Website credibility and intervention effectiveness

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Abstract. Credibility is closely related to trustfulness, reliability, accuracy, authority, bias and quality. There is a strong correlation between credibility of content and its believability [1,2]. Previous studies have identified a number of features impacting on users' assessments of website credibility. In our study, a randomized controlled experiment was carried out with 92 students to investigate the effect of high and low credibility in a website promoting healthy living on the user's behaviour and attitude to exercise. Students allocated to the credible version of the website used it for significantly longer. We believe this demonstrates the importance of designing credible interventions in order to maximise participant exposure. [123]

1 INTRODUCTION

The study of credibility has been identified as an important area of research [3]. Despite the lack of a unified list of dimensions that combine to create credibility (trustworthiness, expertise, competence etc.) there is a general consensus on what features affect perceived credibility.

Credibility is important in all media formats and there is a considerable amount of research on credibility in television, written and spoken communication [4]. The internet however has some unique additional features:

Size - manual assessment of all sites on a specific topic on the internet is not feasible except in the narrowest of fields.

Lack of barriers to publishing - Anyone can create a website at relatively low cost. Authors do not need any qualifications or training in an area before they can publish.

Quality Review - Peer review of internet content prior to publishing is the exception not the norm. Prior to publication a newspaper article will be reviewed by several different editors. Television broadcasts, even when live, are subject to review and those considered to be delivering poor quality or inaccurate information will be withdrawn.

Enforcement - Even if review of internet material was feasible, unless a website contains illegal material, it can not be removed without the author's prior consent.

Validation - Users make judgements about the credibility of a site's content based on the author's credibility. There are a growing number of "phishing" websites that falsify source information in order to exploit visitors [5]. Although there are technical safeguards such as Website Security Certificates and anti-phishing software, current safeguards have been unable to combat this growing problem. New approaches are needed to ensure the integrity of source information.

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There is a strong relationship between credibility and persuasiveness [6]. Pornpitak found that in most situations a highly credible source is more persuasive and that healthcare is an area where additional research on credibility is needed.

We used behaviour change in exercise as a case study. This has been investigated through the Transtheoretical Model (TTM) [7] which allocates people into possible states of change:

pre-contemplation - has no intention to change or denies that there is a need to change.

contemplation - is seriously considering changing their behaviour

preparation - is making small changes to their life to facilitate change

action - is actively engaging in change behaviours such as joining an exercise program

maintenance - continuing to practice change, e.g. exercising

Physical activity declines with age, with the most significant stage of decline in 13-18 year olds [8]. This makes student years an ideal time to target interventions that might restore levels.

Internet and email based interventions have limited impact on behaviour change in physical activity [9]. Improving the quality of these interventions is therefore a high priority particularly with regard to "engaging" and "retaining" participants.

2 WEBSITE CREATION

In keeping with previous studies [10], two versions of a website with the same content and navigation were created. One site was designed with features identified in the literature [1, 11, 12] as improving credibility (Figure 1) and the other with features that erode credibility (Figure 2).

The core content of both websites was the same: background material on exercise and weekly updated articles from reputable sources (Journals, BBC news) identifying it's benefits.

Features associated with credibility included:

Site Awards/Certification - the credible site was accredited by "Health On the Net" (HON). This organisation reviews health-related websites to ensure content is credible and that authors are unbiased and conform to the HON code of conduct. A W3C certification stamp was also included on the credible site to indicate conformance with the XHTML specification ensuring browser compatibility and accessibility.

Photographs of the organization's members - The Assistant Director of the Institute of Sport and Exercise (ISE) consented to have his photograph taken and it was added to the "about us" section of the credible website.

Website Contact Details - The credible site included email addresses and telephone numbers of the website manager and the ISE assistant director at the foot of each page.

Links to external sources & details of the author's credentials for each article - news stories on the credible site included full

references and links to the source materials. No sources were given for material on the control site.

Non-profit - A short message was added to the front page of the credible site informing the user that the "site is non-profit and as such no adverts are displayed or commercial products endorsed".

Content Policy - the credible site included an additional page containing the university's privacy policy.

Display of organization's physical address & contact phone number -The physical location of the university was given in the "about us" page of the credible version along with photographs of the facilities and the telephone number.

Familiar Branding - The credible site used the theme of the university students' sports union with the colour scheme and icons as used by the ISE website.

Interactivity - The credible site contained a rating system where users could vote on the quality of articles and view the average rating.

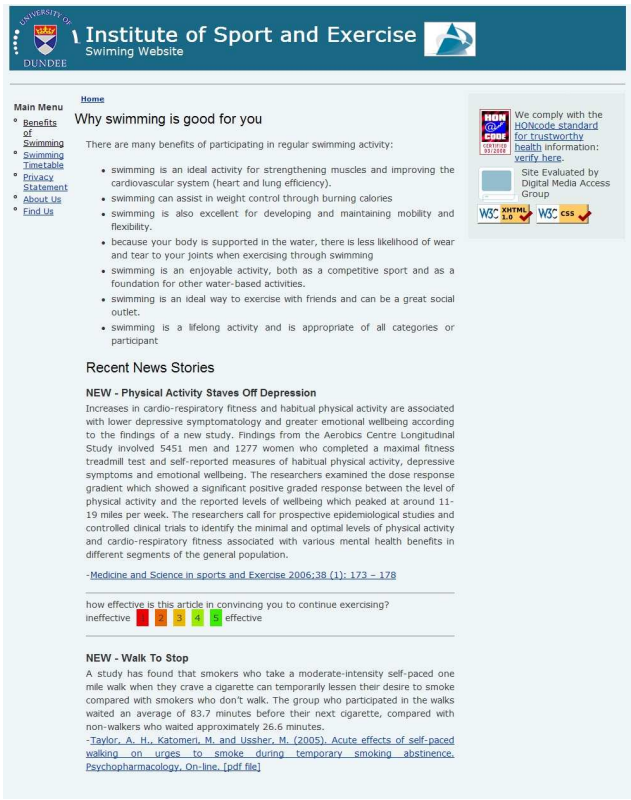

Figure 1. High Credibility site as seen in Internet Explorer at 1024x768 resolution

Reliability - The less credible site contained a broken link on the front page. This link replaced the "about us" link on the credible site to ensure that factors such as menu length and site navigability remained constant. This approach was used rather than more severe methods, such as forcing extended page load times or taking down the site periodically, as this was felt to have too negative an impact on site usability.

Adverts - The less credible site contained a Google advert bar. Google adverts were used because of their familiarity to the user group and prevalence on the web. It was felt that more intrusive advertisements such as "pop-ups" would have too negative an effect on the site's usability.

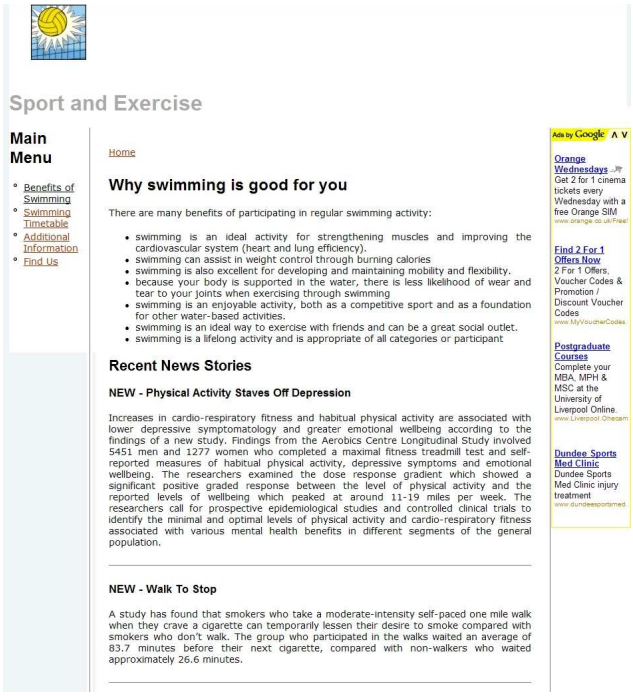

Figure 2. Low Credibility control site as seen in Internet Explorer at 1024x768 resolution

To ensure that both versions of the site were equally accessible, a usability evaluation was performed by a member of the Digital Media Access Group (DMAG) [13]. Both sites were assessed to be equally useable with the exception of the broken link. The reading level of website pages was evaluated using the Simple Measure of Gobbledygook Grading (SMOG) [14]. Both versions of the main website had an average reading age of 12.5, well below the average age of our expected audience. The SMOG grading of the news stories was higher at 15.51 but still well within acceptable limits for a postgraduate student audience.

3 STUDY DESIGN & MEASURES

With the agreement of the University of Dundee ethics committee, a recruitment message was emailed to all current postgraduate students inviting them to participate in a 4 week study investigating attitudes to exercise and the effectiveness of a website promoting exercise.

Participants who followed the hyperlink in the email to the study website were prompted to enter their email address. This was our unique identifier for all participants and also allowed us to send update emails when stories were added to the site to encourage return visits.

After providing their email address and consenting to the study, each participant was randomised to one version of the site and their baseline attitude to exercise was measured using the ISE validated "Physical Activity Preference Questionnaire". Participants were also asked for their age, gender, time spent on

the internet per week and how much of what they read they believed.

Participants' use of the site was logged via a number of server and client side scripts which recorded:

- Time of entry and departure from each page.
- Clicks on the broken link.
- Clicks on the references in news stories.
- Clicks on the "site award" stamps.

New stories were added to the site each week and links emailed out to participants. After 4 weeks an invitation was emailed out to participants to fill in the questionnaire again to measure any change in attitudes to exercise.

4 RECRUITMENT FIGURES & RESULTS

The initial email message was sent to 1584 postgraduate students with a reminder sent 2 weeks later. 233 responded to the email and visited the site. 134 completed the baseline questionnaire and were randomly assigned to one of the two sites. 92 completed the exit questionnaire after using the site for 4 weeks (46 in the control group and 46 in intervention group).

A t-test indicated a significant difference ($p=0.0077$) between the time users spent on the credible & control sites:

- Less credible: mean 54, SD 44, median 46.5 seconds
- Credible: mean 88, SD 71, median 75.5 seconds

The number of pages visited (including repeat visits) also showed a significant difference. The less credible group's mean was 2.6 pages viewed versus 3.7 in the credible group i.e. people allocated to the credible version visited 1 more page.

It is assumed that spending more time on the site and visiting more pages would indicate a more effective and engaging site. It is possible that a shorter visit only indicates a site is better at getting information across but in this case the core content of both sites was the same.

From the baseline and exit questionnaires, the self-reported exercise for each user showed a small but not statistically significant increase ($p=0.0980$) over the 4 week period with the less credible group's mean decreasing from 3.84 to 3.69 and the credible group's mean increasing from 3.85 to 4.0 where the scale was 1: no exercise, 3: not enough to be regular exercise, 5: regular exercise over last 6 months. Other questions regarding attitudes to exercise showed no significant difference.

There was a 10% contamination rate where, over the course of the study, where 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 was too small a contamination rate to influence study results [15].

5 CONCLUSIONS & STUDY LIMITATIONS

This study demonstrates that a credible intervention is more engaging and is able to hold participants' attention for a longer period of time. However, we were unable to show a change in attitude or in exercise behaviour.

A multi-factorial design would have allowed each individual feature / combination to be evaluated and would have given a more comprehensive view of the relative impact of the manipulations. However we chose to develop only two extreme versions of the site because the first step is to try and demonstrate a difference in exercise uptake between the two most extreme sites before exploring which features lead to this. Also, we had access to a limited number of participants (134 recruited, 93 successfully completed). Running the site as a public resource would allow for a far larger sample size and might help reduce any confounding variables such as biased behaviour due to the fact this was a research study, the Hawthorne Effect. However there are ethical considerations when providing information of low credibility to the public outside of the tight control of a local study.

The size of the website used (6 pages) was also a limitation of this study. A larger site would yield greater precision when looking at the number of unique pages requested. 25% of users explored every page on the website. Initially it was planned to tie participation in the study to each student's attendance at the ISE's facilities for exercise but due to an unplanned switch in database manager software, during the study, this information was lost.

A larger study across all student years is planned along with the development of a longer period of the intervention with more engaging content.

The effect of the credibility factors could only be measured if they were used. For example only 6.5% of participants in the credible group clicked any of the certification stamps but it is possible that other users noted them and were influenced by their presence but didn't follow the link to check their validity. Likewise only 13% of participants actually followed a reference.

When considering changes in behaviour as an outcome measure, it is important to consider the persuasiveness of the core content before manipulations of its credibility. If content is insufficient to motivate a change in attitude or behaviour then manipulations to credibility are unlikely to show a difference.

Evaluating participants' behavioural stage of change prior to recruitment to the study would be beneficial and could be used to screen out pre-contemplators. This would increase the likelihood of seeing a positive impact on physical activity. Alternatively, a stage-matched intervention could be used to deliver appropriate content to each behavioural state group.

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