ donation intervention encouraging students to make an informed decision about whether to register as an organ donor. The intervention content was to be based on theory-based interviews with students and current evidence on determinants of and interventions for organ donation.

A2. Apply credibility manipulations to differentiate two versions of the intervention. Credibility manipulations were to be a refined version of those used in the exercise study.

A3. Compare registration rates of each version of the intervention with student participants over a 4 week period.

4.2 Methodology – Site Content

4.2.1 Site content

As seen in the exercise study, developing a successful e-health intervention that actually changes behaviour is difficult. For this subsequent study, significantly more time was spent assembling the site content. Simply providing information about organ donation and opportunities to register can be effective at increasing registrations (Merion et al. 2003; Morgan et al. 2011; O'Carroll, Dryden, et al. 2011; Vinokur et al. 2006). However there are other barriers which are not associated with a lack of knowledge. Some authors have called these 'non cognitive beliefs' (Morgan, Stephenson, Harrison, Afifi & Long 2008). However, this name is somewhat confusing as the beliefs clearly involve some level of cognition but differ from traditional barriers (e.g. not enough time) in the degree to which people are aware of them and their ability to articulate them. These beliefs are:

- Ick Factors (disgust reaction to organ procurement)
- Jinx Factors (fears about the misfortune that could result from signing a donor card)
- Medical mistrust / premature declaration of death
- Bodily Integrity (belief in the need to maintain the integrity of the body after death or face serious afterlife consequences)

In order to assess which barriers were relevant to students, semi-structured theory based interviews were conducted with 10 students from the School of Computing. Theory domain

interviewing (TDF) is a technique in which interview questions (topic guide) are written to cover 12 'construct domains' (Francis et al. 2009) (see Table 12). These domains were created by Michie *et al*. in 2005 by breaking down 33 psychological models of human behaviour and grouping common constructs to arrive at the domains listed below (Michie et al. 2005). This approach ensures that the results of the interview will be useful regardless of what theory is used to assemble the resulting intervention.

Question Domain	Example question from topic guide
Knowledge	Do you know what the NHS Organ Donor Register is?
Skills	How often do you use websites with forms which you have to fill in with information?
Social/Professional role and identity	Could you see yourself as an organ donor? What factors would / might lead you to this decision?
Beliefs about capabilities	If you were interested in joining the register do you think it would be easy to do so?
Beliefs about consequences	Are there any negative effects of being on the organ donors register?
Motivation and goals	In choosing to register or not register, what personal goals are you advancing?
Memory attention and decision processes	Have you ever in the past formed the intention to register but subsequently forgotten to do so?
Environmental context and resources	What could support a person while they are registering as a donor?
Social Influences	Do you feel any pressures to donate? What pressures? Who from?
Emotion	What emotions do you associate with thinking about organ donation?
Behavioural regulation	If you were to decide to become an organ donor during or after this interview, what would be your strategy to make sure you remember to actually sign up?
Nature of the behaviour	What are your views on organ donation?

Table 12 - Construct domains and example questions from the interview topic guide

In total the interview topic guide contained 26 questions and 4 probes (recommended follow-ups to further investigate the answer to a question). Particular attention was paid while interviewing to probe any 'non-cognitive' comments ('medical mistrust' etc) but no direct questions were asked if they were not mentioned in order to avoid leading participants.

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In total 10 students were interviewed, 5 interviews were carried out face to face and 5 interviews were carried out over Internet chat. This was done for participant and interviewer convenience. Participants were recruited through an email to all undergraduate students in the School of Computing with the restriction that they "not currently [be] members of the NHS Organ Donors Register or be unsure of their membership status".

In total 2 hours and 20 minutes of audio were recorded during the face to face interviews which lasted between 18 and 42 minutes. The resulting transcripts totalled 22,279 words. This was considerably more material than the online interviews which totalled 7,292 words.

Transcripts were analysed and each comment or point of view raised by participants was categorised. In total 51 categories were identified, after the eighth interview no new categories were found indicating data saturation had almost been reached (Francis et al. 2010). Data saturation is the point where no new major ideas are likely to emerge. Current practice recommends that a number of initial interviews be conducted e.g. 10 then additional subsequent interviews be done until there are 3 consecutive interviews where no new ideas emerge.

	Face to face transcripts					Online transcripts				
Transcript Number	1	2	3	4	5	6	7	8	9	10
Number of categories identified	30	26	25	31	25	22	16	19	16	20
Number of new categories	30	8	4	5	0	1	2	1	0	0

Table 13 - Number of new categories of found in interview transcripts

Categories were order ranked by number of participants making comments in the category. The comments in each category were evaluated and a decision was made as to whether the category needed addressing in a specific section of the website, whether it simply informed wording of the site or of it was not relevant to the development of the site.

The most common category of comment was 'Knowledge of what the register is', 'How I would register', ' It would help others / save a life', 'Influence of other peoples' views on donation' and ' How often I use web forms'.

Each category was evaluated to assess whether a specific page was required to address the need, whether it should inform content/wording of existing pages or whether it was not relevant to the intervention web site.

For example the category 'How I would register?' included responses such as "*uh no I don't... through your doctors or something like that?*", "*maybe go to the doctors, yeah*" and "*You can sign up online I think*". The high degree of uncertainty in this category translated into the requirement for a page which clearly explained to visitors what information is required and how much time it takes to register. In this case the category also informed the wording of the study invitation email.

One category caused particular concern, 'Unsure if I am currently registered'. 4 participants made comments fitting this category e.g. "*I had a card when I was about 18 which I signed and put in my wallet. But you didn't have to register or anything*". The current electronic register was started in 1994 (NHS Blood and Transplant 2011) and people who carried an organ donor card prior to this may not be registered, the comments in this category indicated that some participants may wish to be registered (and even have registered in the past) but may not be on the current database because of procedure changes. The NHS protocol for such individuals is to re-register and trust the database to prevent any duplication.

A decision was made to divide the site into three sections, for participants:
- Wishing to register immediately;
- Who don't know whether they are registered or not
- Not yet ready to register.

Students mentioned the 'non-cognitive' barrier 'ick factor' e.g. *"I'd be happy for kidneys [or] whatever but eyes are maybe a little bit yucky for want of a better word".* This informed the wording of several pages in which it was made clear that students could register to donate only specific organs. The factor 'bodily integrity' was raised in relation to a third party "*another friend of mine has certain cultural beliefs, and worries about, I kid you not, becoming an incomplete ghost i.e. having to haunt people without eyes, or something*" and by a participant who expressed the desire to look good in a coffin (i.e. open casket). It was

decided that the religion page sufficiently addressed the first comment. The second bodily integrity comment was addressed by adding the page 'will I look the same?' which described several post mortem reconstruction options for organ donors that allow open casket funerals.

The students interviewed did not make any comments that could be described under the non-cognitive classification of 'jinx' or 'medical mistrust'. 3 participants made comments about having a high level of trust in doctors. For example in response to the prompt *"how strong is the worry that your organs might not be perfect?"* the participant responded *"not hugely... not hugely, [I] hold a great deal of trust in doctors [and] medical practitioners"*

The students mentioned one novel barrier: the view that it was the NHS' responsibility to recruit them rather than the participant's responsibility to seek out the register.

Although none of the participants interviewed had religious barriers to organ donation, 3 participants anticipated that some religions might not support organ donation. This expectation was addressed by adding a page to the website containing religious material from the NHS organ donation site and a summary from the British Humanists Association's stance on organ donation (British Humanist Association 2011).

The use of the TDF facilitated determining which organ donation barriers applied to the study population and identified novel concerns not previously identified in the organ donation literature examined.

The end product from the interview process was a selection of page topics that addressed all the organ donation needs of university students (see Figure 20).
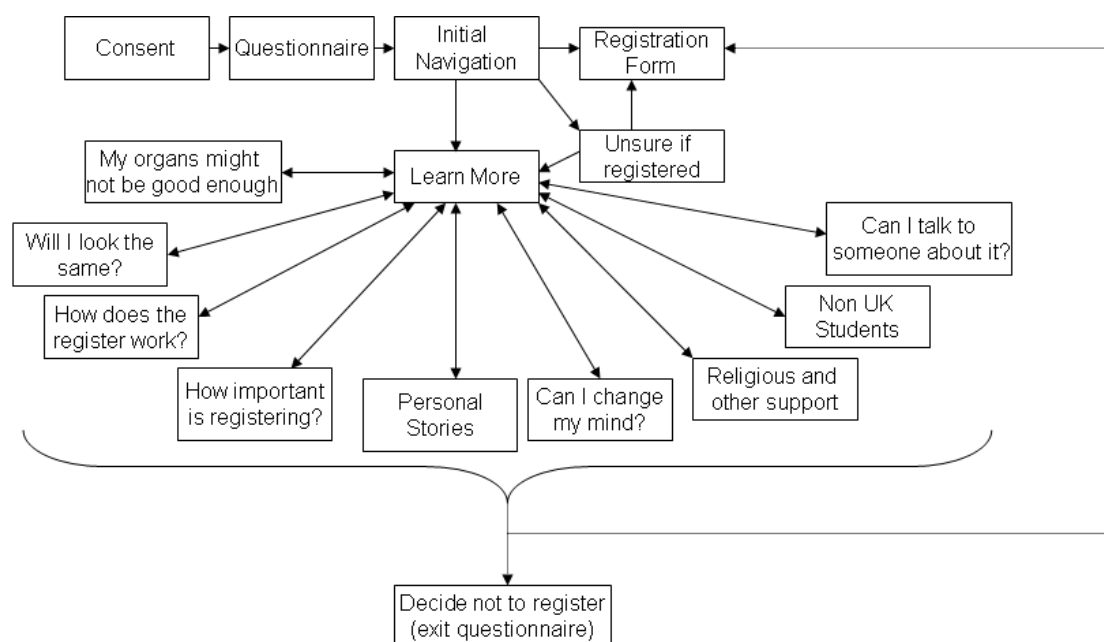
Figure 20 - Organ donation intervention website structure

The full results of the interviews including comments, categories identified and analysis are presented in Appendix 3.

Content was gathered from online health resources, journal articles and government statistical reports to populate each page. The idea of personal stories was raised by several participants and so was included in the design. To populate the personal stories section, comments were gathered from various Facebook organ donation groups after obtaining permission from the posters. Additional stories were gathered from Internet organ donation forums which licensed their material for general use under the creative commons licence.

Content was reviewed by Dr Stephen Cole, Clinical Lead for Organ Donation at Ninewells Hospital and member of the UK Academy of Royal Colleges Donation Ethics Group. The intervention protocol was ethically approved by The University of Dundee Computing Ethics Department and confirmation was obtained from East of Scotland Research Ethics Service that NHS ethical approval was not required.

4.3 Methodology - Credibility Factors

A number of changes were made to the credibility factors implemented in the organ donation study. New inclusions were the representative domain name (.ac.uk vs. .com) and obtaining

an HTTPS certificate. The visual design credibility factor used in the exercise study was dropped (see 3.2.3 Credibility factors).

4.3.1 Security

All online transactions should ideally be protected by secure encryption. The technology that supports this in the current Internet architecture is HTTPS certificates. These certificates are issued by certification authorities (CA) such as VeriSign or GoDaddy. The certificates fill two roles. Firstly they give visitors a way to be certain of the web hosts identity: when a website uses HTTPS encryption, visitors will see a padlock in their browser (Figure 21 and Figure 22). Clicking on this padlock will indicate which CA issued the certificate and confirm the identity of the site. Secondly the certificate allows an encrypted connection to be set up between the browser and web server. This makes it harder to intercept or modify the data connection. A certificate from a verified CA costs £100 - £200 (Warbrick n.d.).

A certificate was obtained at no financial cost from the University of Dundee and deployed to the web server hosting the site. However it took approximately 2 weeks to obtain a signed certificate making this credibility factor a significant effort to implement.
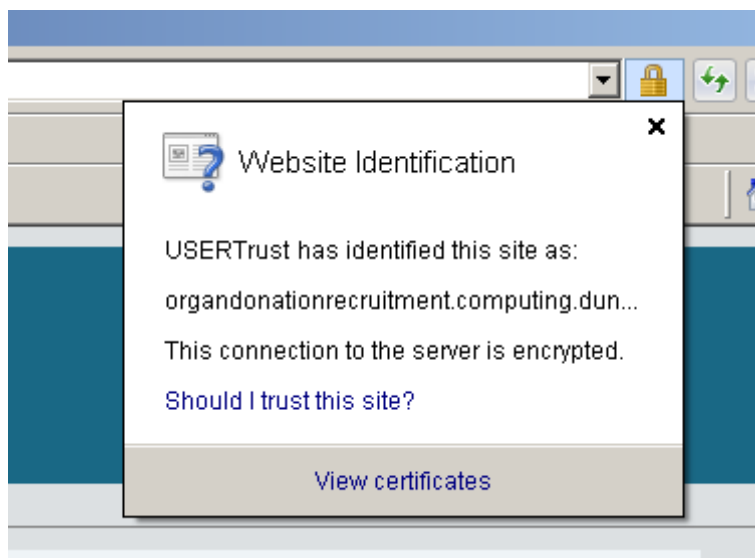
Figure 21 - Screenshot of an HTTPS notification padlock in Internet Explorer
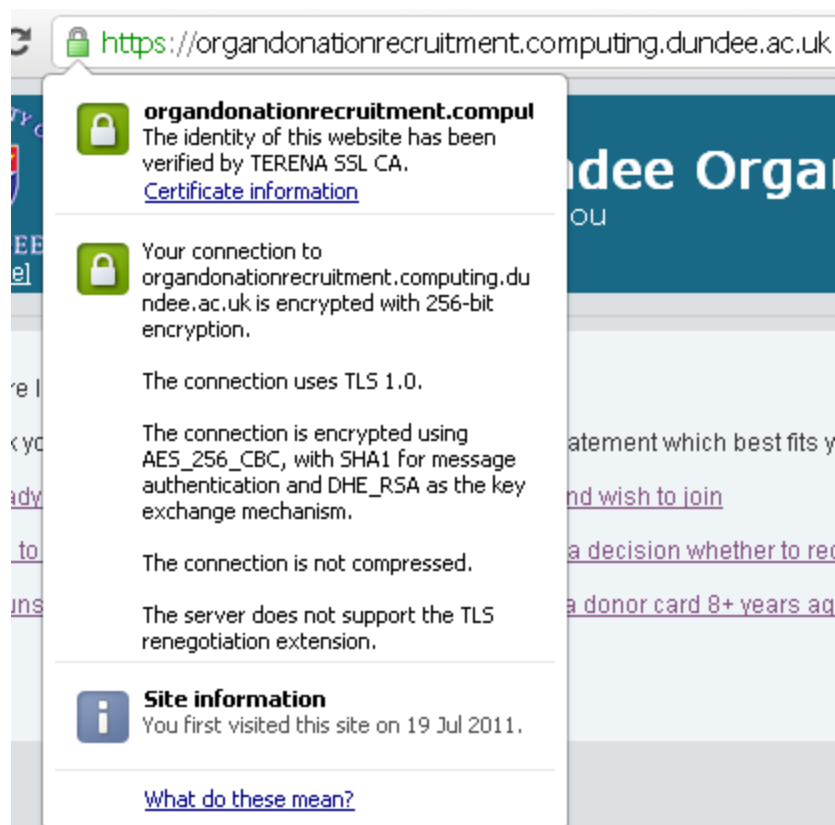
Figure 22 - Screenshot of an HTTPS notification padlock in Google Chrome

4.3.2 Domain name

Domain name was identified in the literature review as a credibility factor (Treise et al. 2003). In this paper visitors were explicitly told that the story they were reading was from a .com or .gov site, whether participants would actually notice it by themselves was not investigated (see Figure 23). A .com domain was registered for the site at a small annual cost for use in the low credibility site to imply it was a commercial site. The high credibility site used the same site name (organdonationrecruitment) but with an extension of "computing.dundee.ac.uk" to show it was hosted by the University of Dundee computing department, an academic institution.
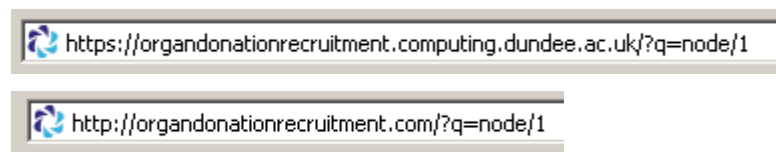
Figure 23 - Screenshot of the browser address bar in Internet Explorer showing domain names of the high (above) and low (below) credibility sites as seen in Internet Explorer

4.3.3 Design appearance

In the previous study two different style sheets were used. One was a recognisable university style and the other was a default style sheet from Drupal. Design professionalism is the first thing website visitors describe when asked what makes websites credible. It was feared the large change in colour and font could overwhelm the effect of the other credibility factors (Fogg 2002b). For this reason, in the organ donation study both sites used the same style sheet (see Figure 24 and Figure 25).

One of the intended audiences of this thesis is web developers considering whether to implement credible design practices. 'Employ a recognisable visual design' would probably not be a very useful recommendation, especially if it's implementation distorted the results of the study by obscuring the impact of more subtle credibility factors.
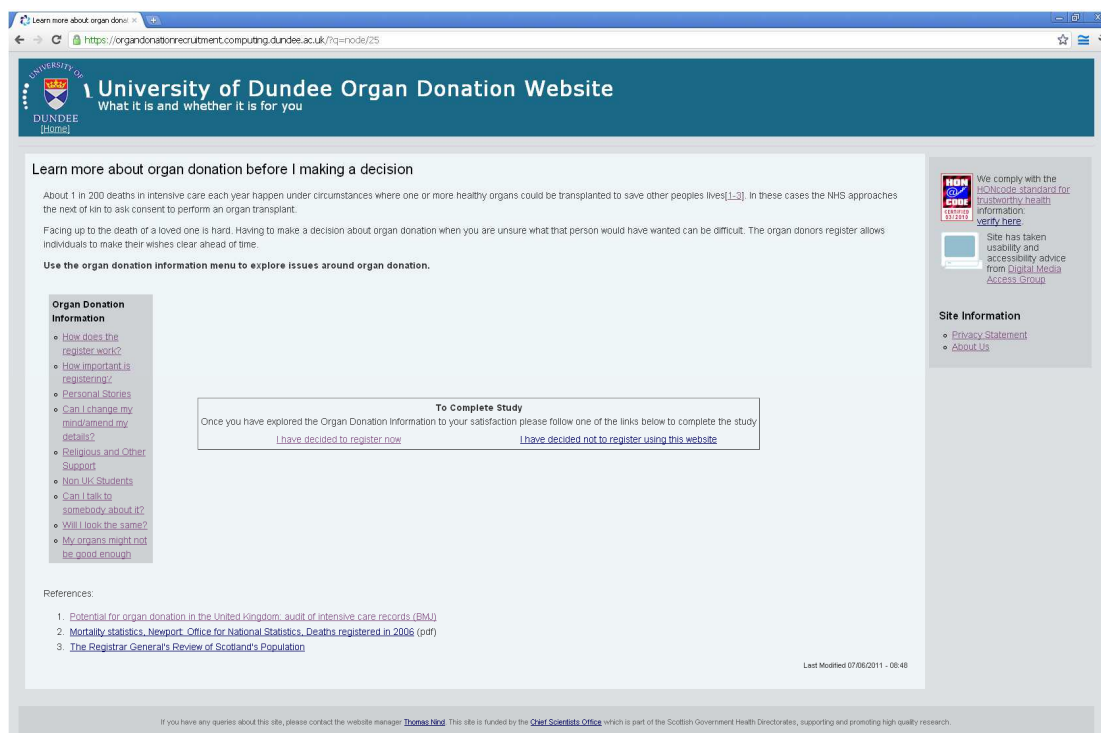
Figure 24 - Screenshot of the 'learn more about organ donation' page of the high credibility intervention
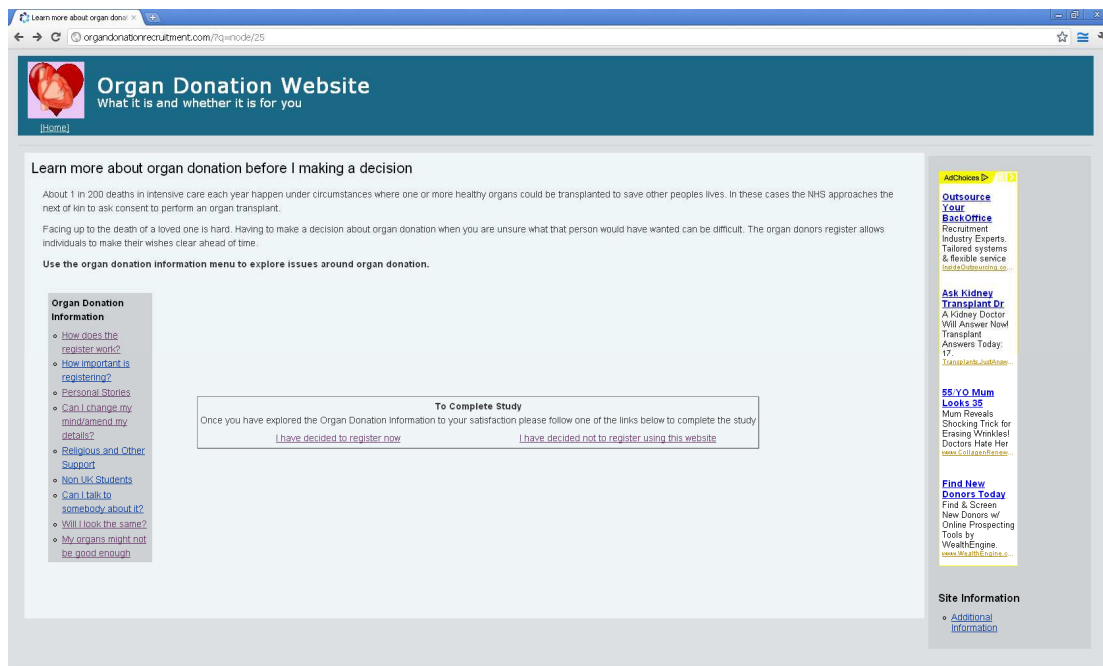
Figure 25 - Screenshot of the 'learn more about organ donation' page of the low credibility intervention

4.4 Methodology – Study Design

4.4.1 Structure

A reviewer of the Chief Scientists Office project proposal (which funded this research) hypothesised that one area where credibility may play the large role is recruitment. In the exercise study participants were only exposed to the credibility factors after completing the consent and questionnaire pages (see Figure 7). This was changed in the organ donation study by creating the consent form and questionnaire inside Drupal as part of the site (see Figure 26).
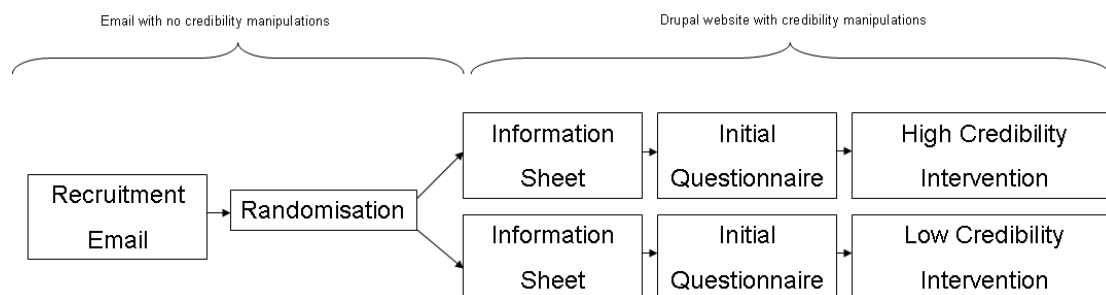
Figure 26 - Revised website structure in which credibility factors are immediately apparent after following email url

In order to accomplish randomisation without needing a login webpage, a tinyurl (TinyURL LLC 2011) was used. A tiny url is a common way of substituting a long unwieldy url for a

short 'alias' link. It is typically used when it is not convenient to write out the full address e.g. in an email where a link might span multiple lines or contains special characters. For example following a link to http://tinyurl.com/yccz9c will take a user to www.dundee.ac.uk.

In this case the tinyurl directed users' browsers to a php script which randomised them based on their IP address to one of two groups. Participants' browsers in the first group were sent a redirect header to the low credibility site and browsers in the second group were redirected to the high credibility site. This process was invisible to the user so from their perspective, they followed a short link and arrived at the same destination as anyone else who followed it.

The php script also logged all visits/redirections in order to verify the integrity of the randomisation and to record when students visited the front page but opted not to participate in the study.

The randomisation calculation used the inbuilt php random number generator seeded with the visitor's Internet Protocol (IP) address. An IP address is unique to the user's Internet access point (though not with his/her specific device). IP address was used as a seed instead of the time of randomisation which is traditionally used. This was done so that if a participant closed their browser then reopened it via the invitation email link they would be returned to the same site.

4.4.2 Planned measures

The primary outcome measure for the study was registration as an organ donor. This was measured using a 2x2 contingency table comparing the number of participants in each group choosing to register with those choosing not to.

Because the credibility factors were incorporated into the consent and registration form (see 4.3 Methodology - Credibility Factors), it is possible that some people might respond to the invitation email but decided not to participate because of the credibility of the site. To evaluate whether this had an effect on recruitment to the ODR, an 'intention to treat' (Hollis and Campbell 1999) analysis was conducted. The intention to treat analysis compared the number of participants registering on the ODR with the number responding to the original email (viewing the site but not necessarily participating) using a 2x2 contingency table.

Secondary outcome measures included the time based measures used in the exercise study (see 3.2.4 Measures). Additionally, the effect of credibility on recruitment to the study (as opposed to final ODR registration rates as described above) was explored using a 2x2 contingency table.

Baseline data was collected from participants including:

- age
- gender
- ethnicity
- religion
- how informed they felt about organ donation
- pre-intervention intention to register
- certainty of pre-intervention intention to register
- participants' assessments of their healthiness
- participants personally knowing a recipient
- participants personally knowing a donor
- whether a participant has ever donated blood

Participants who chose not to register were given the opportunity to complete an exit questionnaire where they could register their reason for not registering and/or any other general comments about the site. A number of pre set options were provided based on current research into reasons for not registering (Morgan, Stephenson, Harrison, Afifi & Long 2008) and barriers identified during the student interviews. An 'other reason' box was also provided. Set options included:

- I plan to register through another channel e.g. at my GP surgery
- I believe medical professionals might not try as hard to save my life if I were in an accident and they knew that my name was on the ODR
- I believe the body must be complete after death.
- I don't want to upset my family
- I don't want to tempt fate / risk bad luck by registering

The exit questionnaire also contained a repeat measure of how informed they felt about organ donation and a measure of how helpful they found the site.

4.4.3 Changes to outcomes

There were no changes to the planned outcomes. However it was decided to perform an additional logistic regression analysis regressing registration onto the baseline questionnaire answers. This was done firstly to determine whether there were any factors that might require to be controlled for e.g. if blood donors were more likely to register and there were a disproportionate number in one group. Secondly this analysis would provide useful information to inform future campaigns which could target the largely untapped resource of students.

The logistic regression calculation was initially carried by Dr Falko Sniehotta, a collaborator on the project. The regression was then repeated and expanded by the author during the writing of this thesis.

4.4.4 Manipulation check

Prior to the study launch, a manipulation check was conducted. This check was designed to ensure that the intervention measure (high vs. low credibility) had been properly implemented. If the manipulation check had failed then it is possible that the intervention developer's concept of credibility as implemented was not the same as participants. In such a case the study would not have actually been testing the effects of credibility at all and would need refinement.

The manipulation check consisted of four MSc students being presented with a printout of the main page of each site and being asked to identify any differences and state which site they found more credible or would be more inclined to believe. They identified all differences with the exception of the domain name and HTTPS manipulation and indicated a preference for the high credibility site. Although simple, this test confirms that the manipulations were interpreted by these students as heightening/lowering credibility.

It was decided not to modify the domain name/HTTPS manipulations because any increase to prominence would be artificial and not representative of real websites.

Pingdom web page speed test analyser (Pingdom 2012) was used to confirm that the loading time of both sites was the same.

4.5 Recruitment

4.5.1 Initial recruitment

Eligibility criteria for participants were defined as being either:

- not currently members of the NHS Organ Donor Register, or

- did not know what the register is, or

- were unsure whether they were registered.

Initially participation was open for all students and staff of Dundee University.

The initial plan for recruitment involved recruiting from the Dundee University population which consists of 16,270 students (Higher Education StatisticsAgency 2010). To determine the eligible recruitment pool the number of students already registered must be deducted. There are no publically available figures for student registration on the ODR. However there are statistics for general population divided by geographical region. In Tayside this figure is 34% (Strategic Health Authority 2011), giving a participant pool of 10,250.

Recruitment emails were sent over a 1 month period starting as soon as the intervention website was brought online. Assuming the consent rate matched the exercise study (8.4%) then there would be 748 participants. This would be sufficient to demonstrate a relatively small effect size based on a-priori power calculation with (d=0.25) effect size with $\alpha = 0.05$ and $p = 0.95$.

 If recruitment did not achieve the expected rates then the study could be expanded, with appropriate ethical submissions, to Newcastle and/or Warwick universities.

Although the plan was to email invitations directly to each potential participant, changes in Dundee University policy meant that this was no longer possible. Instead a short (375 characters) summary was included in the weekly university electronic newsletter on 15th of July 2011. This resulted in a very low response rate (Figure 27). It was initially assumed that the low rate was due to the launch date in the middle of the student summer holidays and so a

second round of recruitment was conducted during term time. This second round also had a very low response rate (Figure 28). In total only 79 (0.77%) of 10,250 Dundee students participated. In addition 8 members of staff and 2 who identified themselves as "other".

Dundee Recruitment Round 1
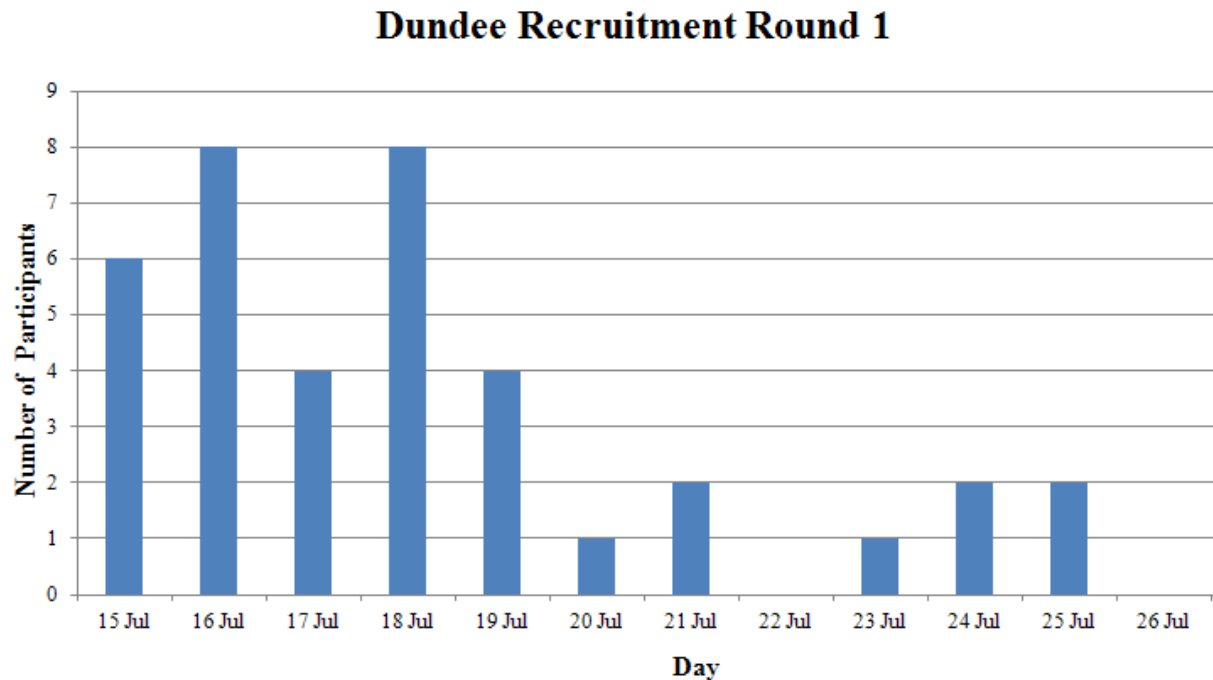
Figure 27 - Number of participants recruited in the first round at Dundee University

Dundee Recruitment Round 2
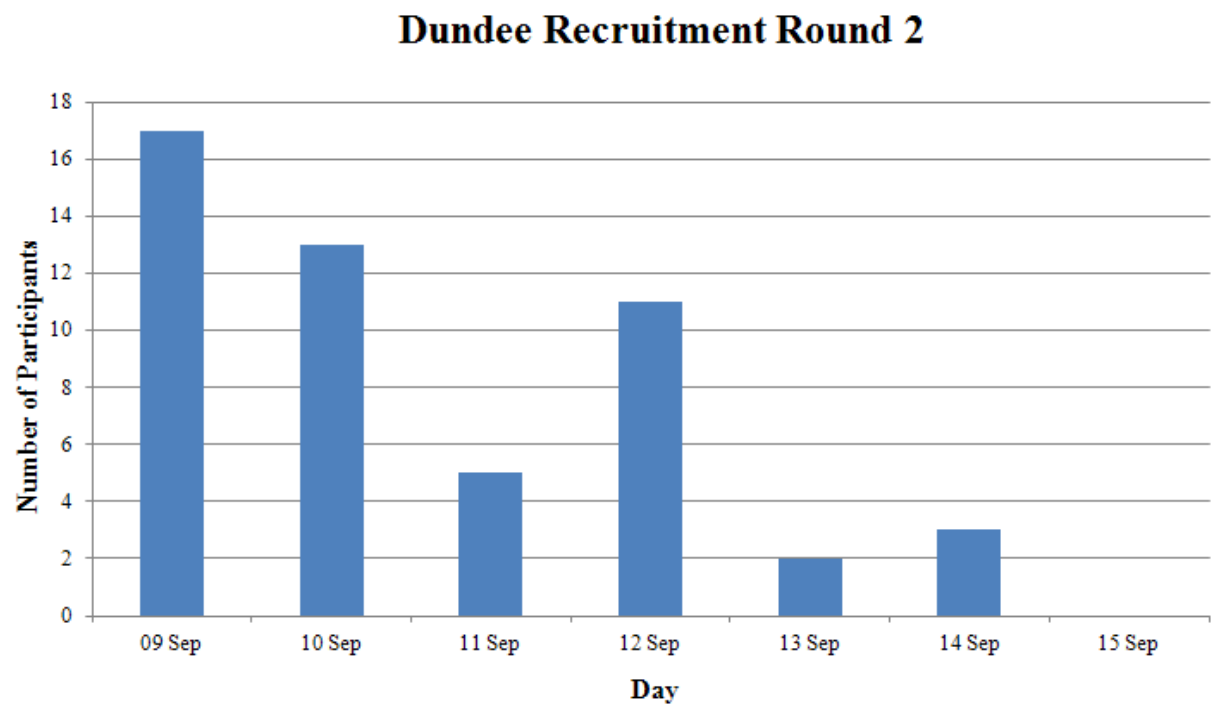
Figure 28 - Number of participants recruited in the second round at Dundee University

4.5.2 Expanded recruitment

The low recruitment at Dundee University triggered the contingency plan of extending recruitment to Warwick University. Warwick confirmed ethical and administrative support for the project and were willing to implement the planned recruitment route of direct emails. Starting on the 27th October 2011, 28,771 students were emailed study invitations. The Higher Education Statistics Agency lists 28,870 total students implying that email addresses were not accessible for 99 (0.3%) students. The West Midlands has a lower organ registration rate than Tayside, 24% (Strategic Health Authority 2011) leaving an eligible participant pool estimate of 21,866.

In the first 8 days 552 participants were recruited (see Figure 29). Combined with Dundee this gave a total of 641 participants which was short of the recruitment target of 748. With the participation rate sharply dropping off it was decided to initiate a second round of emails on the 4th of November.

It is recommended by Schulz and Altman (Schulz, Altman 2010) that interim analyses are not performed, instead clear cessation criteria should be set. The 8th of November was the first time that the number of participants was checked and found to be above the recruitment goal. At this point there was a combined recruitment figure of 889 and data was finalised for analysis.
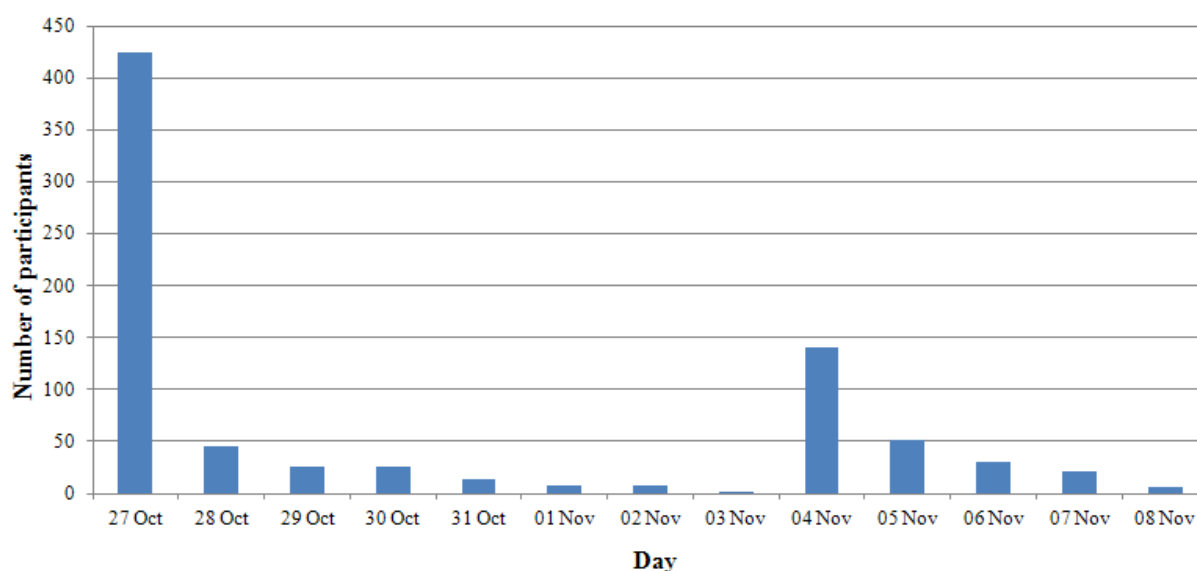
Figure 29 - Number of participants recruited in Warwick (including reminder email on 4th November)

Over the course of the study, two participants were removed from the study (and had their study data deleted). One was already a donor but didn't realise this met the exclusion criteria until they had enrolled in the study. A second participant was a foreign exchange student who was only in the UK for 1 week. Both participants made contact by email and specifically requested to be removed. One was from the low credibility group; the other was from the high credibility group.

4.5.3 Visitors versus participants

In addition to the 889 people who participated in the study, a record was taken the people who followed the link in the invitation email but decided not to participate after evaluating the information and consent page (these people are described as **visitors**). The php tracking script (see 4.3 Methodology - Credibility Factors) recorded 2830 requests for the information/consent page. Many of these were from web crawlers or were the result of page refreshes from invalid/missing consent information being entered in the enrolment dialog. An estimate of the number of actual **visitors** is shown in Table 14.

Classification	Number	Reason
Web crawler	479	User agent of request contained the words "bot", "spider", "google", "yahoo" or "crawler"
Duplicate	260	Another request was made by the IP Address less than 120 seconds before
Developer IP	23	IP address was one of the computers used for development.
Invalid url	2	Requests were via web server IP: "134.36.36.34/?q=node/1" so could not have come from genuine users.
Presumed to be valid **visitors**	2066	Did not fit into any other classification

Table 14 - Breakdown of visitors to the information/consent page of the site during the study

Despite comprehensive analysis, it is likely that there are still some erroneous entries in the 'presumed valid' group. The same method was used to identify **visitors** in both the high and low credibility groups preventing any bias. The potential inaccuracy of **visitor** data only affects the intention to treat analysis and **not** the main study outcome or analysis of factors associated with registration. Once **visitors** had registered their details they become **participants** all data was individually identifiable.

4.5.4 Recruitment Summary

A full breakdown of how users progressed through the intervention is presented as a CONSORT (Schulz, Altman 2010) diagram (Figure 30).
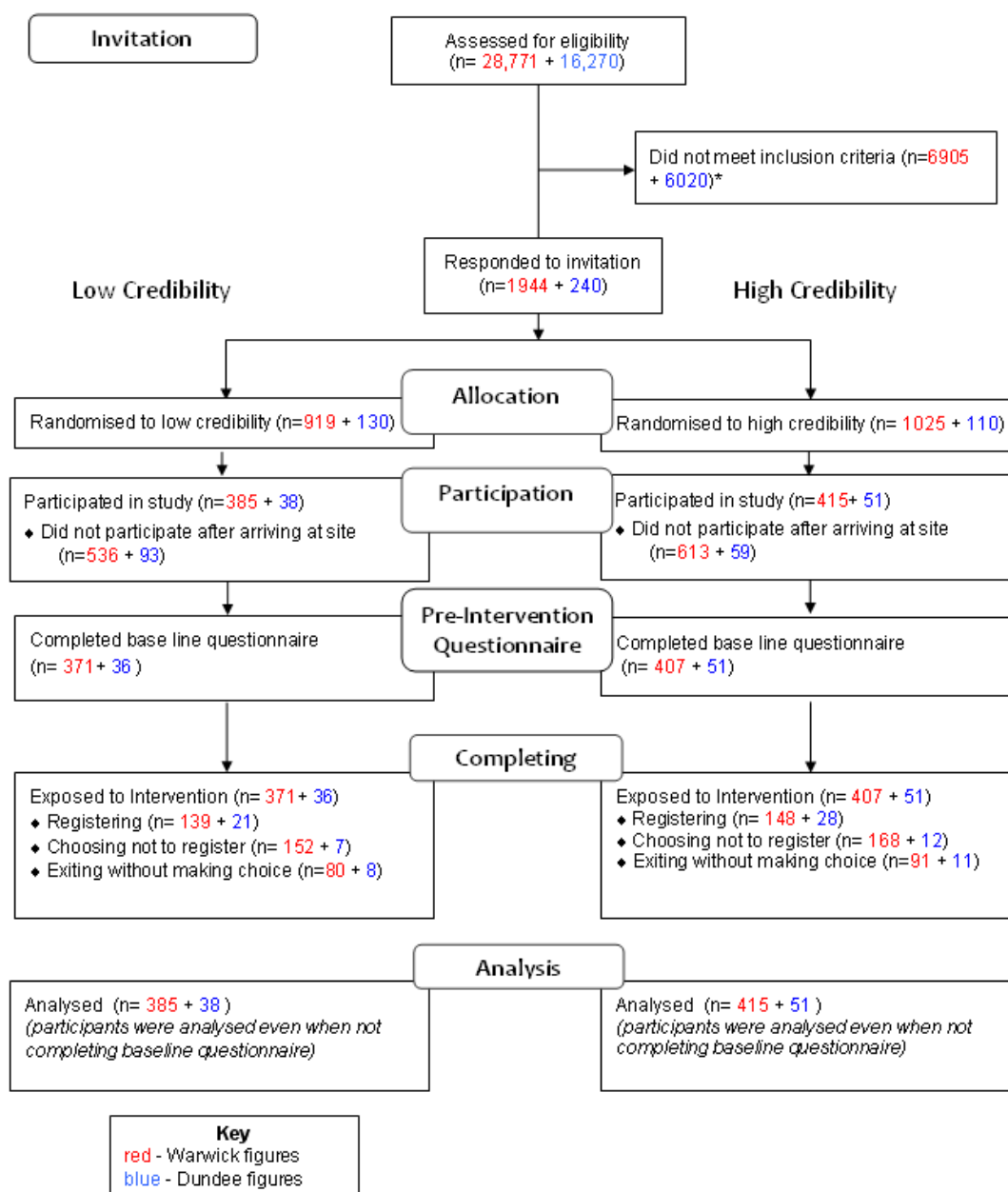
* Estimate based on current organ donor registration rates in Scotland (37%) and the West Midlands (24%)

Figure 30 - Consort diagram showing participant flow

There was a difference in group sizes between site visitors randomised to the high (1103) and low (963) credibility websites. An exploration of this uneven randomisation was conducted. The difference was found to arise from the IP based randomisation. IP addresses are

normally unique to each web user however this is not always the case as a home network may use a single IP address for multiple computers or a dialup Internet connection may change IP addresses each time it connects to the Internet.

Some IP addresses turned out to be sending requests for many different clients, this may be a proxy server or wifi gateway. In particular 48 "presumed valid" requests were made by the IP address137.205.222.193 and 28 were made by 212.219.41.130. Both of these IPs were randomised to the high credibility group. The requests were from a range of devices / browsers e.g. iPhone OS, Symbian, Firefox, Mac OS making it unlikely to be a single user. These appear to be mainly mobile devices reinforcing the hypothesis that the IP address is a gateway of some sort. It was decided that this difference was unlikely to introduce a sample bias because devices in the cluster were unrelated and IP address / Internet access method are unlikely to be related to registration as an organ donor (outcome measure).

Future studies should avoid using IP addresses for randomisation and instead use a session variable or cookie to track page refreshes and repeat visits.

4.6 Results

4.6.1 Participant baseline data

Of the 889 participants who filled their name, position and university into the consent/information form, 865 proceeded to complete the baseline questionnaire (see Table 15).

In the interests of avoiding potential conflict with participants, religion was left as a free text box (rather than a fixed set of options). This resulted in a large number of different responses (see digital appendix). These responses were manually categorised.

	Low Credibility	High Credibility
Position	Postgraduate 158 Undergraduate 250 Staff 7 Other 8	Postgraduate 161 Undergraduate 294 Staff 7 Other 4
Initial intent to join the ODR	yes 161 no 114	yes 175 no 118

	undecided 132 unanswered 16	undecided 164 unanswered 9
Certainty of intent to join the ODR (mean of Likert scale 1-10)	5.5	5.3
Gender (Female)	237 (58%)	238 (52%)
Mean Age (based on year of birth)	24.1	24.3
Participants' estimates of their chances of living past 75 (mean)	70.9%	70.6%
How informed participant is about organ donation (mean of Likert scale 1-10)	5.5	5.3
How healthy participant feels (mean of Likert scale 1-10)	7.4	7.4
Have ever donated blood (Yes)	127 (31%)	133 (29%)
Know someone who has donated (Yes)	42 (10%)	48 (10%)
Know someone who has received an organ (Yes)	64 (16%)	68 (15%)
Religion (originally free text)		
No religion	193 (47.4%)	204 (44.5%)
Christian	104 (25.6%)	120 (26.2%)
Muslim	20 (4.9%)	25 (5.5%)
Hindu	12 (3%)	13 (2.8%)
Sikh	1 (0.3%)	4 (0.9%)
Jewish	1 (0.3%)	2 (0.4%)
Buddhist	4 (1%)	15 (3.3%)
Other religions	11 (2.7%)	9 (2%)
Religion not stated	61 (15%)	66 (14.4%)
Ethnic Origin: *(ethnic categories were duplicates of those on the ODR)*		
White - British	240 (59%)	247 (53.9%)
White - Other	51 (12.5%)	63 (13.8%)
White - Irish	5 (1.2%)	7 (1.5%)
Asian or Asian British - Other	20 (4.9%)	27 (5.9%)
Chinese	26 (6.4%)	36 (7.9%)
Asian or Asian British - Indian	25 (6.1%)	30 (6.6%)
Asian or Asian British –	3 (0.7%)	9 (2%)

Pakistani		
Black or Black British - African	6 (1.5%)	8 (1.8%)
Other	21 (5.2%)	20 (4.4%)
Not Stated	10 (2.5%)	11 (2.4%)

Table 15 - Baseline participant data

There was no visible discrepancy in any of the baseline data between study groups. In keeping with the CONSORT (CONSORT 2011) randomised controlled trial analysis approach, no significance tests were performed to verify this:

"...significance tests assess the probability that observed baseline differences could have occurred by chance; however, we already know that any differences are caused by chance. Tests of baseline differences are not necessarily wrong, just illogical."

The majority of participants were undergraduate or postgraduate students with only 14 staff and 12 'other' participants. At least 1 of the 'other' participants was external to the university leaving a website comment beginning:

"I came upon this survey as my sister works with NHS Tayside..."

There was an even distribution of participants between yes/no/undecided when posed the question "Before visiting this website, did you intend to join the Organ Donor Register?". This implies that even when students are not planning to register they are willing to explore the issue within the context of a research study. Whether they would be as willing if approached under different circumstances i.e. not in a study, is unknown.

The question "How certain were you [about joining the ODR] (if you are undecided, please leave this question blank)" proved to be rather ambiguous given its dependency on intention to join (yes / no). Many participants who were undecided still selected a certainty.

Participants reported a mean of 5.4 for how informed they felt about organ donation. The large standard deviation of 2.5 implies there was a wide range of levels of knowledge about organ donation.

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The mean age of participants was 24 which fits with the majority being undergraduate followed by postgraduate students. The standard deviation was 7.5 with the youngest participant being 17 and the oldest 70.

Two measures of healthiness were included, a Likert scale "How healthy do you feel?" and " What do you think are the chances you will live to be 75 or more (where 0 means there is no chance you will live to 75 or more, and 100 means you will definitely live to 75 or more)?". These are established ratings for measuring how people assess their personal health risks (Schoenbaum 1997). Both groups showed high expectations of longevity and healthiness.

Gender distribution was roughly even with a slightly higher representation of females (55%) compared to the UK national average of (50.78%) (Office for National Statistics 2010).

A wide range of ethnic and religious backgrounds were present among participants. In order to assess how representative participants were of the general public a comparison is presented below (see Table 16 and Table 17). This is based on 2001 census information for England and Whales, reported in 2004 (Office for National Statistics 2004a, 2004b). The results of the 2011 census are not yet processed.

Religion	Study Participants	General Population
Christian	45.90%	71.75%
No religion	25.90%	14.81%
Muslim	5.20%	2.97%
Hindu	2.89%	1.06%
Sikh	0.58%	0.63%
Jewish	0.35%	0.50%
Other religions	2.31%	0.29%
Buddhist	2.20%	0.28%
Religion not stated	14.68%	7.71%

Table 16 - Comparison of study group religion to general population

The 2001 census data does not include figures for people who chose not to state their ethnicity or who selected 'Other'. In order to compare study participants with the general

population (see Table 17) the 62 participants who chose Other/Not stated were omitted. The study participants were more diverse than the general population.

Ethnicity	Study Participants	General Population
White: British (WB)	58.96%	86.99%
White: Other White (WO)	13.80%	2.66%
Asian or Asian British: Indian (ABI)	6.66%	2.09%
Asian or Asian British: Pakistani (ABP)	1.45%	1.44%
White: Irish (WI)	1.45%	1.27%
Black or Black British: Black Caribbean (BC)	0.48%	1.14%
Black or Black British: Black African (BA)	1.69%	0.97%
Other - Chinese (OC)	7.51%	0.89%
Asian or Asian British: Bangladeshi (ABB)	0.24%	0.56%
Asian or Asian British: Other Asian (ABO)	4.60%	0.48%
Mixed: White and Black Caribbean (MWBC)	0.61%	0.47%
Mixed: White and Asian (MWA)	1.09%	0.37%
Mixed: Other Mixed (MO)	1.33%	0.31%
Black or Black British: Other Black (BO)	0.12%	0.19%
Mixed: White and Black African (N/A)	0%	0.16%

Table 17 - Comparison of study group ethnicities to general population

A high proportion of participants had given blood in the past (30%). This figure is difficult to compare to the general public because the NHS only reports the number of regular donors which does not include lapsed donors. In 2009 4% of the population (NHS Choices 2010) gave blood.

Knowing someone who had donated an organ (10% of participants) was less frequent than knowing someone who had received an organ (15% of participants).

Overall the data collected did not show any large variation from what would be expected if the same sample had been taken from the general UK population with the possible exception of propensity to donate blood.

4.6.2 Primary measure

The planned primary measure of the study was registration as an organ donor. This was measured by mirroring the NHS organ donation registration page. Participants who made the decision to register entered their personal information into this form. Participant information was stored on a password protected MySql database.

After the study had been completed this information was securely transferred to Christine Cole, Team Leader of NHS Blood and Transplant, Organ Donation and Transplantation Directorate who added the data to the NHS organ donors register. Registration information was emailed as an encrypted zip file whose password was independently communicated via telephone.

Of the 889 participants, 336 (37.79%) chose to join the ODR after reading the intervention site. A 2x2 Chi-squared contingency table with Yates correction was used to assess whether there was a statistically significant difference in registration rates between groups (high vs. low credibility) (see Table 18).

	Registering	Not Registering
High Credibility	176	290
Low Credibility	160	263

Table 18 - 2x2 Contingency table comparing registration rates with intervention group (Chi squared=0.000 p=0.944 two tailed)

The p-value of 0.944 indicates there was no statistically significant difference in registration rates between participants reading the high credibility site and those reading the low credibility site.

The intention to treat analysis confirmed that the credibility manipulations did not impact recruitment rates of visitors to the site (see Table 19).

	Registering	Not Registering
High Credibility	176	927
Low Credibility	160	803

Table 19 - 2x2 Contingency table comparing registration rates across all visitors to the site (Intention to treat analysis) (Chi squared = 0.119 P = 0.7303 two tailed)

4.6.3 Overview of website usage data

In total 5112 pages were requested by participants. Calculation of time spent on site was captured via JavaScript in the same way as during the exercise study. Unfortunately this was only available for 990 (19.3%) page requests. This low rate is likely to be the result of the increasing use of mobile devices and users opting to restrict/disable JavaScript with tools such as NoScript . As a replacement measure, time spent was calculated as elapsed time between a user's page requests. This gave values for 4212 pages (82%) (the duration spent on the final page request of each user is not accessible). In order to verify the accuracy of this calculation, the JavaScript figures were compared to the new elapsed time values (where values were available for both). Values were within 1 second of each other in 851/939 cases (90%) and within 10s of each other in 908/939 cases (96%). Cases where the calculations do not match may be the result of tabbed or windowed browsing where multiple pages are opened by the user at once.

Similar to the exercise study, there were a small proportion of extreme page view duration values. In order to more accurately visualise the distribution, a histogram (see Figure 31) is presented showing all page views below 500 seconds. The full dataset including the 76 values that were over 500 seconds also presented below as a box plot (see Figure 32).
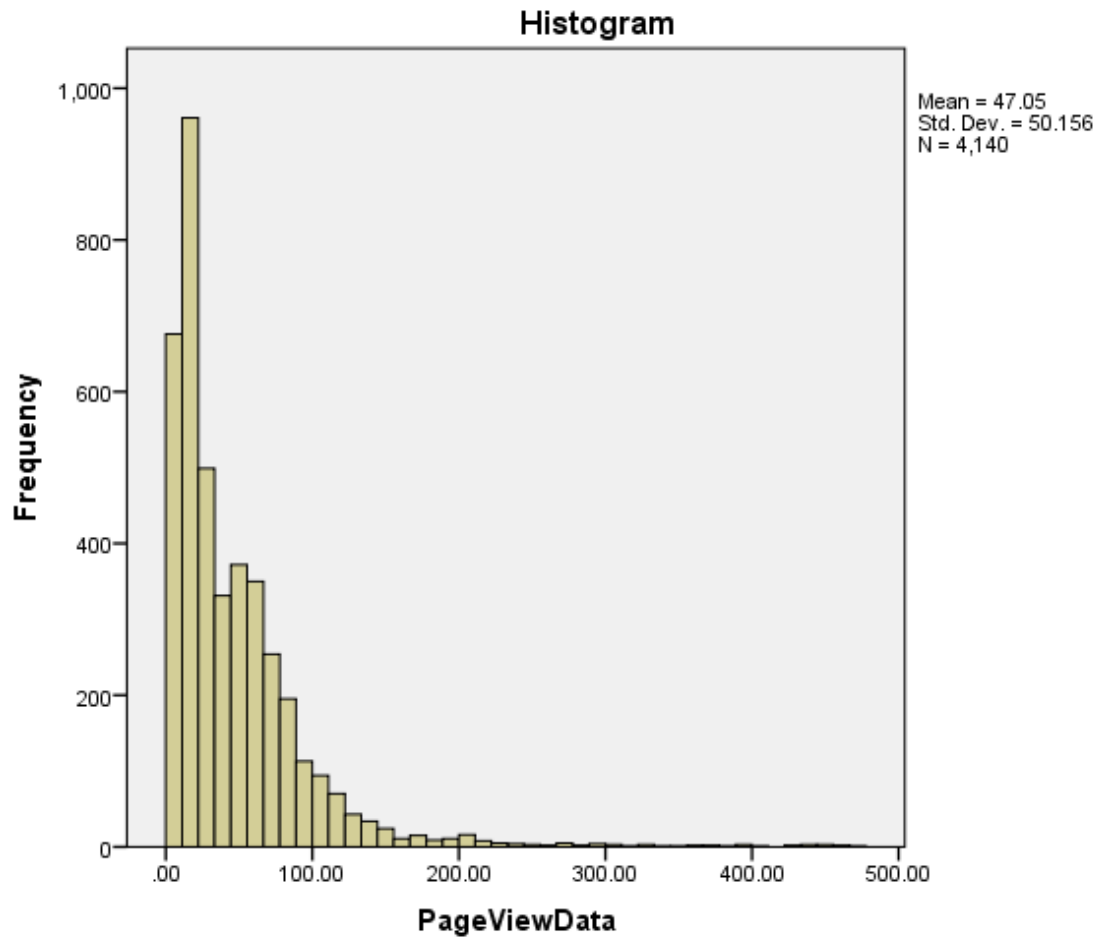
Figure 31 - Histogram of all page view times under 500 seconds (4140/ 4216)
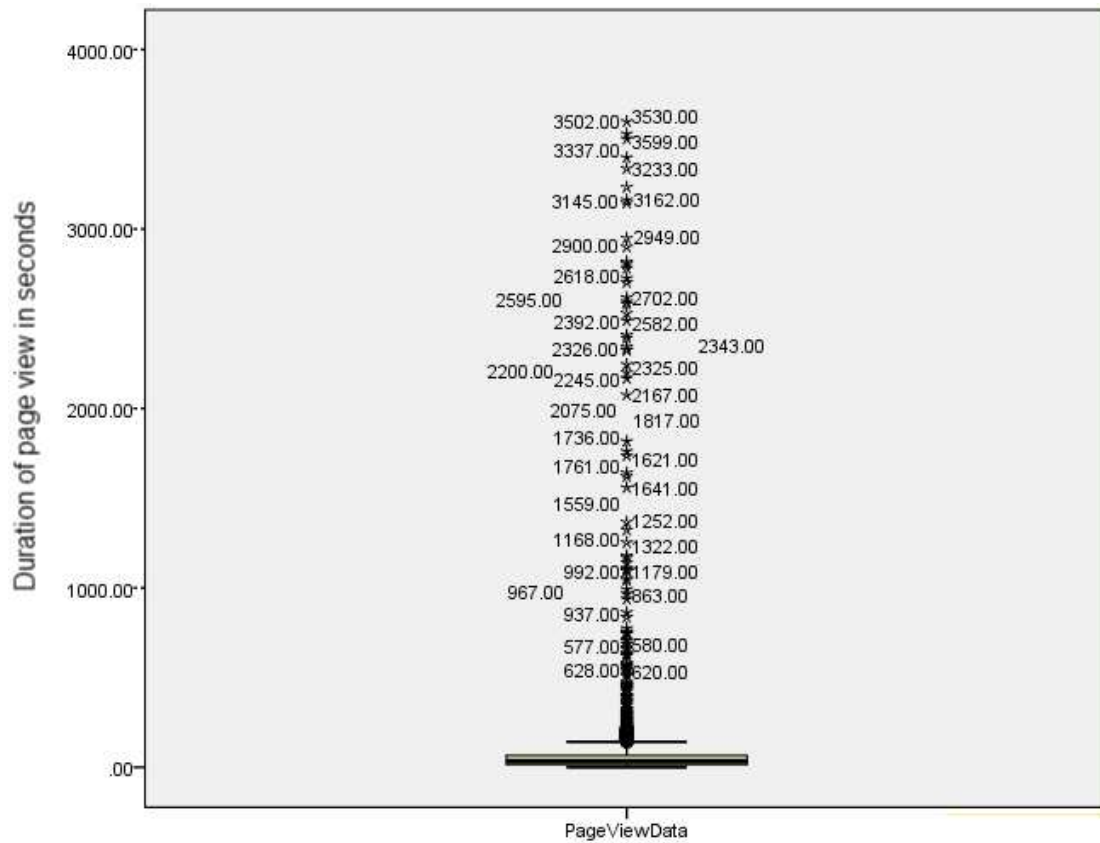
Figure 32 - Box plot of all page view times in seconds

In keeping with the approach used in analysing the exercise study data, all statistics were calculated both with and without outliers. For completeness, page view and site visit duration graphs are also presented (See Figure 35 and Figure 36).
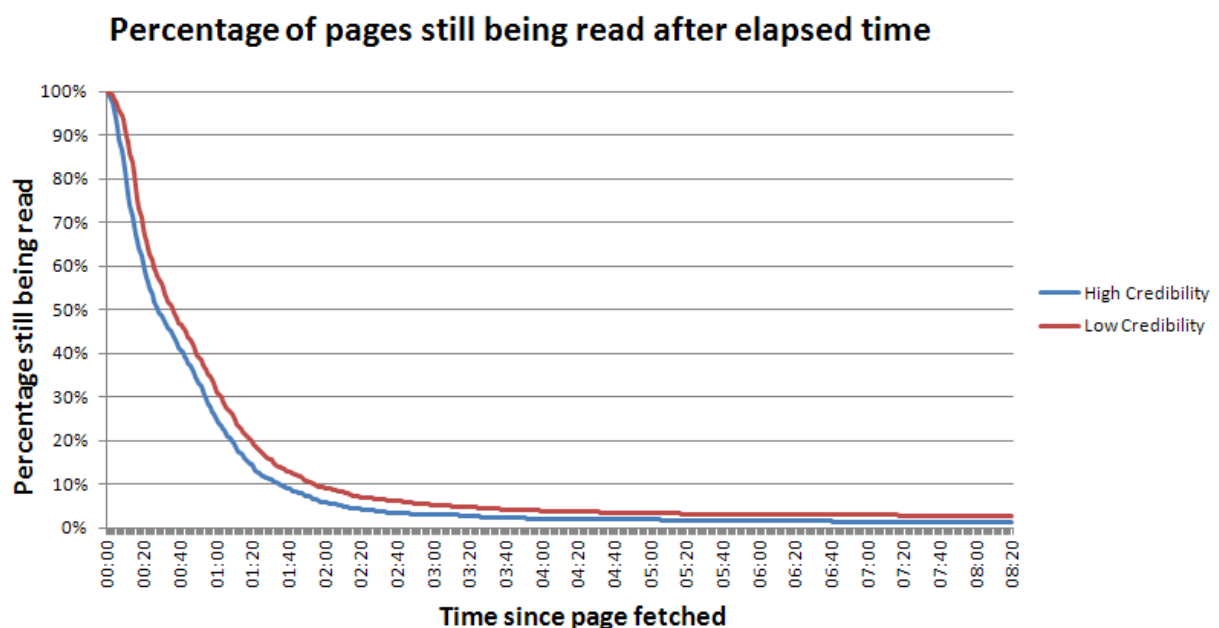
Figure 33 - Comparison of page view durations in the high and low credibility organ donation sites
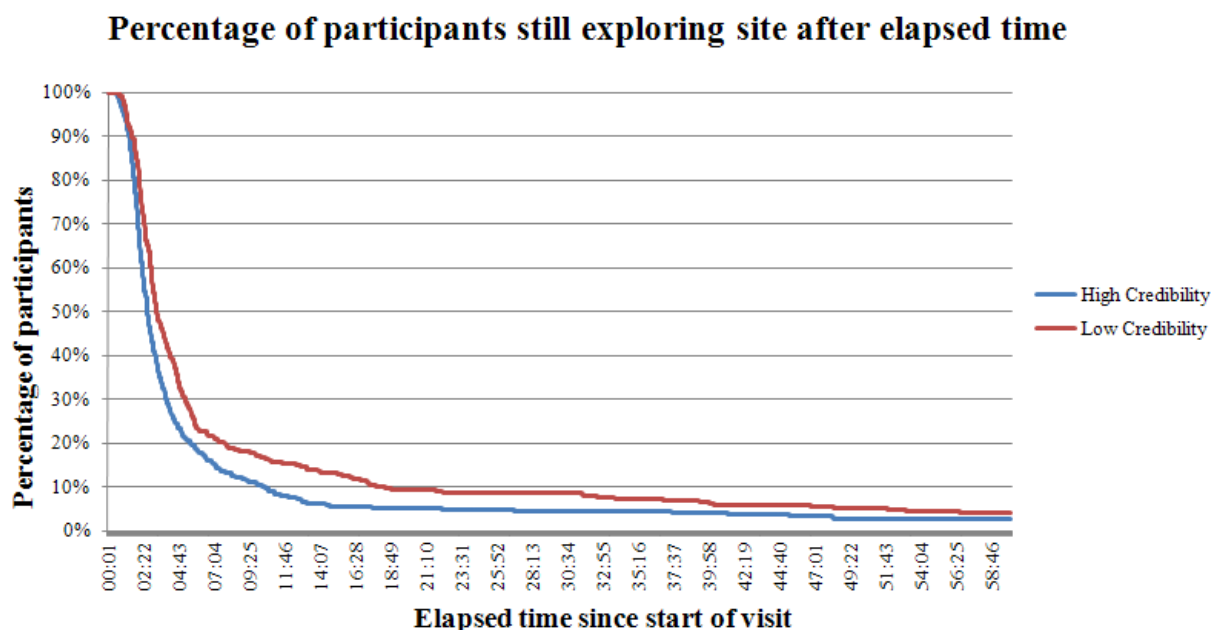
Figure 34 - Comparison of visit durations in the high and low credibility organ donation sites

Determining potential outliers was more difficult than in the exercise study due to the increased number and variance of extreme cases. Values of 500 (8 minutes 20 seconds) and over were set for page duration which excludes 29 cases (1.2%). The outlier point for visit duration was set at 3600 seconds (1 hour), excluding 10 participants (1.1%). In practice this made no difference to the outcomes of any of the Mann Whitney U calculations (Except in the case of the exit questionnaire page).

Significance of time spent on each page P < 0.00005 (with outliers P < 0.00005)		
Group	High Credibility	Low Credibility
N	2212 (2237 with outliers)	1924 (1975 with outliers)
Median	29s	37s
U	2395679.0 (2509062.5 with outliers)	
Significance of visit durations p= 0.000018 (p=0.000018 with outliers)		
N	461 (466 with outliers)	418 (423 with outliers)
Median	2m37s	3m9s
U	112275.0 (114594.0 with outliers)	

Table 20 - Mann-Whitney U results for time spent on each page and visit duration

In both time spent per page and visit duration per participant, significantly more time was spent by users of the low credibility site (see Table 20). This is the opposite finding to the exercise study where participants spent more time on the high credibility intervention.

4.6.4 Website browsing behaviour

Time spent on each page was analysed using the same method as in the exercise study. In the interests of clarity, the site map of the website is shown again (see Figure 35).
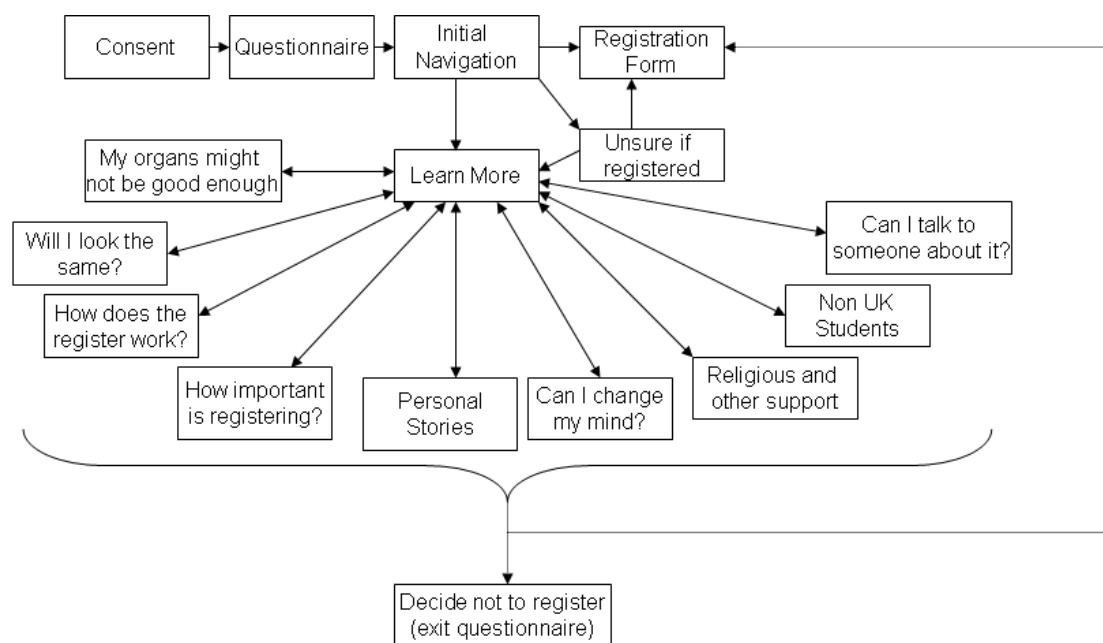
Figure 35 - Organ donation intervention website structure (reminder)

The following table (see Table 21) summarises the results of Mann Whitney U tests for significance of each page view duration when comparing high credibility view time to low credibility view time. This analysis approach is the same as was used in the exercise study (see 3.3.1 Participant browsing patterns) but is presented in summary form due to the large number of pages present on the site. Each test is presented both with and without outliers (in brackets).

Page	Number of participants viewing page in high/low credibility group (Without outliers)	Median time spent viewing page (difference between medians)	Mann Whitney U test: U value (Without outliers)	Mann Whitney U test: two-tailed P value (Without outliers)
Organ Donor Registration Form	242/213 (236 / 204)	61s / 72s (+11s)	29098.5 (26946.5)	p= 0.01645 (0.02991)
Unsure if registered or obtained a donor card 8+ years ago	103/99 (101/ 98)	13s /18s (+5s)	6557.5 (6454.5)	p= 0.00037 (0.0001)
Learn more about organ donation before I making a decision	310/ 267 (307/262)	19s / 22s (+3s)	47261.0 (45715.0)	p= 0.0031 (0.00478)
How does the register work?	73/71 (71/71)	45s / 52s (+7s)	2951.5 (2809.5)	p=0.1459 (0.234314)
How important is registering?	52/43 (50/43)	39.5s / 42s (+2.5s)	1135.0 (1135.0)	p= 0.8994 (0.64497)
Personal stories	41/35 (40/35)	32s / 43s (+11s)	879.5 (844.5)	p= 0.0902 (0.1234)
Can I change my mind/amend my details?	53/44 (N/A)	13s / 20s (+7s)	1578.5 (N/A)	p= 0.00227
Religious and other support	37/34 (37/33)	34s/61s (+27s)	865.5 (828.5)	p= 0.00569 (0.00928)
Non UK students	42/30 (41/30)	13.5s / 20.5s (+7s)	852.0 (852.0)	p= 0.01056 (0.00522)
Can I talk to somebody about it?	32/15 (N/A)	5s / 13s (+8s)	349.0 (N/A)	p= 0.01199
Will I look the same?	57/51 (57/50)	26s / 40s (+14s)	1855.5 (1798.5)	p=0.01161 (0.01773)
My organs might not be good enough	54/52 (54/51)	16s / 25.5s (+9.5s)	1689.0 (1635.0)	p= 0.06956 (0.095976)
Exit questionnaire	202/ 177 (196/ 170)	39.5s / 44s (+4.5s)	19967.5	p= 0.0479 (0.0554)

Table 21 - Time spent on each page (Mann Whitney-U test results). Highlighted pages had significantly different view durations between high and low credibility participants.

Although there was a **significant** difference in time users spent on many of the pages, in some cases the median difference was very small (e.g. +3s / +5s). In the case of this organ donation study, time spent on pages may be a problematic measure because unlike the exercise study, greater time spent reading the material does not necessarily translate into a more successful intervention. The purpose of the intervention is to get users to make a decision one way or another and the time it takes them to make that decision is not necessarily relevant. This topic is covered more in the Conclusions and Recommendations chapter.

In addition to the investigation of page view duration, the first page users chose to visit was examined i.e. whether they selected " I already understand what the Organ Donor Register is and wish to join", "I wish to learn more about organ donation before I make a decision whether to register or not" or "I am unsure if I am currently on the register or I obtained a donor card 8+ years ago". This gives an indication of how many participants were exposed to the core content of the intervention (information to address organ donation barriers, See Figure 35).

93% of participants followed one of the 3 initial navigation options. The remainder either exited at this point (3%), followed another link (privacy statement/about us/logout) (1%) or had already exited without completing the baseline questionnaire (3%).

53.7% followed the 'I wish to learn more…' path and were thus exposed to the content. 22.7% chose ' I am unsure if I am currently on the register…'. Only 16.7% of participants went directly to the organ donor registration option. This means that the majority of registrations came from participants who had explored other areas of the site before going to registration page.

4.6.5 Qualitative results

The website contained an exit questionnaire for participants who did not wish to register (see Figure 36). This form contained a checklist of possible reasons participants might not want to register. These options included all 4 non-cognitive beliefs and "I don't want to upset my family" (this concept came from the student interviews).

Figure 36 - Study exit questionnaire

339 participants filled out the exit questionnaire (as opposed to leaving the study by closing their browser/registering). There were no significant differences in the exit questionnaire data between credibility groups (see Table 22).

Exit Questionnaire Item	Answer	
	High Credibility	Low Credibility
I plan to register through another channel e.g. at my GP surgery	32.78%	30.19%
I believe medical professionals might not try as hard to save my life if I were in an accident	12.78%	15.09%
I believe the body must be complete after death.	13.89%	16.35%
I don't want to upset my family"	19.44%	15.09%
I don't want to tempt fate / risk bad luck by registering	10.56%	12.58%
How informed do you feel on organ donation?	6.93 Mean (up from 4.78 at baseline questionnaire)	7.18 Mean (up from 4.94 at baseline questionnaire)
How helpful have you found this website?	7.21 Mean	7.12 Mean

Table 22 - Exit Questionnaire Answers

The website was found to be helpful and exiting participants felt more informed about organ donation compared to when they started the study (p<0.0001 t-test to compare pre and post levels).

If this study were to be repeated the wording "please indicate the reason why you are not registering" would be changed to express it as an optional item as participants may have felt they were required to tick one of the options (although an Other option was provided). Check list items should have been presented in a randomised order. The high response rate of "I plan to register through another channel…" may be an artefact of it appearing first in the list (30%+).

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In total 31 (14 high credibility, 17 low credibility) comments were left in the section entitled 'comments on this website' (see Appendix 2). Feedback comments were categorised (see digital appendix). The majority of these comments were actually reasons for/against donating (16), this left 15 comments concerned with the quality of the site. Of these, 5 were positive (e.g. "*Very good information that has made me think hard about this!*"), 5 were negative (e.g. *"Lots of text, makes it hard to read")* and 4 were related to credibility of the site.

Of the 4 comments which were related to the credibility of the site, 3 comments (all in the low credibility group) criticised the site:

"This does not look like a trustworthy website, there are Adsense ads on the right for goodness sake. Also, there is no encryption and this whole site looks unprofessional"
Comment 1 - Criticism of adverts

"The Website doesn't seem so professional so I am weary [sic] of applying through here. There is no logo or society which is affiliated with this which adds to my uncertainty. The website looks very amateurish. Donating an organ is a big deal... I doubt people would do it through this website"
Comment 2 - Site appears amateurish

"The website was too slow to load different pages. Had it not been a research project, I would have left it at the first page click.

Also, the website doesn't look professional and again had I not known it was a research project, I would definitely have questioned its source i.e. I wouldn't have trusted what it had to say.

With regards to the section on Islam, it would have been useful to have provided a reference to link to the claims that were made, i.e. that X supports organ donation and here is the original source. I will not(sic?) have to go and try and find them.', 'I'm not entirely sure what my religion has to say on this issue. I read the section on Islam, but not entirely convinced. Need to read up more on it"
Comment 3 - Slow, Unprofessional and lacks references

There was one comment specifically mentioning benefitting from a positive credibility manipulation (references).

"…The critical factor for me was the Religious information. Knowing that Pope Benedict XVI supports it and is in fact registered himself greatly encourages me to do it as well. Had I known he/the Catholic Faith was against it I would have decided not to register at all. For me, being able to see that link and information was really useful. I would have had to try to find out myself either via the Internet or a Priest etc."
Comment 4 - Reassured by the presence of a reference

An analysis of the free text reasons not to donate was carried out. This was done by categorising all the answers participants entered into the 'Other' dialog box. The results of this process are presented below (see Table 23).

Category	Number of participants comments
need to think about it more	20
unsure/not ready	14
non UK student / intending to register in home country	12
belief that organs might not be good enough	7
it is too early to make decision	5
must consult family	5
religious uncertainty	4
desire to control who receives any potential donation	4
do not agree with organ donation	3
do not like to think about organ donation	3
'ick factor'	3
I want to talk to someone about it first	2
fear of death	2
fear/belief of still being alive when organs are retrieved	1
uncomfortable considering organ donation	1
intending to donate to science instead	1
wishing to be cryogenically frozen	1
in need more information	1

Table 23 - Comment categories in exit questionnaire

The most common category was 'need to think about it more', these comments were usually vague e.g. *"I want to take more time to think about it"* but some were more emphatic about the need to spend time thinking *"need more time to think (i.e. longer than an Internet session!)"*.

Similarly to the first category 'unsure/not ready' had many vague comments e.g. "*Just don't feel ready yet*".   Neither of these categories yields particularly actionable information for organ donor researchers.

The category 'non UK student / intending to register in home country' is more interesting as it confirms the findings of the student interviews that many participants would be overseas students currently studying in the UK. The high incidence of this category demonstrates that the decision to add a specific page addressing this issue was correct. However the advice on that page encourages students to register for the duration of their stay regardless of whether they intend to register in their home country as well.

Seven participants cited existing medical conditions as a reason not to register. This is interesting as NHS advice is to register in almost all conditions(Diabetes Uk 2009) (excluding only HIV and CJD). Conditions cited by participants included type 1 diabetes, hepatitis, receipt of a blood transfusion in 1993, an "*inherited blood condition*", "*previous medical condition*", "*chronic disease that is not entirely understood*" and *"having suffered multiple organ failure in the past"*. This group was predicted from student interviews. The page 'My organs might not be good enough' advises participants that that there are very few conditions prohibiting organ donation and that tests are carried out by specialists to rule out transmissible diseases. The page also highlights the fact that even when some organs may not be suitable, others might be.

The first novel category which was not addressed by the site was 'it is too early to make decision'. The 5 comments included "*[I] Plan to register later on in my life*" and "*Just don't think it is something to make a decision [about] now, i.e. too early*". This category is interesting and may reflect a larger trend to put off decision making on organ donation i.e. it is unlikely that all the participants in the "I need to think about it" category actually planned to set aside time to contemplate the issue.

Five participants identified a need to discuss the issue with their family e.g. *"I should probably run it through my parents first"* and "*I would like to ask my family before I make this decision*". This is positive as such discussions may lead to registrations not only of the student but possibly also other family members. A recent government health campaign is encouraging people to become 'ambassadors' for organ donation by recruiting work colleagues and relations (NHS Blood and Transplant 2010). Students may be a particularly good group to target due to the low cost in accessing them and high proportion of the public which goes to university.

Four participants cited the need to consult with a religious person or further research the views of their chosen religion.

Four participants expressed concern about who might receive their organs as a reason for not registering e.g. "*I would like to know who could benefit from the donation: I would prefer [to] help a nice kid rather than a terrorist or a murderer."* and *"I don't want to register in the UK, where my organs may go to people I don't consider worthy (e.g. alcoholics, the obese etc)".* These statements are interesting as currently people registering on the organ donor register are unable to indicate a preference for who could receive their organs. Allowing specification of preference may increase registrations but may also lead to complex ethical issues and difficulty interpreting wishes e.g. if a preference was unclear and the donor was deceased. Increasing knowledge of the organ allocation process may also help counter this view as organs are already assigned based on rigorous criteria including current health, genetic compatibility, likelihood to adhere to treatment and long term prognosis.

Only 4 comments fit with established non-cognitive beliefs (Morgan, Stephenson, Harrison, Afifi & Long 2008), 3 comments fit the concept 'ick factor' e.g. "*I'm not sure as to the religious ruling - I don't like the thought of my body being cut open after I am dead."*. A further comment: "*I believe that a person is still 'alive' when organs are being harvested.*" would fit either 'medical mistrust' or 'bodily integrity' non-cognitive beliefs. The low incidence of this category is likely due to the existing checkboxes for such concerns (see Figure 36).

Three participants disagreed with organ donation, 3 more simply did not want to think about it. There were 2 remaining novel comments, one participant intended to be cryogenically frozen and another indicated they "*might donate to science*".

Only one participant indicated that they required more information (excluding those who desired further religious clarification). This together with the increase in how informed participants felt demonstrates that the site was effective in removing knowledge as a barrier to registration.

4.6.6 Factors associated with registration

Having found that credibility had no significant effect on registration behaviour, analysis proceeded to evaluation of the baseline questionnaire data. To determine which factors did correlate with registration a regression analysis was used.

A binary logistic regression calculation is a multivariable analysis which shows which factors are associated with a binary outcome measure (yes/no). In this case registration (did register=1 / did not register=0) was regressed onto the factors collected in the baseline questionnaire. The result of this calculation is a list of coefficients indicating the association of each variable with registration (e.g. if someone did not intend to register at the start of the study they might be 3x less likely to register than someone who initially intended to).

Binary logistic regression was used for all factors except religion and ethnicity. These two factors are categorical variables with a large number of possible values and many under populated categories. A separate regression was used for these variables.

IBM SPSS Statistics version 20 was used to perform all regression analyses

Variables entered into the binary logistic regression include:
1. trust - whether the participant was in the high or low credibility group (this is expected to be non-significant given initial analysis)
2. page count - the number of pages requested by the participant during their visit.
3. certainty - linear variable (Likert scale) indicating "how certain you were" about intention to join.
4. gender - categorical variable indicating either male or female

5. livepast75 - linear variable (Likert scale) indicating participants estimated chances of living past 75.

6. intend join - categorical variable indicating whether the participant initially intended to join the organ donor register through the study website (yes / no / undecided).

7. how informed - linear variable (Likert scale) indicating how informed participants felt about organ donation

8. how healthy - linear variable (Likert scale) indicating how healthy the participants feel they are

9. know recipient - categorical variable (yes/no) indicating whether the participant knows someone who has received an organ transplant.

10. blood donor - categorical variable (yes/no) indicating whether the participant has ever donated blood

11. time spent - linear variable indicating the number of seconds the participant spends on the site.

12. age - linear variable indicating the age of the participant in years. This is was calculated from year of birth only.

13. know donor - categorical variable (yes/no) indicating whether the participant knows someone who has donated an organ (living or deceased donation).

Table 24 shows the number of each categorical case entered into the analysis. 33 cases were omitted either for having no questionnaire data (24) or having missing data (9). The results of the regression are shown in Table 24 and Table 25.

		Frequency
intend join	no	227
	undecided	295
	yes	334
know donor	no	771
	yes	85
know recipient	no	727
	yes	129
blood donor	no	596
	yes	260
gender	Female	469
	Male	387

Table 24 - Categories used in binary regression analysis

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1ª	trust	-.076	.179	.178	1	.673	.927
	page count	.139	.033	18.015	1	.000	1.149
	certainty	-.038	.037	1.065	1	.302	.963
	gender(1)	-.033	.183	.032	1	.859	.968
	livepast75	-.004	.006	.540	1	.462	.996
	intend join (yes)			167.703	2	.000	
	intend join (no)	-3.597	.291	152.380	1	.000	.027
	intend join (undecided)	-2.555	.316	65.418	1	.000	.078
	how informed	.083	.041	4.139	1	.042	1.087
	how healthy	.039	.054	.525	1	.469	1.040
	know recipient(no)	.611	.273	4.988	1	.026	1.842
	blood donor(no)	-.418	.197	4.513	1	.034	.658
	time spent	.000	.000	.157	1	.691	1.000
	age	.048	.013	14.765	1	.000	1.050
	know donor (no)	-.027	.336	.006	1	.936	.973
	Constant	-1.273	.762	2.792	1	.095	.280

Table 25 - Results of regression analysis, highlighted variables are significant

The regression analysis shows the significant factors (Sig. < 0.05) were number of pages visited, initial intention to join, how informed they felt, knowing a recipient of an organ donation, previously donated blood and age.

For significant factors, the regression coefficient (B) will be positive when it is associated with registration and negative when it is associated with not registering. The regression coefficient for non significant factors is irrelevant. The larger the magnitude of B the greater the impact of this factor e.g. those not intending to join are very unlikely to register compared to those who did intend to (-3.597).

The factor most associated with registration was intention to register as a donor at the onset of the study (yes / no / undecided). It is interesting that registrations were still obtained from 68 participants who were initially undecided and 22 did not plan to register, showing the website was able to change participants' minds in some cases.

| | | | Registration | | |
			No	Yes	Total
Initial intention to register	no	Count	210	22	232
		% within intention	90.5%	9.5%	
	undecided	Count	228	68	296
		% within intention	77.0%	23.0%	
	yes	Count	91	245	336
		% within intention	27.1%	72.9%	
Total		Count	529	335	864
		% within intention	61.2%	38.8%	

Table 26 - Initial intention to register vs. actual registration

The direction of effect of knowing an organ recipient was surprising (B =0.6). This indicates that participants who did not know an organ recipient were more likely to register (39.42% vs. 35.88%). This may be because people knowing organ recipients are more likely to have already made a decision prior to the study and therefore had either already registered (and been excluded from the study) or formed a negative view i.e. a recruitment bias.

Blood donation was strongly associated with organ donor registration. It is likely that the motivations to donate blood are similar to those to register e.g. desire to help others. Current NHS practice already involves some cross recruitment e.g. the NHS ODR has an advertisement for blood donation (NHS Blood and Transplant 2012) but may benefit from more.

Age was associated with registration with older participants more likely to register. Looking at this feature in isolation we can see that the size of the difference is considerable (Table 27) with almost twice the registration rate in the age groups 40-49 than 0-19. However there were substantially more young participants as should be expected of a student user group.

Older registrants are also seen as advantageous because they are more likely to be in a position to donate in the near future and may be an untapped group. For example there is currently an NHS campaign to secure registration from "female[s], aged 35-54 and in AB [middle class and upper middle class] social grade" who "could be considered the easiest group to convert into registrations" (NHS Blood and Transplant 2010).

Age	Registrations	Total	Percentage
0-19	53	185	28.65%
20-29	215	551	39.02%
30-39	31	71	43.66%
40-49	26	39	66.67%
50+	10	18	55.56%
Total:	335	864	

Table 27 - Registration rates by age (total excludes people who did not list their age in the questionnaire)

Ethnicity and Religion were looked at independently because of the high number of dimensions in the dataset. A binary logistic regression of religion with a reference category of Christianity (the most prevalent religion) found that Muslim participants were the only religion to have significantly different (lower) registration rate (see Table 28). This association is also found when using a reference category of 'no religion'.

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Christianity			30.347	8	.000			
Buddhism	-.620	.539	1.327	1	.249	.538	.187	1.545
Hinduism	-.977	.518	3.553	1	.059	.376	.136	1.040
Judaism	-.284	1.232	.053	1	.818	.753	.067	8.427
Muslim	-1.918	.541	12.553	1	.000	.147	.051	.424
Not stated	-.273	.225	1.472	1	.225	.761	.489	1.183
Other	-.572	.498	1.318	1	.251	.565	.213	1.498
Sikhism	1.795	1.126	2.541	1	.111	6.022	.662	54.769
No Religion	.236	.171	1.913	1	.167	1.267	.906	1.771
Constant	-.409	.137	8.955	1	.003	.664		

Table 28 - Binary logistic regression of religion with a comparison variable of Christianity highlighted variables are significant

In a logistic regression the reference variable is important and should be representative of the question the researcher wants to ask e.g. if you use a reference category of white British then the question is "are the following ethnicities more or less likely to register than white British participants". In order to avoid controversy, 8 regressions were conducted using each category in turn as the reference category. The raw registration data is also presented below (see Table 29).

Ethnicity	Number Registering	Total	percentage registering
White - Irish	9	12	75.00%
Mixed - White and Asian	5	9	55.56%
Black or Black British - Caribbean	2	4	50.00%
White - British	232	485	47.84%
Mixed - White and Black Caribbean	2	5	40.00%
White - Other	44	116	37.93%
Mixed - Other	4	11	36.36%
Other	6	18	33.33%
Not Stated	5	21	23.81%
Asian or Asian British - Indian	13	55	23.64%
Asian or Asian British - Other	5	38	13.16%
Other - Chinese	8	62	12.90%
Black or Black British - African	1	14	7.14%
Asian or Asian British - Pakistani	0	12	0.00%
Asian or Asian British - Bangladeshi	0	2	0.00%
Black or Black British - Other	0	1	0.00%
Total	**336**	**865**	**38.84%**

Table 29 - Registration rates of each ethnicity

In order to reduce the number of categories and prevent under sampling some ethnic categories were merged. The logistic regressions showed that combined categories white British/Irish and mixed ethnicities had significantly higher rates of registration than most other groups and that black British and Chinese ethnicities had significantly lower. This holds true with all reference categories except 'not stated' and 'other'. One factor which biases these results is the fact that foreign participants may be more likely to prefer registering in their home country and not with the UK NHS.

4.6.7 Study adherence

In general, adherence to the study was good. Of the 889 participants, only 24 (2.6%) failed to complete the initial questionnaire. Although completion rate of the baseline questionnaire was higher in the high credibility group, the difference was not statistically significant (see Table 30). Of the 865 participants completing the baseline questionnaire and being exposed to the intervention, 78.0% either registered as an organ donor or completed the exit questionnaire. The remaining 22.0% may have missed the link to the exit questionnaire or chosen not to give a reason for not registering. The proportion completing (exiting/registering) versus closing their browser did not differ significantly between study groups (see Table 31).

	Completing baseline questionnaire	Not completing baseline questionnaire
High Credibility	458	8
Low Credibility	407	16

Table 30 - Contingency table comparing baseline questionnaire completion rates across all participants (Chi squared = 2.859 P = 0.0909 two tailed)

	Exiting / registering	Closing browser without exiting / registering
High Credibility	364	102
Low Credibility	335	88

Table 31 - Contingency table comparing study completion (exiting/registering) rates across all participants who were exposed to the intervention content (Chi squared = 0.097 P = 0.7550 two tailed)

4.7 Discussion

The finding of this study was that although surface credibility manipulations changed how long participants spend exploring the website, it did not significantly affect outcome behaviour. Intervention creators cannot therefore expect any improvement in their website's effectiveness by implementing current guidelines or seeking certifications such as HON. Implementing such guidelines may however provide other benefits e.g. user satisfaction, or may be required by external agencies e.g. ethics boards. In order to defend this result it must be established that the study was rigorous and that the null result was not attributable to a flawed methodology. This will include demonstrating that the surface **credibility manipulations were successfully implemented** and that the **intervention developed was effective**.

The surface credibility manipulations used in the study website were based on a substantial literature review into perceived credibility of web sites. The features selected for implementation were representative of the literature and omitted only those that would alter the core content or be unrepresentative of real world practices e.g. a web author would not deliberately misspell words.

The manipulation check confirmed that when presented with both versions of the site, MSc students could identify the credibility manipulations and indicated that the high credibility site appeared more credible. Although small in number (4 out of 31), some site feedback comments specifically mentioned credibility related complaints e.g. "*The Website doesn't seem so professional so I am weary [sic] of applying through here. There is no logo or society which is affiliated with this which adds to my uncertainty. The website looks very amateurish. Donating an organ is a big deal... I doubt people would do it through this website*". Such comments demonstrate that the site manipulations **were being noticed** by some participants and that they **affected perceived credibility.**

The **effectiveness** of the intervention itself is harder to justify as no independent control site was used. The website resulted in 336 registrations for organ donation (37.7%) demonstrating that it was effective at encouraging students to register and even at persuading some of those who were initially not intending to register to change their minds (9.5% of participants not intending to register). The registration rate is favourable when compared to

recent organ donation interventions such as O'Carroll *et al.* (O'Carroll, Dryden, et al. 2011) who obtained a registration rate of 20.7% and Merion *et al.* who obtained a rate of 10% (Merion et al. 2003). Merion *et al.* report the number of participants following a link to a registration facility meaning the figure for actual registrations will be less than 10%.

Although this figure cannot be compared directly to the national registered population it may be useful to consider that only 29% of people in the UK are registered, 24% in the West Midlands where Warwick University is located (Strategic Health Authority 2011). When comparing rates it should be noted that members of the public with a highly positive view of organ donation are likely to already be registered and thus not eligible for non donor studies. The registration rate in Scotland is 37%, however only 89 of the 889 participants were from Scotland (Dundee University).

For a true assessment of effectiveness a randomised controlled trial would be required comparing the effectiveness of the intervention developed with the current NHS website. A proposal has been submitted to the Chief Scientists Office for a four month project to conduct such a trial.

The website was developed based on interviews with students using established psychological theory (S Michie et al. 2005), current best evidence on organ donation barriers (O'Carroll, Foster, et al. 2011) and was validated by an organ donation expert (Dr Stephen Cole, Clinical Lead for Organ Donation at Ninewells Hospital). This ensured that the study website was of **high quality** and thus likely to be **effective.**

One of the key components of the credibility frameworks (see 2.3 Frameworks) encountered in the literature review was that the viewer must have interest and personal investment in the website being viewed. From the comments left on the site and the student interviews it is clear that the behaviour targeted was emotional and involved considerable thought. A degree of perceived risk should also be present given that it required participants to submit personal details and trust the study administrators to pass them on securely to the NHS. This ensures the study cannot be criticised on the grounds that the behaviour was inconsequential or of low risk (Corritore et al. 2005).

Chapter 4: Credibility in an e-health Organ Donation Intervention

This study is the largest 'manipulated website' study to date. Previously the largest was (Flanagin and Metzger 2007) with 574 participants. It is highly unlikely that the null result is due to insufficient recruitment.

It is important to publish research results regardless of significance in order to avoid publication bias (Møller and Jennions 2001). The finding that surface credibility manipulations change browsing patterns and perceived credibility but not objectively measured behaviour is both interesting and novel. This study is the first time that the link between credibility and behaviour has been explored using an objectively measured health behaviour (registration as an organ donor). Until now studies have relied on Likert scales, content recall, Think Aloud, site preference and self reported behaviour.

The following chapter explores possible reasons for credibility manipulations not affecting outcome behaviour. It also discusses why credibility manipulations had different effects on visit duration in this study than in the exercise study.

Chapter 5: Conclusions & Recommendations

This chapter will discuss the combined results of the two studies described in this thesis. It will begin by summarising the methodology used and the main outcomes. It will then explore possible reasons for the findings, if they can be generalised and ends by making suggestions for future research.

5.1 Main Outcomes

The aim of this research was to determine whether the effectiveness of e-health interventions could be improved by implementing current credibility guidelines. To evaluate the potential for improvement, two experiments were conducted using the 'manipulated website methodology'. The manipulated website methodology involved randomising participants to one of two conditions. In the first condition an e-health intervention was presented containing all the factors which are theorised to improve credibility upon simple inspection. In the second condition, the same intervention was presented but containing only factors which are theorised to decrease credibility upon inspection. Care was taken not to implement any factors that would be unrepresentative of the processes a web developer might go through assembling such a site e.g. incomplete paragraphs or deliberate misspellings.

The experimental measures of the first study were time spent on the site, attitude to exercise and self reported physical activity. The primary measure for the second study was registration as an organ donor (through the site). The findings were intended to determine whether intervention developers could expect an improvement in intervention performance if they invested the effort to fully implement current credibility guidelines.

The combined results of the exercise and organ donation studies were that:
- Surface credibility manipulations do not change the **effectiveness** of a website as measured by organ donation rate or self reported physical activity.
- Surface credibility manipulations do change the way participants browse a website as measured by time spent on a page and visit duration.
- The change in duration spent on pages was positive (high credibility led to increased duration) and large in the exercise intervention. The change in duration spent on pages was negative (low credibility led to increased duration) and small in the organ

donation intervention. This relationship is discussed below (see 5.1.2 The effect of surface credibility on browsing behaviour).

- Credibility manipulations are noticed by some participants, a minority of which were motivated to give credibility related feedback criticising the website (see 4.7 Discussion)

As far as the author is aware, the organ donation study described in this thesis is the largest 'manipulated website methodology' study carried out to date (N=889). It is also the first study to use an objective health outcome behaviour (registration as an organ donor).

Additional outcomes of this research are:
- Registration of 336 students in the organ donors register (ODR).
- Identification of significant predictors towards registration as an organ donor, including:
  1. Number of pages visited on the intervention website
  2. Initial intention to join before being exposed to the intervention
  3. How informed about organ donation participants consider themselves
  4. **Not** knowing an organ donor recipient. People who know an organ donor recipient may be more likely to have already made a positive decision and thus be ineligible for recruitment.
  5. Having previously donated blood
  6. The age of the participant, with older participants being more likely to register
- Methodology recommendations for future credibility studies into the effect of credibility factors
  1. Use of the 'manipulated website methodology' (see 2.5.3 Studies using manipulated website methodology)
  2. Use of an objectively measurable behaviour.
  3. The need to reduce inherited credibility gained from participating in a university study (see 5.1.1 The effect of surface credibility on outcome behaviour).

A more in depth analysis of these outcomes, their generalisation and recommendations for future work are presented below.

5.1.1 The effect of surface credibility on outcome behaviour

In exploring the null effect of surface credibility on behaviour, a number of possible interpretations are presented below. These theories are based on feedback from presentations of the results in research seminars (Nind et al. 2009; Nind et al. 2012) and the results of other studies found during the literature review.

It is possible that inherited credibility (Fogg and Tseng 1999) overrides surface credibility factors i.e. because participants knew they were participating in a study they were willing to overlook the low credibility of the study website. The University affiliation of the recruitment channel (email/newsletter) may have further heightened inherited credibility. The recruitment methodology used was highly representative of other credibility studies. Some studies have tried to counteract the effects of high inherited credibility by instructing participants to consider a specific scenario e.g. "imagine [you] had found the website by following a link from a search engine" (Harris et al. 2009b). Such an approach is unlikely to lead to natural site evaluation behaviour.

An ideal study methodology to investigate this hypothesis would be one under which participants are either unaware that they are in a study or multiple recruitment channels are used e.g. recruitment via university email and recruitment by a public anonymous internet forum. Hiding the fact that a study is taking place has many ethical considerations including justifying the removal of informed consent. The first step in justifying such an approach would be to demonstrate that without source obfuscation, surface credibility has no effect. The studies presented in this thesis provide evidence towards such a case.

As far as the author is aware there has yet to be a credibility study in which participants are unaware of a site's origins or that they are participating in a research study. Eastin *et al* (2006) have used a 'deceptive search engine' to obfuscate the true origins of a site. This involved creating a search engine which returned the same 8 result pages regardless of the search entered. The intention was to give the illusion that the pages accessed were real websites fetched from the internet rather than sites created specifically for the study. The 8 pages formed a 2x2x2 factorial dataset of manipulated source, dynamism (colourful, hyperlinks, sounds and animations) and advertising. This approach would only be suitable for a very constrained topic (in this case, to search for information about pug dogs). The

young age (average = 9 years) of participants (N=135) may also have helped preserve the deception, although no contamination check is reported. A contamination check involves determining how many participants become aware of a hidden experimental manipulation during a study. The study found that dynamism and source had a positive effect on participant's perception of the site but led to reduced site recall.

A second possibility is that surface credibility is only evaluated when the content being examined is either not understood or contradicts the readers' views/knowledge (Eastin 2001).

Another possibility is that the high quality of the textual content of the site may override the low credibility of the presentation. This would be a particularly worrying finding because of the ease with which online information can be copied e.g. a phishing site could present copied information from a high quality site in order to harvest personal details.

In investigating the effect of surface credibility on alcohol consumption reduction (Harris et al. 2009a) found no difference in intention to reduce consumption immediately following the study but found a reduction in self reported consumption at 1 week follow-up. Their conclusion was that credibility had a delayed effect on participants. Where the health behaviour is immediate (registration) this effect would not be apparent. A follow-up questionnaire could be conducted to see how many participants have registered since the study although such a study would be self reporting. No other references to a delayed effect from credibility manipulation were found in the literature.

5.1.2 The effect of surface credibility on browsing behaviour

The effect of credibility manipulations on visit duration was inconsistent but significant. This demonstrates that surface credibility affects how participants browse pages. In the first study participants were willing to spend more time viewing the high credibility site but conversely in the second study participants spent longer on the low credibility site. In the first experiment, participants had no clear exit point and were invited to continue browsing material as long as they wished. In the second experiment a fixed end point was set and a link presented on each content page meaning a quicker decision to register could be a positive sign. It is clear, however, that participants evaluate pages differently when the surface credibility is changed. Future work could investigate these browsing pattern differences but given it did not affect the choice participants ultimately made it may not be worthwhile.

The new credibility factors included in the second study and the removal of visual design modification may be responsible for the difference in time spent. The visual design in the first study was intended to be familiar to participants because it was the same as the students union website style sheet (the low credibility arm used a default Drupal style sheet). The colours used differed considerably between sites, which can affect readability, aesthetic preference and behavioural intention (Hall and Hanna 2004).

Many credibility researchers have altered visual design under the heading 'dynamism'. This can include manipulations such as removing all pictures/videos/animation, changing navigation hierarchies or even dropping style sheets completely (Eastin et al. 2006; Kim 1998; Sundar et al. 2003). While such drastic alterations may reduce credibility they will also affect overall opinion of, and ability to use the website. Findings from such studies are less useful than those focussing on more subtle features such as referencing/HTTPS/third party certification which are more representative of what might be implemented in practice by a web designer.

When looking at the interplay of accessibility, aesthetics and credibility (Reilly and Flood 2008) stated that a purely functional website, without aesthetic considerations, causes an "immediate hostility towards the website and its content. Users have expectations when accessing websites. As the internet is highly visual, users expect to see a highly visual website". This view is supported by the studies of (Roberts et al., 2003), (Stanford et al. 2002) and (Roberts et al. 2003) where aesthetics and usability are consistently identified as the most important factor in judging credibility.

In comparison to the manipulations described above the credibility manipulation in the first study is quite minor but given the effect size may indicate the disproportionate effect that visual design has on website browsing behaviour. The impact of aesthetics and usability may be better investigated independently of subtler credibility manipulations such as advertising / third party certification.

The page view duration difference was not the result of a flaw in the system. Page download times were tested using a web tool (Pingdom 2012) and found to be the same time. The same

technology platform (Drupal) was used for both studies making it even less likely that this difference was the result of software/hardware issues rather than genuine user behaviour.

5.2 Generalisation

It is important that authors assess the extent to which findings can be applied to other experimental domains.

The findings of the literature review included identifying a rigorous methodology for evaluating the effect of credibility manipulations on a health intervention website ('manipulated website methodology'). The methodology was tested successfully through use in two e-health studies on different topics (exercise and organ donation). The methodology is highly generalisable and it is recommended that future studies into credibility also use the 'manipulated website methodology'. The addition of an intervention control would further improve this methodology.

When considering the generalisability of the studies in this thesis, the exercise study had several limiting factors. There was a sampling bias from recruiting students/faculty who may not be representative of the general public. The recruitment method (university email) increased the likelihood that participants were at work when they engaged in the study. Such an environment is unlikely to be the same as where a person would normally engage with an exercise promotion website. The biggest factor limiting external validity is the lack of an objective behavioural measure and the subjectivity of page reading time/visit duration as an outcome variable.

Factors that limit the generalisability of the organ donation study include the binary nature of the behaviour which is very different from longitudinal health behaviours such as smoking cessation or alcohol reduction. The topic area addressed by the intervention website (organ donation) may have unique attributes such as the emotional involvement / anticipation of death. These attributes may change the way a website is evaluated when compared to other health behaviours e.g. smoking cessation. In the case of the organ donation study, the recruitment eligibility (not currently be registered on the ODR) may also restrict generalisation.

5.3 Improvements

In the event that a researcher wants to repeat the studies described in this thesis, a number of suggested improvements are described below. The focus of this discussion will be the organ donation study as its methodology was informed and improved by the findings of the exercise study.

Recruitment of participants in the organ donation study was 10 times higher in Warwick (800) compared to Dundee (89). It is important that when a large sample size is needed, recruitment should be done through direct email rather than inclusion in email newsletter. Judgement of whether a study merits direct email should be subject to an ethical board to prevent 'spamming'.

The pre-study questionnaire had two problematic questions. The question "have you ever donated blood?" should be changed to "have you donated blood in the past 6 months?" as this figure is more readily compared to national statistics. The question "How certain were you [about joining the register before you arrived at the site] (if you are undecided, please leave this question blank)" is problematic because it cannot be interpreted independently of intention to join. This makes it difficult to analyse statistically. Additionally, despite the instruction not to answer when undecided, many participants still gave a value. This question should be dropped or rephrased for any future studies.

Transfer of registering student details to the NHS organ donation register was done manually by Christine Cole who works as a Team Leader at the ODR. This approach would be unsustainable in a larger/longer term study and use of the official NHS organ donor form would be required. This does not pose a problem for tracking registration rates as a study ID can be sent when referring the user. A separate ID could be sent for each arm of the study. The difficulty with this approach is that it weakens the credibility manipulation since participants would be entering their personal details into the NHS website rather than the manipulated study site.

A logical extension to the organ donation study would be to manipulate reputed (inherited) credibility by using an alternate recruitment strategy such as placing a link on a public internet forum. Such a 2x2 factorial study could identify how surface credibility interacted

with credibility inherited from recruitment channel i.e. does surface credibility only affect behaviour when someone arrives already having a certain amount of distrust?

5.4 Recommendations for future work

The finding that surface credibility manipulations only affect browsing behaviour and not outcome behaviour lays the groundwork for future studies. If this research can be duplicated in other health areas then it will mean that current credibility practices are not effective i.e. users are just as willing to engage with and submit personal information to a website that does not appear credible as to one which implements current best practice. This is the first time that surface credibility has been explored using a large scale intervention with an objective behaviour measure. If surface credibility is unimportant to website outcomes or only plays a role when inherited credibility is low then the usefulness of current credibility guidelines needs to be questioned. New ways of improving surface credibility need to be invented and tested. Future studies must, where possible, use objective measures instead of relying on self reported behaviour or substitute measures of effectiveness such intention, preference, site recall and perceived credibility.

The ability to record student's organ donation registration details directly and pass them on to the NHS after the study was of great benefit, allowing an objective measure of registration rather than having to rely on self reporting. This was possible due to close ties with NHSBT and may not be possible in future as it created additional workload for NHSBT database staff that had to add the new data to the main NHS database. The currently recommended approach for recording the effectiveness of organ donation campaigns is through the use of a 'campaign id' which is passed as a GET variable when forwarding participants to the NHS organ donor registration form. This is done by forwarding participants to the registration form with a campaignCode variable i.e. "…registration_form.asp?campaignCode=X" where X is a study or group identifier. NHSBT can then inform researchers how many registrations resulted from a specific study. This method has several major drawbacks. The first is the inability to tie registrations with baseline data i.e. although you know how many participants signed up in each arm, you don't know which ones. The second disadvantage is that the perceived risk of submitting data directly to the NHS is likely to be lower than to a university study. Since risk is an important factor in forming credibility judgments, the study would have been significantly weakened if participants had to leave the study website and submit through the NHS form. It is the recommendation of this thesis that the NHS consider

whether (given suitable ethical approval) a globally unique participant identifier could be sent instead of a study specific campaignCode.

Although the organ donation intervention resulted in a higher registration rate (37.7%) than other recent organ donation studies which achieved rates of 20.7% (O'Carroll, Dryden, et al. 2011) and 10% (Merion et al. 2003), it is not certain that this number of participants would not have registered anyway had they been sent directly to the NHS website rather than the study. An independent control (email containing a link to the NHS website) would have demonstrated empirically that the intervention developed was effective (regardless of credibility). When using a manipulated website methodology with e-health interventions, authors should consider using an independent control in order to measure the baseline effectiveness of the actual intervention from which to judge the scale of effect caused by credibility factors.

There is the potential for future studies to explore the effect of surface credibility in combination with inherited credibility e.g. by recruiting a pool of participants from a low credibility source such as an internet forum, obfuscating the university affiliation of the study. However, recruitment strategies explored must be reflective of current practices e.g. if a health intervention only ever intends to recruit students then findings would be of limited value. Inherited credibility may vary between user groups e.g. students may be more trusting of a university than members of the public.

Greater insight into the null effect could have been gained from including some subjective measures such as perceived credibility / website recall in a follow-up questionnaire. Such data would confirm findings of the qualitative data and manipulation check: that the surface credibility factors implemented in the website were noticeable and lowered perceived credibility of the site. If credibility factors affect perceived credibility but not behaviour then much of the literature may need to be re-explored in terms of research impact.

Both visual design and interactivity credibility factors were dropped from the second intervention described in this thesis. This was done because of the effect of factors in changing the aesthetics and functionality of the site. In the literature review many such factors were encountered such as jargon, misspellings and 'dynamism'. These changes do not produce findings that are useful to web developers e.g. telling a web developer to avoid

making misspellings in order to improve site credibility is not novel or useful. Future studies that are intended to benefit web developers should avoid exploring surface credibility factors which are not reflective of real world practice.

Ultimately web developers want to know if it is worth investing time and effort into writing a privacy policy, obtaining third party certification, implementing HTTPS encryption etc. Evidence from the studies in this thesis suggest that it is worth making such changes because it improves attitude towards the site but developers should not expect to see any increase in their sites effectiveness as a result.

5.5 Publications arising from this work

The following publications arose from work described in this thesis. In addition, a funding proposal was granted (CZG/2/462) based on the findings of the first study reported in this thesis. This grant funded the second study.

Nind, T. J., Ricketts, I. W., Sniehotta, F. F., Wyatt, J. C., & Cole, S. (2012). Do Credibility Cues Affect the Persuasiveness of a Web Site? *Symposium: Influencing People with Information*. Aberdeen. Retrieved from http://www.abdn.ac.uk/~csc264/sipi-2012/nind.pdf

Nind, T., Wyatt, J., Ricketts, I., Mcpate, P., & Liu, J. (2009). Website credibility and intervention effectiveness. *Proceedings of the Symposium Persuasive Technology and Digital Behaviour Intervention Symposium A symposium at the AISB 2009 Convention* (pp. 36-39). Heriot-Watt University, Edinburgh: SSAISB: The Society for the Study of Artificial Intelligence and the Simulation of Behaviour. Retrieved from http://www.aisb.org.uk/convention/aisb09/Proceedings/PERSUASIVE/FILES/Proceedings.pdf

A journal paper is planned for submission to the Journal of Medical Internet Research describing the results of the organ donation credibility study.

5.6 Proposal arising from this work

Although credibility did not change the effectiveness of the organ donation intervention described in this thesis, the registration rate across both groups was high (37%). Based on the effectiveness of the intervention, a proposal has been submitted to the Chief Scientists Office for a four month project on which the author is a collaborator. The aim of this project is to compare the effectiveness of the tailored organ donation recruitment intervention with the current NHS standard. The hypothesis is that more participants will register through the tailored intervention than through the NHS website.

This will (if successful) provide evidence to support greater focus on targeted recruitment, using information tailored to the audience.

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Appendices

Appendix 1 - Elaboration Likelihood Model
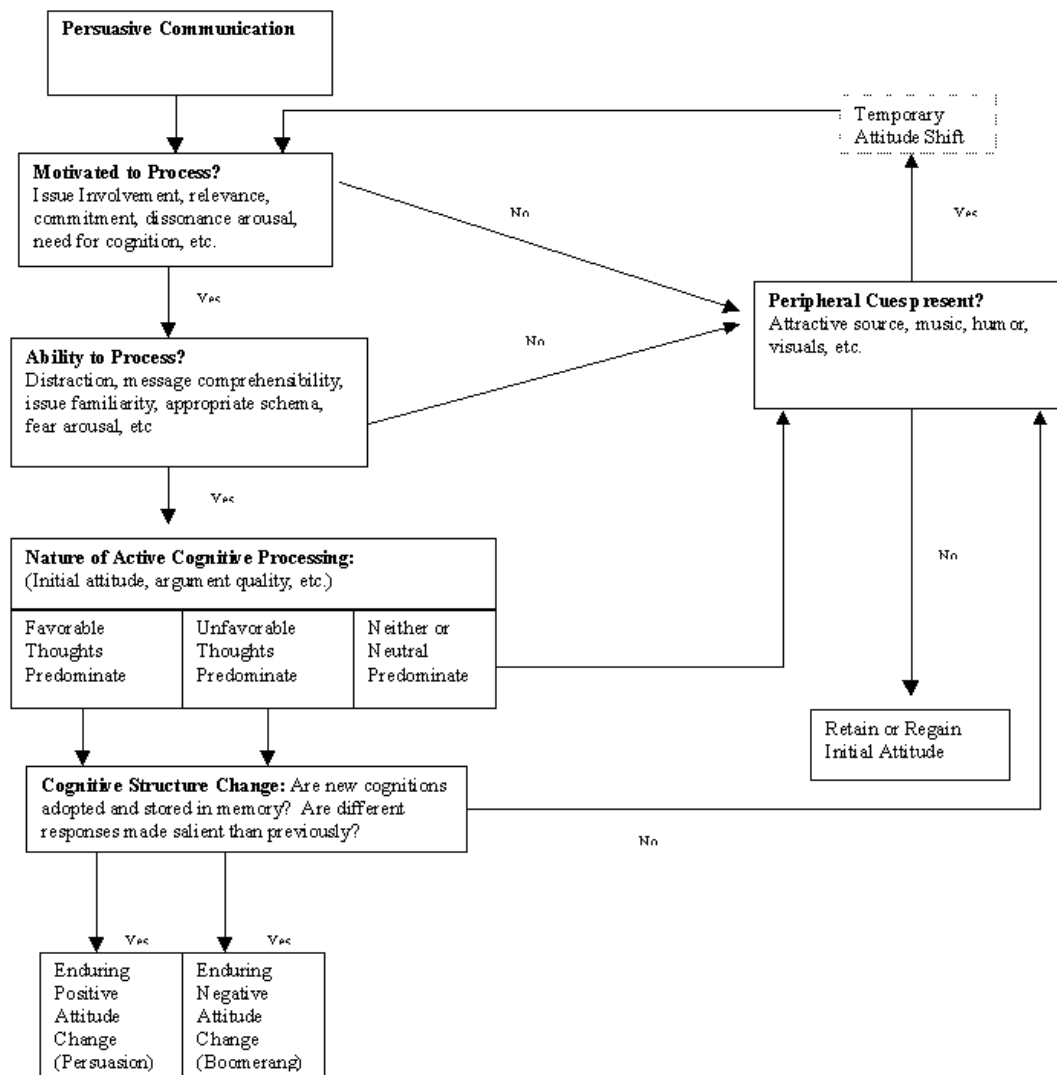
Appendix 2 - Organ Donation Exit Questionnaire Responses

All comments in this appendix are verbatim including spelling/grammar errors by participants. This is done to maintain data integrity and prevent accidental distortion or researcher bias.

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Low Credibility - Reasons for not registering as an organ donor

"I plan to register through another channel e.g. at my GP surgery" 30.19%
"I believe medical professionals might not try as hard to save my life if I were in an accident"15.09%
"I believe the body must be complete after death." 16.35%
"I don't want to upset my family" 15.09%
"I don't want to tempt fate / risk bad luck by registering" 12.58%

Feedback on the site:

Very good information that has made me think hard about this!
Sorry, but I did not find the information I was looking for amonf the links proposed.
As I have a form of Haemophilia, I would want doctors to try very hard to save my life if I had an accident, and wouldn't want them to not try as hard, which I think could happen in some cases.
The website was too slow to load different pages. Had it not been a research project, I would have left it at the first page click. Also, the website doesn't look professional and again had I not known it was a research project, I would definitely have questioned its source i.e. I wouldn't have trusted what it had to say. With regards to the section on Islam, it would have been useful to have a provided a reference to link to the claims that were made, i.e. that X supports organ donation and here is the original source. I will not have to go and try and find them.','I'm not entirely sure what my religion has to say on this issue. I read the section on Islam, but not entirely convinced. Need to read up more on it
The Website doesn't seem so professional so i am weary of applying through here. There is no logo or society which is affiliated with this which adds to my uncertainty. The website looks very amateurish. Donating an organ is a big deal... I doubt people would do it through this website
It's hard to think about organ donation at such a young age even though it might sound silly. My family is aware that I agree to donate my organs after my death but writing it down, "setting in stone" so to say, scares me. I have to hope that my family will make the right decision if necessary
I found the website quite interesting, although it didn't tell me anything I didn't already know. But I imagine it would be helpful if a person was considering registering and wanted further information. I really don't understand the religion page, and I found it quite patronising. It felt as though you think a major reason people don't become donors is because they think it is in some way 'against' their religion, and I'm not convinced about this - particularly in Britain, large parts of which seem to deny any religious basis to their lives! My own reasons for not becoming an organ donor are to with medical attitudes to life and the human body. I'm not a believer in the human body as spare parts. This is not to say that if one of my children or my husband were in a situation where they needed an organ, I might not feel differently, but in principle I don't

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agree with donation. I guess it's like a lot of things - I can only have this belief until it's tested. But as far as my own body is concerned, I would never want to be an organ donor, as I don't see myself as a set of spare parts, and for myself, I am at present quite pragmatic about life and death and the fact that the body has a shelf life. Who knows when my 'best before\' date might be, but when that time comes, I would like to think that I can accept that life has a natural ending.'

I understand why its important - but cant really consciously bring myself to consent. This is not for any afterlife or religious beliefs just that I simply can entertain the thought of having bits removed, nor to have other people bits added to me (but if I were dead I wont know - and if saved by a donor I'd probably get over it!). Not sure this is the type of feedback you were after but really hope it is helpful. In fact I might sign up now having thought it through in this way - does seem a bit silly not to. I have now changed my helpfulness score from 5 to 8.','Just don't like the idea of giving or receiving either blood or organs

An interesting study. The Status Quo bias plays a big role in many people's decisions, but as for me, I was unconvinced by the medical nature of this webpage. It may be more appealing, or at least less intimidating if the actual nature of the organ transplants weren't immediately mentioned.

I came upon this survey as my sister works with NHS Tayside. I feel a guilt about not registering for organ donation but my late father's words stop me from committing myself. He believed that a person is still alive when organs are being harvested and I believe this is true also. I would like to be persuaded otherwise but I guess I am the type of person for whom 'seeing is believing' and it would take a lot to convince me.','I believe that a person is still 'alive' when organs are being harvested.

This does not look like a trustworthy website, there are Adsense ads on the right for goodness sake. Also, there is no encryption and this whole site looks unprofessional

This is the first time I have thought about it, it is something I may sign up for but it feels like a big thing to just do it now

I am surprised by its poor level of information comparing with the seriousness of the subject.

In my home country (EU member state), everyone is automatically registered until he decides to withdraw from the Organ Donation Initiative. So if I am to register in UK also, I would like to register via my GP.

I shall make my decision a little later in life.

The website is simple in appearance but I guess that it is under development - users may seek to challenge the religions page

Perfectly good website. All of the relevant information is supplied as necessary.

Free text reasons not to donate:

I would like to know who could benefit from the donation: I would prefer help a nice kid rather than a terrorist or a murderer.

Not comfortable with the idea - feel like my body suddenly becomes a thing

Just don't think it is something to make a decision now, i.e. too early

I will go back to my country after finishing my PhD, so I will register there!

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I want to consider it further
I'm not entirely sure what my religion has to say on this issue. I read the section on Islam, but not entirely convinced. Need to read up more on it.
I feel I need to consider this decision some more first
I want to think about it more
There's no exact reason, i just don't feel comfortable enough with the idea to donate right now.
I suffered multiple organ failure some years ago, and while I have made an apparently unprecedented and complete internal recovery I expect that my organs are not as good as they would need to be. My decisoon was not influenced by that hilaroius Monty Python sketch
I want to register in my home country
Haven't thought about it enough
i think this is a decision that takes a long duration of thought, something which i have not been able to give the issue
Still can't decide
Somethings I am considering but not comfortable yet making this decision.
I'm 18, it too early for me to consider what would happen after I die.
Not sure whether or not my religion is encouraging organ donation, as there are many different perspectives on the issue.
I have type 1 diabetes so am not permitted to register
No determining who might recieve the organs i.e. might be someone who has been involved in a serious crime etc
I don't agree with organ donation
Want to consider the issue more thoroughly and over a longer period of time before consenting.
Not sure if as a Christian it is okay to do it would like to speak to a priest about it and then decide. It is all good it being written down on paper but would like to discuss it.
I am still uncertain, may make a decision later in life
Just don't like the idea of giving or receiving either blood or organs
I believe that a person is still 'alive' when organs are being harvested.
I want to take more time to think about it
I want to think about it a bit more first.

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Am a little unsure about it
Need to get back to my homework
Just don't feel ready yet
i'm not sure as to the religious ruling - i dont like the thoght of my body being cut open after i am dead.
as an EU student, I will only be here for another year.
I would like to speak to someone about it first.
I am a foreign non-Uk student and would rather wait and register in my own home country. Although death may strike at any time, I would rather make this decision when I am settled.
will register in my home country
I need some time to think.
I should probably run it through my parents first
need more time to think (i.e. longer than an Internet session!)
Moral objection to the equality of criminals on the register
I need to think about it some more
I am not completely sure if I wish to donate my organs at this point in time.
Want to speak to family first
More time required
I don't like the thought of my organs being "harvested" after I am dead. I am afraid of dying and registering as an organ donor involves facing up to this.

High Credibility - Reasons for not registering as an organ donor

"I plan to register through another channel e.g. at my GP surgery" 32.78%
"I believe medical professionals might not try as hard to save my life if I were in an accident"12.78%
"I believe the body must be complete after death." 13.89%
"I don't want to upset my family" 19.44%
"I don't want to tempt fate / risk bad luck by registering" 10.56%

Feedback on the site

I think that Organ donation from age 18+ should be an opt-out system rather than and opt-in system! Then people who are really vociferous about not wanting to be organ donors can remove themselves from the list-

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but it is up to their own innitiative to go about it. The state should then accept the wishes!
I need more information before I can make an informed decision. I've thought about donating several times in the past but up to now was under the impression that the body must be complete after death. Now that a member of my family has benefited from receiving an organ it raises questions, surely if it is ok to receive an organ than it must be ok to donate them!
Good website that makes clear the facts and information on organ donation.
I can understand why people would do this but I don't think it's something I could sign up for right now. Although, strangely, I wouldn't mind donating an something whilst alive.
Lots of text, makes it hard to read
I am an international student, and feel that my parents should be able to see me as full if I ever happen to die while I'm in this country.
Provided a lot of information on a topic that I had before known very little about and was very easy to navigate.
Very helpful and informative website.
It's very significant. This website encourages people to donate organs in order to help other patients, to prolong their lives. It's a continuity of life. However, I still need some time to think about this and discuss with my family. Anyway, it's useful and meaningful.
I am in two minds about donating as I often wonder where my organs would go and have reservations about this. It would be nice to be given a choice as to whom or more precisely what category of patient would receive my organs. I believe some people are more deserving and would make better use of this 'gift'. While some people despite the possibility that they might be in more urgent need a transplant are less deserving than someone born with the need for a transplant as they are in fact a victim of their own actions (drink, drug abuse). I do not see why a donation cannot be given with caveats. I would rather donate knowing my contribution was going to what i would consider a deserving cause rather than simply the person in the worse situation.
I think I will actually consider Organ donation now, thanks to this study/website. I was just something I never really thought about before, maybe because of my age as I am only 21. The critical factor for me was the Religious information. Knowing that Pope Benedict XVI supports it and is in fact registered himself greatly encourages me to do it as well. Had I known he/the Catholic Faith was against it I would have decided not to register at all. For me, being able to see that link and information was really useful. I would have had to try to find out myself either via the Internet or a Priest etc.
For ease of navigation having the menu at the top instead of/as well as the bottom of the page would be useful. The header underneath the title "University of Dundee Organ Donation Website" has shifted and currently obscures the title.
I studied Medical Law last year, and I learned loads about the procedures and ethics involved in organ donation, because I was genuinely interested in the topic. I would really like to donate my organs after death, and it would be a comfort to me to know that I'd be helping people live after I pass away. However,

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there are a couple of reasons why I am still undecided on the issue: (1) I may not live in the UK after graduation (my parents currently live in China), and (2) I would like to retain my organs if - touch wood - any of my family members ever need them. I am still very open to the idea, and I will discuss the issue with my family before deciding! Thanks for making such an easy-to-navigate website :) It's very clear, touches the heart, and genuine
I found this website rather strange, sort of like a promotion for becoming an organ donor but not through the NHS.

Free text reasons not to donate

I might donate to science
Unsureas of yet as to the feelings of my family
My beliefs and certainty of life leaves me with mixed feelings about removing organs. There's an element of trust or understanding about death
My family & I have discussed this in the past and nothing in the website made me change my mind.
I need more time to think about it and understand it better
I want to be cryogenically frozen
I want to join the register in my home country when I move back home.
I am an international student returning home for good by 2012 (but am registered as an organ donor back in Singapore)
I am considering registering in my home country.
I just don't think it's a particularly nice idea that I'm going to be cut up and have bits of my body in other people after I'm deadm...
More information required.
I might not work in UK after I graduate
I do not feel i am ready to male this kind of position yet, however i plan to consider it.
I don't want to register in the UK, where my organs may go to people I don't consider worthy (e.g. alcoholics, the obese etc)
I find the thought of organ donation after death slightly strange.
I'd just like more time to reflect on the information I have read.
I really have to think about it
Still not sure
As an agnostic i'm not sure what is the correct decision

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I have an inherited blood condition which means that I cannot donate
previous medical condition prevents it
Not very sure yet.
As yet undecided
I will register in my home country
I am unable to register due to reception of a blood transplant in 1992/3. Also, I would like my body to be able to function after death, i.e. i would give 1 kidney because you can spare one.
still need time to be mature enough to decide on this. Anyway, it needs courage.
I would like to ask my family before I make this decision
Need some time to think through what I've read
I need to give myself more time to such a decision
not keen on
I would like to discuss this with a family member first.
This decision is too important to be taken on the Internet. I would need to meet someone, to feel more reassured to register.
Need to discuss it/think about it further.
I do not know if I can make such a commitment at the moment. Maybe when I'm older.
I have a chronic disease that is not entirely understood. I cannot donate blood and assume organ donation would be the same. I plan to talk to my GP about it.
Plan to register later on in my life
Find the idea of stuff being taken out of me weird
I am hepatitis positive, I think its not possible to do this. If its possible, please let me know!
If I would be registered, I would do it in my country.
Want more time to think about it. Probably not going to die soon.
I plan to register once I'm home in my country
I am still undecided on the matter.
still undecided
I'm still not sure if I like the thought of my organs being given to somebody else
I still haven't decided

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Appendix 3 – Organ Donation Interview Categories

Knowledge of what the register is?
Transcript1
do you know what the NHS organ donors register is? Participant: uh no I don't
heard of things Don- uh Donor cards before but um. I mean I don't know if that puts you on the register having one of those or not?
I would assume there is a website or something but I would think they would send me stuff and I would have to fill it out and send it back to them
Transcript2
is it where your register details and if you die then they know what organs to then take from you
Transcript3
but I'm sorta thinking.. I'm sure there is a way you can opt out, even if it is just phoning somebody but that would be one concern.
Transcript4
I assume it's some sort of database of people that have given their consent to use their organs
Transcript5
presumably if you have a donor card then that means that your organs if you pass on are then available for use on the NHS for other patients
I couldn't say that I was- yeah- that would make sense
Transcript6
Interviewer: cool, so first I'd like to ask you if Do you know what the NHS Organ Donor Register Participant: yeah
Transcript7
Do you know what the NHS Organ Donor Register Participant: yes I do
Transcript8
you know what the NHS Organ Donor Register is? Participant: yes...
Transcript9
I'd like to start with whether you know what the NHS Organ Donor Register is? Participant: yes
Transcript10
yes - I have heard of it
Unsure if I am currently registered
Transcript4
the last time I filled out an organ donation card was long before databases or that
Transcript7
I don't *think* I'm registered
Transcript9
am unsure, pretty sure I'm not
may have agreed at some point in the past and can't remember - not sure what the process of joining is Participant: not sure how to check
Transcript10
I am unsure of my membership status
I had a paper card when I was about 18 which you signed and put in your wallet. But you didn't have to register or anything
People who have been affected by organ donation are more likely to be signed up
Transcript1
I don't know anyone who has ever received an organ personally (…) if I did know someone who had received an organ donation I would probably be more aware
Transcript3
people that are in the medical profession more because they will know a lot more about it.
people who are registered are more likely to have been affected by it in some way shape or form
Transcript4
I think those that work in those fields are going to be a lot more aware of the subject because they are not only around all the material but they are also seeing firsthand what the effects are
it's amazing how many people will do things not because just they want to be charitable but just because something has happened in their life that makes them aware of a certain issue and then they do something for a charity relating to that issue
Transcript8
perhaps people who have gone through a close friend/family benefitting from organ donation?
Transcript10
I suspect people who have had previous experience (i.e. family member) requiring an organ would be most diligent about joining
People need to be informed

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Transcript2
I'd maybe see quite a few university students doing it, you know, because I think w- we I think we've been more informed about... this kind of think, like organ donation.
I think people need to know what they are signing up for. not just ok yeah take this take that, you really need to know, you know, what you're getting- what they are going to do with your organs and things like that
I think there's a lot of places that kind of set up stalls like "oh just sign up" and they're not really talking you through about, you know, what you have to- what's going to happen
I think, you know, we need a bit more education on like organ donation.
I just think a lot more information out there would definitely help and I think you'd probably get a lot more people like maybe donating them if you had more people acknowledging it
I'd like a bit more information than just saying "alright ok I'll just tick this, this and this".
I... don't know how long- much they would inform you with. but somet- enough information that's adequate so that you know what your signing up for. Not kind of leaving out any details
Transcript3
if it was promoted more or something, that would influence a lot more.
like a wee information guide about what benefits does it have to people. And like some statistics would quite help
like how many people are affected or how many people are waiting on needing a transplant.
probably a lot more information, what you can get out of it as well... um.. probably the same but tailored more towards a student's point of view
Transcript5
I mean I don't know very much about it so I would appreciate information....
Transcript8
what kind of marketing do you think would be effective? Participant: well, information, really
what I think happens is after you die, they cut you up and take whatever they need, freeze them, and use them in someone else Participant: but that's probably wrong
if I was informed more... perhaps more likely
Transcript9
: I would like the information clearly presented, and a list of common questions that people ask
need to know about what is involved in registering
Transcript10
Emotions (when thinking about organ donation in general)
Transcript1
I would feel very humbled if I was able to help someone by, you know, giving an organ
losing a loved one but being able to save another life. Would make me feel, would.... well it wouldn't you know obviously..... help me get over them but it would help... you know the feeling of......helping someone else, that would be very strong, a very strong driver
Transcript3
that feeling that you know what you've done
thinking about joining the register in a way it would be happy, in the way that you would be helping somebody
on the other hand sand because you'd be thinking about what some people are going through
Transcript4
they are all positive emotions
I think that anybody that's a human being must appreciate the relief to know, and to get that call.(empathy)
emotion I think, it's a very peaceful emotion I think. And for myself it would give me a great sense of peace to know that that would happen when I die
Transcript5
it would probably give them a sense of contentment, you know, that they had taken a step to do it you know.
I just feel it's a reasonable thing to do.
Transcript6
Well the way I see it is; if you ever needed an organ and no one was registered, you'd be pretty pissed off
Transcript8
I suppose for lack of a better word, it's "scary"
you feel good about yourself
Transcript10
sense of achievement (?)
Would these emotions make it less or more likely for you to join the register? Participant: neither - just a happy bonus.
I see it as a very practical decision - pointless organs going to waste unnecessarily. Emotions and sense of worth gained it a bonus.
Anticipating emotions after death
Transcript1
although I'm probably never going to experience that, the thought of experiencing that does make me feel better

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Trusting doctors
Transcript1
I'd I have hold a great of trust in doctors and medical practitioners, I know a lot of people just.... don't respect them very much but I don't I don't personally- I respect them very highly
Transcript4
You know I've known enough doctors and nurses you know as friends and that , in the past and I know that they treat each patient as their patient and they are not thinking about anybody else
Transcript5
no, I- unless you start harvesting peoples organs while they are still alive [[laugh:19m 54s]] I can't think so (joke?) Interviewer: is that something you would be worried about? Participant: not at all no
I don't want to cause my family further upset if I died
Transcript1
possibly hurting my family I don't know I mean.... I don't know if I was... if I died and doctors wanted my eyes, I don't know if it might upset my mum or something like that
I think organ donation is good
Transcript1
I agree with it ahem. I don't have any problems with it
uh I would donate my organs
: definitely yeah, I would like everything....donated
. I think most people can see why it would be a good thing
if you knew you were going to die it's obvious you would donate your organs I think most people would
Transcript2
I think.. it's a great thing if you can go and save another life, a baby or you know someone else who can live on their life a bit longer. I think it would be a good.
peace of mind that you're doing a good thing? I suppose? that you can be of use.... I think that's really it
Transcript3
: I think it's a good idea
I said it's a good idea, it's a good thing.
Transcript5
I would do it, I would do it basically
it's just something that, it's just something that I agree with so I suppose I would be staying in line with a belief in something you know
Transcript6
what are your general views on organ donation? Participant: I'm for it
Transcript7
it's okay :)
would you say you are for it? Participant: I am not opposed to it
: I am for it yes,
Transcript9
I think it's a good thing
Transcript10
It cost nothing
Transcript1
because there's nothing you can do, your past the point of no return
Transcript2
, if you've passed on and are not have your organs for a better use
I mean we are all going to die at some point so might as well do something worthwhile.
Transcript4
, my belief is when/if I'm dead I'm dead, I don't believe in an afterlife or anything else and it's purely a pragmatic thing
Well there's always something nice about giving something for nothing, just pure charity
Transcript5
you know I mean if you're dead, why not.
Transcript6
Well I'm dead, I don't need the organs anymore
since I'm going to be dead, it's not like I need them anymore
there is no reason not to
Transcript7
they can have bit of me after I die, I won't be needing them

Can increasing surface credibility improve e-health intervention effectiveness?

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Transcript10
I no longer need them
It would help others / save a life
Transcript1
if it was going to help someone then I would be tot- totally for it
Transcript2
I think it's good you know it gives someone else another chance at life
just really being able to save a life, knowing that you can still do something good after you have passed on
well both are saving lives I suppose
Transcript3
you will in the long term help somebody,
Transcript4
if you can help somebody else's life then surely that's the least you can do.
Transcript5
if it actually means that other people can be offered a better life if there's a hope of that then why not
Transcript6
It allows people to live for longer
Transcript8
I can see why people do it, and it saves lives
Transcript9
it helps to save lives
Transcript10
am quite happy that if any of my bits and pieces can help someone
Personal moral obligation
Transcript1
if there's well you know if I die there's nothing I can do about that and if there's something I can do to help someone else then I think I should
I don't think I'm obligated though I think its um morally I want to
I think people feel like you know if the facilities there why wouldn't you do it. (blood donation)
so it's almost like moral obligation which I was saying beforehand
I don't feel like I'm obligated but I feel pressure from myself like it's something I should do when it's something I do believe in
you probably feel safe in mind that you are doing your part to help someone else if the worst- if the worst comes to the worst.
I f- like well for me it would be fulfilling my moral kind of incentives.
if there is the opportunity to save someone else or help someone else you definitely should and that's a very strong feeling
Transcript2
I think if you got a lot of information about it then I think... you would feel obligated by yourself to maybe do it because then you'd know right "well this is the right thing to do".
peace of mind that you're doing a good thing? I suppose? that you can be of use.... I think that's really it
Transcript4
leave it to the individual to decide whether that's something they feel an urge to do.
Transcript6
if someone is registering just so that they can feel good about themselves then that not a good reason to register
you should register because it saves people's lives, not just so you can say that you're a giving person
Transcript7
would take an organ off someone, therefore its ethical of me to offer my own. So yes, I do.
it's a bit selfish to want one for yourself and not give your own
feeling of good karma?
Transcript9
aren't I doing a wonderful thing, aren't I great
that sounded sarcastic? did you mean it that way? Participant: no - I just mean it might make you feel good about yourself I suppose,,,
Transcript10
Don't need to join because…
Transcript1
I'm sure my family- if something happened to me would, they would do that on my behalf
like I said, I think my family would, would make the right decision for me uh

Appendices

Transcript2
I definitely would.... if there was more options available like you know for registering.
Transcript4
certainly just in case I have made it clear to my parents for example if anything happened I want my organs donated
Transcript6
I tried to register a couple of years ago but at the time couldn't Interviewer: what problem did you encounter? Participant: medical; Participant: *medical
I was trying to sign up through my GP but he advised I didn't at that time
Transcript8
one of my friends said she's not on the list, but everyone knows she wants to donate
I have all my negative views, but I don't see campaigns to change that which makes me think it's not THAT big an issue; I.e. they're not in severe need of organs
Transcript10
I had previously thought as long as my next of kin knew it should be sufficient.
I might not be able to un sign
Transcript3
I wasn't sure if I opted in and then maybe I changed my mind later on-
it seems a good idea now but I don't know whether in a few years time I'd. Opinions would change but
I've went to do it and then just changed my mind (because "maybe I couldn't get back out of it again")
It doesn't come up
Transcript1
I don't think a lot of people may plan it or think it
. It's not that it's you know that it's got any really negative connotations about it but it's not something that you think about
People don't plan, like, I don't know what my funeral is going to be like, or I don't have a will or anything like that
It's not something people tend to think about I don't think. Unless they know that they are in a vulnerable position or...
maybe they have not been exposed to it before
we've never had any... any losses of kind of young people in the family so it's never something that's ever come up into it.
It has to be made at a very difficult time for a lot of people. I think, it's not something you plan.
Transcript2
I think it's lack of information, I think if there was more out there then it would be a topic of conversation because- I think maybe you see it at the fresher's faire which is once a year you're not really going to talk about it
Transcript3
say you passed a poster that said organ donors that'd maybe start a conversation but it's not something that I'd just talk about
Transcript4
it's very- almost a topic that doesn't get discussed much.
I think it's a subject that needs to be talked about more,
that topic hasn't I think ever come to mind, not even in the pub. You know have a few pints and a chat, it's not a topic we have actually discussed no
Transcript5
well I guess it's not come up in discussion to the best of my recollection anyway with other members of my family so I couldn't really say,
I can't really ever think of any conversations about donating organs, it's not something that comes up.
it's not the kind of information that I would necessarily go and seek out to be honest. I've never searched for information on becoming an organ donor
Transcript9
we have never discussed it
Transcript10
(discussion with friends) Not something that has ever come up in conversation.
How I would register?
Transcript1
uh no I don't.. through your doctors or something like that
going to the doctors to get a card but I don't know if that would put me on any kind of register
like just trying to imagine what the form would be like..... couple of A4s or something.
yeah I will probably go from here and find out you know have a Google and see what I can find out about it. I mean is there ways to sign up online?
Transcript2
maybe go to the doctors, yeah
probably ask at reception and see what they would say because I think that they would know the information that I would need

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I hope it would be, just like simply filling out a form then that would be fine
Transcript3
as I say the one on the form when I got the driving licence it was more just like a ticky box and it seemed that if you ticked it that was it,
I'm sure there's an organ donor website and you can just go straight on to that and just sign up from there..
I think just it's a case of going into the website or wherever you sign up for anything that's through the government, even like passports I think do it.
probably yeah just a case of filling out a, 2 minutes, a case of filling out a form.
Transcript4
I assume probably if you went to the NHS website there would probably be a link there.
. I think I did come across a website at one point but I can't honestly remember
to take those 2 to 3 minutes to fill out the form
I suppose now I'm- I've got so much on my plate at the moment that it's- it's just fitting it in that's I've got
Transcript5
there's obviously a great deal of issues I can imagine you know in terms of questions of what organs can be used or what circumstances
I would look to see how I would do it, but it would be online
5-10 minutes would be good
Transcript6
You can sign up online I think
Google it
Less than 10 minutes to fill out the form
Transcript7
I think I remember a form about it when I applied for my driving licence?
(would it be easy to join) yes I just looked at the website
Transcript8
I assumed I'd just phone up ninewells switchboard and ask to be transferred, should I decide to do it
Participant: I have no idea Participant: presumably you'd have to sit through tests? Participant: but then that would be pointless cuz they won't harvest until you die. so maybe they look at your stuff after you die Participant: I have no idea
in my mind it's a mixture of a normal GP visit and a bunch of x rays, and it would take up quite some time before you're deemed eligible
so in all, how long do you think it would take you to register? Participant: well, possibly fill in a form Participant: and then get an appointment Participant: do some blood tests maybe Participant: I think it would be staggered over a period of a couple of weeks
Transcript9
Do you know of places to go or people to talk to about joining the register(hypothetically)?Participant: no
probably use the internet...
how much time would you set aside to do it? Participant: about 5 minutes
Transcript10
I have no clue - but I guess now that you have brought this up I will be looking it up online to find out what is required
I would hope it would take less than 5 mins
My organs might not be good enough
Transcript1
I wouldn't want to kind of give off my rubbish body parts to someone else if they weren't going to help them,
Transcript5
But I could imagine if I got to an age of my life where my... you know.. I'd sort of let go, you know, I wouldn't necessarily feel the same way. You know that I would necessarily be contributing anything of benefit so that might well be a deterrent I suppose.
I don't know what my family or friends views on organ donation are
Transcript1
they don't not have views on organ donation.. if that makes any sense as in ahem, I don't know why they wouldn't do it
I think I remember one of my brothers telling me that he would donate anything but his eyes because he has rubbish eyesight
so I think he's, and you know, I assume he's on a list or something or but as a family as a whole we're not, we don't have anything wrong with that
yes that wasn't really a discussion that more a passing comment
I don't think I've ever spoken to someone about organ donation.
I think it's you know, my decision- it's to do with me, it's not to do with anyone else.
Transcript3
it's not something I've spoken about
Transcript6
do you know what your families views on organ donation are? not really
Transcript8

but I have no idea about the rest of my family
Transcript9
Do you know what your family thinks about organ donation? Participant: next Participant: no
Transcript10
I know what my families/partner/close friends views on organ donation are
Transcript2
.. I think my parents are both signed up to the register
I've got a younger brother so I don't think that he will have any views on it just yet
Transcript3
my mum was saying last night when I spoke to her about it. She's like yeah she would be an organ donor but she doesn't want someone touching her eyes
Transcript4
opinion of my mother whose under the impression that because you're on a donor register that if you were in say accident and emergency, say you'd been knocked over that they would work as hard to keep you alive knowing that your organs could be used
I think all my family would be happy donating organs apart from my mother.
Transcript5
, my mother... I think um, I don't know about **** she was organ donors but she has always said she wouldn't have any objection to it so....
Transcript6
My boyfriend is registered I believe
Transcript7
Have you ever discussed organ donation with your family or close friends/partner? Participant: yups, both
wide-ranging - my mum is kind of funny about it, dad doesn't mind and my girlfriend is really for it
Transcript8
I know my grandmother wants to donate
Transcript10
I know about my immediate family - ones where I would be potentially involved in any decision making about.
I remember advertising but nothing specific
Transcript1
I'm sure I've seen television adds but nothing sticks in my head
Transcript2
I think I saw a stall at one of the fresher's fairs that's about it. I've never really seen anything else
Transcript3
I've heard um like on the radio there's been a couple of adverts but more of it I've heard more for donating blood than donating organs I've not heard much or seen much about donating organs
I'm sure I've seen one on a bus but the details of it I couldn't…
Transcript4
I can't remember the last time saw so much as a television advert for organ donation, you know,
I'm sure going back a few years there used to be the odd television advert just to keep people's awareness
I think it was to do with the NHS so I don't remember if they had carried out a survey or somebody had carried out a survey on behalf of them for the NHS. I'm not quite sure but it was just something that I came across and it wasn't particularly surprising
Transcript5
, I've encountered information about organ donor statistics and whatnot probably throughout my life at different times but I couldn't say it was, you know, associated with a campaign as such you know.
I remember specific advertising
Transcript1
. I've seen these hospital television programs before, the ones where they send camera crews into hospitals (...) and that was actually a quite eye opening scene... seeing the reality of... of that…
well I don't watch much uh live television and that's why I remember seeing all these... the... the blood donation adds
there's the boy talking about his, you know, baby sister so- sorry it's a really vague example but those are very good
Transcript2
I've seen maybe one or two adverts on TV but not that much (…) not really encouraging I suppose they want "I'd like to tell you more about organ donation and why you should do it and why it's good"
Transcript3
, you hear it in the passing where there's people.. as I say the wee adverts that I have heard. It encourages you more. And to hear, as I say, people on the news constantly. Um if they have been affected by it or trying to encourage you to do it
Transcript5
, I've seen quite a few documentaries about sort of speculation on you know memories of organs and what not, whether or not they have their own level of perception, you know on some degree, on some level.
Suggestions for intervention / advertising

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Transcript1
I dunno if you could add something if you sign up to the register you can connect it to your Facebook you can you know once you get to the end of the process. "help us promote"
Transcript3
like as I said the real life story ones are the best. Because the adverts of giving blood it's all about "so and so needs a blood transfusion" and I want to give blood but I don't weigh enough.
(poster busses TV) I think just including all of them, that way you are hitting everybody because not everybody
Transcript4
Make it a big campaign . so everybody is clear that if they have any issues and they definitely want to opt out
maybe have a section on the NHS website or simply applications through the door. Any sort of system and if there's any questions or help lines or so on just make sure there's support system
Certainly television it would certainly be a good place to start.
it would be interesting to see statistics to see how many people are waiting on organs and how many sort of percentiles of, what the odds are of an organ and a compatible organ being available. Just to put the desire and the needs of the patients into more of a real context. So I think... how many- one in a hundred, how many people are likely to need an organ in their lifetime.
you know "whets the odds of you needing a kidney in your life?" I don't think anyone would have the slightest ballpark idea.
Transcript5
I suppose a video, some kind of instructional element to it or at least gives a reassurance about how quick and easy it's going to be
Transcript6
TV adverts would be good
really emotional, they tend to involve a really ill child that really needs blood and it's the parent talking into the camera asking people to donate
Telling people how many people die a year will waiting for organs
Maybe an online chat thing to help the person through the sign up process if there was anything they were stuck
Transcript8
information campaigns, what happens, what are the statistics, how many people this helps, etc
Transcript10
high impact info would be good to make it a good thing to do - some basic stats on people whose lives have been saved, dramatically improved by an organ that was donated
telling them how many people on the register - showing they are part of a big group presence
Or if it was a FaceBook app - tell them who of their friends are already registered.
If I was presented with the opportunity
Transcript1
... if I was presented with the opportunity I would do it. It's not something I would turn down it's just I don't feel like I have been presented with the opportunity yeah But I would definitely do it if it was... if it was given to me
Transcript2
I've not had the opportunity to sign the forms
Transcript3
probably like, once this website is ready I think I'll wait till this website is all- and I'll have a look around that and then probably yeah, next six months to a year
Transcript5
See if someone put it in front of me, I'd probably do it, you know
if you send me an email I don't see why not
Face to face promotion
Transcript1
I just watch what I want to watch on demand you know.. so... a way that's worked so far, is you know, people on the ground
like at the fares and things, the fresher's far
I think for the bone marrow one they had people standing outside the union asking you to go downstairs
But yeah actually meeting people and being able to talk to someone
Transcript2
I personally think it would be better with a person because a leaflet you just kind of scan through it and not really take it in but if someone's standing explaining it to you or even like on a TV advert then I'd probably take it in better
I suppose if I'd gotten like information from someone and they said "oh you can go into this website and fill in the form" I'd probably do something like that.
Transcript3
sort of groups travelling around the country,
I would like some contact back from being on the register
Transcript1
you know, a pack and.... they , you know, they sent you regular information about what's going on in the trust (bone marrow)
Transcript4

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They could maybe get written feedback confirming "yes, your opt out application has been processed" so that they have that peace of mind
and you assume that would be it and maybe a confirmation email.
Transcript6
up to a week for a letter of confirmation
and the little card thing

Influence of other people's views on donation

Transcript1
I tend to agree with my family a lot of things
I know it's not the same as organ donation uh.... well.. actually that said (...) that said when the...uh.. bone marrow people were in the union we all went down together as well actually
friends definitely do influence the way that you think about it
Transcript2
I don't think they would be bothered, like, you know, if I've passed on or whatever, died in a car crash then at least then I can save a life. I think they would be fine with that
I suppose so but not in a bad way because I think like, you know, they've got their heads screwed on right so if they are doing organ donation, it must be like kind of the right thing to do
Transcript3
: I think other people's opinions as well, about whether your family members are- whether they support it
(mothers views) that sort of made me think yeah actually I wouldn't like somebody taking my eyes out
.. I think it's sort of a lot to do with what the people around you whether they are a part of it whether they support it.
Transcript4
how much do your families views on organ donation influence your own views on organ donation? Participant: not at all
Transcript5
I don't know whether that was an influence on my own perception of it
Transcript6
their opinion on it wouldn't influence mine
I tend to form opinions based on facts as I see them rather than on what other people think
Transcript7
have their views affected your views (if at all)? Participant: not much really, it's my decision
Transcript8
does her views impart on your own at all? Participant: umm no
have their views impacted on your decision at all? Participant: no
Transcript10
Not very important. Ultimately it is one decision where I don't have to take anyone else's feeling into consideration

Consequences of registering

Transcript1
The way I mainly look at the pros and cons of... uh.. external decisions are, like whether. I- I'd be happier and my kind of- my future life. So it might affect my employment or my family or anything like that. I don't see how choosing to become an organ donor would affect you know a future career like
Transcript3
- maybe pestered by phone calls or something.
I'm sure it wouldn't be passed on but they might ring to check to do a few questionnaires or something like that or check to get your opinion...

Hypothetical: other people might be against organ donation

Transcript1
... I can't think of any negative consequences personally other than you know people judging you I don't see-. I'm sure some people are against organ donation, people are against you know There's always someone that likes something and someone who dislikes the same thing um so I possibly you know
Transcript2
I suppose... like people with other, you know, opinions on it would probably find it very negative....
Transcript4
If I had another partner and there was an issue why they maybe had an issue with it. Their feelings for example if I was in a relationship with someone that felt strongly about it
Transcript5
perhaps older people, not necessarily very old people who perhaps would consider their organs to be [[laugh:9m 40s]] you know... fit for transplant.

Hypothetical: Religions might not like organ donation

Transcript1
I don't know if religion would affect... whether people want to donate organs or not

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Transcript2
uh like... certain religious faiths, like Jehovah witnesses don't do blood transplant um transfusions and things like that, I suppose they would be the kind that would frown upon organ donation... um... and then maybe quite a few other religions or people that culturally as well....
Transcript4
I do think that religion does have a big bearing on that decision
you know I don't have any religious views or anything along those lines so

Death is a sensitive subject

Transcript1
I've had two friends who have died in the last year and I, the one that died most recently.. who.. uh.. I didn't even think about it I don't know if she... maybe it's a you know too sensitive a subject for us to talk about
I'm comfortable talking about it by all means but it's not something I don't think I would... who would discuss it as a group if that...

Thinking about your death is unpleasant

Transcript2
it's usually sad because your thinking about yourself when you're dead so...[[nervous laughter:15m 12s]] Participant: it's not the most positive thinking ever.... um.... but.... yeah....
Transcript7
well, death? so it's kind of awkward
Transcript8
mean, death in itself it quite scary
and if you think you're going to be chopped up afterwards... can't say that makes me feel pleasant!
Transcript9
you do tend to think of death and tragedy a little bit...
Transcript10
I guess some people might struggle to consider their mortality
I have a friend who won't write a will or even consider it because she freaks out at the thought of dying

Ick Factor

Transcript2
I think it's quite intrusive, you think now when you're alive and well but I suppose when you're dead it's not as intrusive, you're not going to need them
Transcript3
just the thought of somebody cutting into your body when you're dead it's horrible to think about
I'd be happy for a kidneys whatever but eyes are maybe a little bit yucky for want of a better word
Transcript5
so what is the concern specifically about your eyes that you have? Participant: I don't know, I don't know, it's hard to put a point on.... it's probably irrational but it's just.. I couldn't sort of summarise, you know, but there you go
I was thinking in case of my eyes then I guess it's just, it is irrational, it's something I can't really get to a sort of you know... *****
Transcript7
it's a bit icky, thinking about organs, the idea of having someone else's
Transcript8
but the idea of having bits of me removed after I die is a bit... odd
I suppose... the idea of things happening to me after I die that are out with my control feels unnatural?

Advantages of a website

Transcript1
- if you could do it just like that you could just go to a website and it's there.
I think a lot of the thing would be educating people why it's important and make it simple for them to do it... uhh I think that that's a way that a website can be of help, because just giving someone a leaflet and saying why they should donate... I don't... personally find it's as engaging as you know a good website.
Transcript2
I suppose just putting on your computer and signing a form, it would be much easier
I think people my age would definitely then sign up for it, if you had it like available that way than just signing a bit of paper
Transcript3
I mean an online one you can sort of do at any time of day. It's free, you don't have
theres a lot of people who don't like phoning now as well
where on a website it's not a required field, you wouldn't put something in while on a phone they might force you to put something in
Transcript5
people can do it whenever they want, it's free.
Transcript6
Online registration makes it easier for people who lead a busy life to register

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Transcript8
(is web better) probably Participant: you don't have to deal with people, for one Participant: and possibly it's faster and you can take your time
Transcript9
much easier to access
Transcript10
online means people can do it as soon as they think of it
Technology is more/less trusted than pen and paper
Transcript2
with the technology is a bit more trusted than just signing a flimsy bit of paper
Transcript4
obviously if it's just a website, it's all electronic data, people feel a sense of security by something on paper
How often do I use forms
Transcript1
simple submissions I do with everyday email, facebook whatever. but filling out forms once a week or twice a week and I mean I don't sign up for things that often
Transcript2
I use them quite often, couple of times a week
Transcript3
probably once a day, there's probably- I fill in a form once a day
Transcript4
not particularly often to be honest, you know it's one of these things, most websites that tends to be registering whether it's an email service or whatever you are using and then I always use the stored passwords or I just click and it autofills everything.
Transcript6
3-4 times a week
Transcript7
yes I do I love the internet
Transcript8
how often do you use websites with forms which you have to fill in information ? Participant: constantly
Transcript9
pretty regularly... not sure how often exactly
Transcript10
I guess daily.
Forms should be short/simple
Transcript1
found some forms to be over complicated and it's kind of you know deterred me from continuing and I get to the point where I don't have time to do this now
if I'm going through just one thing after another I feel like it's just not worth the means at the end the I might stop
Transcript4
even when it comes to organ donation if you're looking at a page with 10 fields to fill in, you think "I'll bookmark that and come back" and you never do
as little information as possible but just enough to make sure it's all legal and obviously fills all the requirements they need
Transcript5
If it's a process that's not particularly time consuming then I wouldn't object to doing it
It's like you know make the process as easy as possible to set up because
Problems encountered when using forms
Transcript3
some of them that I don't like is when it's "any other comments?" and it won't let you move on unless you've filled it in that any other comments box, but sometimes that yeah...
Transcript4
occasional hiccup if there's lots of code script or incompatibility php or something along those lines
Transcript6
postcodes not being accepted, needing to put in a house number and not having the option for house name, not having student listed as an occupation,
website failing to load, capatcha being unreadable,
Transcript7
I hate sites which lose your info if you submit and there is an error and you have to re-enter stuff, you know?
Transcript8

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: it's a bit repetitive to give your information over and over, and all websites specify different 'required' things
it would decide my form was incomplete and remove all the data for me to start over again. that's irritating.
Transcript9
do have problems with those captcha things... if that counts
Transcript10
My pet hates include the autofill option on some browsers don't match the design of some forms so you get half filled information. Also forms that are presented oddly like in three columns which are difficult to track through.
ones where you press submit and it doesn't go and it turns out you needed to complete a field but it doesn't help you find the error
I have never had a problem with a form I had to fill in
Transcript2
have you ever had problems with web forms where you had to fill in personal information Participant: not really no
Transcript5
have you ever had any difficulty using a website with forms? Participant: no
Transcript9
probably, not recently - can't remember exactly
I would remember to sign up by…
Transcript2
I suppose they could maybe give you a card or something with the website details on it, you know "here's the website, go onto it, sign on the form, it's easy it's quick" wanna do something like that otherwise I probably would forget
Transcript4
even if it's an email or something along those lines, you know if you have 2 minutes
because you are always logging into your emails it's a part of your connection to the internet you are using day in day out and if it drops into your inbox it takes 1 second to click it and then you feel compelled to do the rest
Transcript10
put it in my Google calendar as a task to complete
It is the NHS responsibility to advertise
Transcript2
I think, definitely think it's their responsibility to do that, I mean if they are wanting to get our organs then I suppose they should really be out there advertising it.. you know educating people and letting them know all that kind of thing
I just think they need to take a bit more- like I suppose responsibility in educating us I mean they want more organ donors they are going to need to go out there and educate.
Transcript4
... I think that maybe the onus should be on GPs to make sure that the question is asked.
Transcript5
so if you were interested in joining the register, how would you go about doing it? Participant: well send me an email, make it an easy process.
Transcript6
where should that pressure come from do you think? Participant: NHS
No advertising or not enough
Transcript3
I don't think it's publicised enough, I don't sort of think, there's not.... maybe like a lot more adverts or something, or posters round about
Transcript4
it seems strange that there is no formal campaign on behalf of the government to reach out to people that want to participate. So you would have thought that all the money we pay in taxes, that would be a damn good place to start
I think there should be more information on ... the state of the healthcare system as it is now, the real effects of people waiting on organs
Transcript6
They've got the adverts about blood donation but I haven't seen one about organ donation
Transcript7
(aware of any adverts?) not really. I don't have a TV so I probably would miss them anyway
Transcript8
if anything, I don't think there's enough "marketing"
Transcript10
not aware of any at all. Lots about giving blood but nothing about organ donation
opt in opt out
Transcript3
I've always thought that there'd maybe be more people registered if at birth you were opted like you were part of the register and then you opted out
Transcript4
because it's an opt in opposed to an opt out process, it's a lot of wasted resources basically

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know I've always been of the belief that it should be an opt out process as opposed to an opt in
Transcript7
not sure if it's an opt-in or opt-out thing
people should be rewarded for joining
Transcript4
I think that seems to be needed. I don't know what incentive or what form but, something to entice people
I'm sure there's many companies that would appreciate the publicity and say "yeah we will put that up for a draw- a prize or something like that".
I think reward could be a dangerous route to go down you know getting people to sign up because they wanted the reward,
I think it should be left as it is, no real reward as such but any reward should be fairly meagre.
There are no societal pressures to donate
Transcript1
: I don't feel pressures no,
Transcript2
not really, because there's a lack of information there not really you know, getting you to do it
Transcript3
do you think there's any pressures to donate? from anywhere? Participant: no Interviewer: no pressures? Participant: there doesn't seem to be anyone forcing you that you have to, it's encouraged but you don't have to
Transcript4
Do you feel there are any pressures to donate? Participant: No I really don't
Transcript5
I don't know I mean I wouldn't do it out of a sense of obligation. So, I don't know how other people feel about it.
But.. you say you wouldn't do it out of a sense of obligation but do you think there is a sense of obligation there at all? (silence) Participant: No
Transcript6
I don't think that there is any pressure to donate
Transcript8
Do you feel any pressures to donate? Participant: no
Transcript9
Do you feel any pressures to donate? Participant: no
Transcript10
no pressures
There should be more societal pressure to donate
Transcript4
(there are no pressures...) and I actually think that's wrong
Transcript6
(no pressures)Although there probably should be
Joining the register is a personal goal
Transcript4
it's just one of the things to tick off the list so to speak
I've got many goals in life and matters such as organ donation, if everybody took the time to do it then what a better world it would be
Transcript5
Put my money where my mouth is essentially
Transcript10
Not that I am aware there is a register then it is definitely on my to do list - and I would intend to find out how to do it and do it soon
I haven't gotten around to it
Transcript4
I suppose now I'm- I've got so much on my plate at the moment that it's- it's just fitting it in that's I've got
but you know it just slips your mind and you never get round to doing what you should do.
Transcript5
I guess just laziness you know, to be honest
I hadn't got round to it so far in life
I think the bottom line is that I don't have any doubts, I just haven't done it, so that's... it's maybe like not the most beneficial answer you know... um but it's just that's how I feel about it you know, I just haven't got around to it yet
Transcript6
Just haven't got around to registering yet

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Transcript9
laziness, apathy
Everyone should sign up if able
Transcript6
unless you have a medical condition that prevents you from donating, you should register
I want to look good in coffin
Transcript7
Not too keen on my eyes.... is there a reason not your eyes specifically? Participant: so I look nice in my coffin
There are societal pressures to donate
Transcript7
kind of expected to
society maybe?
any specific area of society? (peers, workmates, NHS etc)?Participant: peers
You need organs in your afterlife
Transcript8
another friend of mine has certain cultural beliefs, and worries about (I kid you not) becoming an "incomplete ghost" I.e. having to haunt people without eyes, or something

Appendices

Digital Appendix

In addition to the regular appendices above, anonymised study data is available at http://searchcredibility.computing.dundee.ac.uk/DigitalApendix.zip and http://www.webcitation.org/68aZ0UsRd. The digital appendix zip archive is also presented at the bottom of this document. A list of files contained in this zip archive is presented below.

- Exercise Study – Folder containing all data for the exercise study
    - Page Browsing Data.xls – Spreadsheet containing browsing information for all participants in the exercise study.
        - Total Pages Requested – A list of all pages requested by users (removing duplications)
        - Stdev – page view durations for all participants, used to calculate standard deviation and other statistics
        - High credibility – Each page requested by participants in the high credibility group including IP address, date of access etc
        - Low credibility – Each page requested by participants in the low credibility group including IP address, date of access etc
        - Chart Visit Duration – Page used to create a graph of participant visit duration
        - Chart Page Duration – Page used to create a graph of all participant page view durations
        - Chart Page Duration By Page Type - Page used to create graphs of all participant page view durations (sub divided by page type)

    - Pre Post Questionnaire Answers.xls – Spreadsheet containing pre and post questionnaire answers for participants in the exercise study.

- Organ Donation Study
    - Interview Analysis With Online.xls – Spreadsheet containing relevant comments made during the organ donation interviews conducted as part of the content gathering for the second study. Comments are categorised based on what the comment is concerned with e.g. 'my organs might not be good enough [to donate]'.
        - Analysis – List of all relevant comments made by students interviewed categorised by comment concern e.g. 'My organs might not be good enough'
        - Results – An automated summary of whether each participant mentioned a specific comment category
        - Data Saturation – Evaluation of the number of novel category comments brought up by each participant. This is used for calculating data saturation (when any further new participants are unlikely to express ideas that have not been raised before)
        - Action – List of each comment category, its importance and how it informed the assembly of the organ donation intervention content. Comments are ordered according to how often they were mentioned by different participants.

Appendices

- o Exit Questionnaire Analysis Final.xls – Classification of the comments left by participants on organ donation intervention site when exiting. This is duplication of Appendix 2 but with comments divided by category.

- o Organ Requested Pages Dundee And Warwick Final.xls – Spreadsheet containing browsing information for all participants in the organ donation study.
  - Baseline Data – Analysis of participants baseline demographic data (religion, ethnicity, age)
  - Recruitment – Page used to create the graphs of recruitment (when participant first accessed the intervention website)
  - Total Duration Spent On Site –
  - Website Usage Data – Page used for creating graphs of page view durations and site visit durations.
  - Website Usage By Page - Page used to create graphs of all participant page view durations (sub divided by page type)
  - Organ Requested Pages High - Each page requested by participants in the high credibility group including IP address, date of access etc
  - Organ Requested Pages Low - Each page requested by participants in the low credibility group including IP address, date of access etc
  - Pre Questionnaire – Full baseline questionnaire results
  - Exit Questionnaire – Full exit questionnaire results
  - Miscellaneous – List of interactions with the credibility factors: Participants clicking on the broken link and participants following references.
  - Registrations – List of participants registering as organ donors including duplicate baseline questionnaire information
  - Frontpage Visits - List of all requests for the front page of the organ donation intervention website including categorisation as web crawler, duplicate request etc
  - Analysis Registering – An analysis of what factors might lead to registration as an organ donor using 2x2 contingency tables. This approach was abandoned in favour of a logistic regression
  - Analysis Exiting - An analysis of what factors might lead to exiting and not registering as an organ donor using 2x2 contingency tables
  - Mean time on each page – Analysis of how long participants spent (mean) in each area of the site. Used to get an initial idea of the dataset before using Mann Whitney-U calculations.
  - Pre Questionnaire Table – Full baseline questionnaire results combined with some exit questionnaire data. Used to get an initial idea of demographic spread of participants.

- o Regression.sav – IBM SPSS v20 file containing baseline questionnaire data and registration behaviour. Used to perform the logistic regression (see 4.6.6 Factors associated with registration)