How do brochures encourage walking in natural environments? A content analysis.

Keywords: physical activity; greenspace; tourism; UK

Summary:

Physical activity levels are declining throughout Europe; jeopardising physical and mental health. Targeting walking promotion seems a promising way of rectifying this. Natural environments can facilitate walking but the least active are less likely to access them. Local authorities are tasked with creating promotional materials for less active populations but there is no research examining whether these materials include effective persuasive messages. The present study explores how recreational walking brochures use persuasive messages to encourage walking in natural environments.

A coding taxonomy was developed to classify text in recreational walking brochures according to five behavioural content areas and 87 categories of potentially persuasive messages. Reliability of the taxonomy was ascertained and a quantitative content analysis was applied to 26 recreational walking brochures collected from <COUNTY>, UK.

Brochures often provided information about an advertised route, highlighted cultural and aesthetic points of interest, and provided directions. Brochures did not use many potentially effective messages. Text seldom prompted behaviour change or built confidence for walking. Normative information was rarely provided and there was a general lack of information on physical activity and its benefits for health and well-being.

The limited range of message strategies used in recreational walking brochures may not optimally facilitate walking in natural environments for inactive people. Future research should examine the effects of theory-informed brochures on walking intentions and behaviour. The taxonomy could be adapted to suit different media and practices surrounding physical activity in natural environments.

**INTRODUCTION**

Directing public health efforts towards the promotion of walking for inactive people may help overcome growing levels of physical inactivity, and its associated economic burden, across Europe (International Sport and Culture Association, 2015; Ogilvie *et al*., 2007). This is because walking is the greatest contributor to achieving physical activity (PA) targets among adults (Bélanger *et al*., 2011) and independently reduces the risk of a number of physical and mental health conditions (Hamer and Chida, 2008; Jeon *et al*., 2007; Robertson *et al*., 2012). Natural environments are seen as supportive settings for increasing recreational walking (Elliott *et al*., 2015), but less active populations, such as those living in areas of high social deprivation, access them less often even when living nearby (Richardson *et al*., 2013). In response to this, the UK’s provider of health and social care guidance – the National Institute for Health and Care Excellence (NICE) recommend that countryside planning bodies develop materials that encourage recreational walking in natural environments for inactive people based on evidence-based theoretical explanations of health behaviour change (NICE, 2012). Whilst messages based upon behavioural theory are persuasive (Brawley and Latimer, 2007), they may not capture the full range of potentially persuasive aspects of recreational walking in natural environments such as heritage features, flora, fauna, or less tangible facets such as an environment’s aesthetic or spiritual value (so-called ‘cultural ecosystem services’) (Church *et al*., 2011). Such characteristics are important motivators for infrequent visitors to natural environments (Dallimer *et al*., 2014), who are also likely to be less active (Richardson *et al*., 2013). It is unclear at present, if, and in what ways the materials that planning bodies are required to produce, use behavioural theory or cultural ecosystem services to persuade inactive people to walk in natural environments.

However, it is well-known that health promotion materials more generally are rarely informed by behaviour change theories. For instance, a content analysis of 71 brochures promoting safer sex found that a third of these only used two or less potentially-effective persuasive message types out of a possible 20 (Abraham *et al*., 2002). Abraham and colleagues also formalised a methodology for identifying theory-based persuasive messages named the ‘Content Analysis Approach to Theory-Specified Persuasive Educational Communication’ (CAATSPEC) (Abraham *et al*.,2007). This involved classification of theory-derived persuasive messages under four superordinate content areas reflecting constructs used in a range of behaviour change theories: providing information; highlighting consequences; establishing normative beliefs; and promoting, encouraging and instructing on, actions. Using this, they found that brochures targeting the reduction of alcohol consumption only used a narrow set of persuasive messages. Of greater significance to the present study, another content analysis used CAATSPEC to analyse the content of 22 PA brochures (Gainforth *et al*., 2011). They noted a dearth of text detailing goal-setting, planning, and affective benefits of PA. This may have been because the PA brochures are targeted at people who are already motivated to be active rather than inactive people.

Despite this body of research, a content analysis of persuasive messages in recreational walking materials has not yet been undertaken. Recreational walking brochures, often a popular form of tourism marketing (Brito and Pratas, 2015), guide readers through walking routes, normally with the aid of a map, drawing their attention to potentially interesting features (e.g. historical sites). They have been shown to be effective at promoting PA in outdoor environments previously (Merom *et al*., 2003) but there is little research into which messages are included in brochures and which may be most persuasive for particular audiences. Given the range of reasons for accessing the natural environment for walking, which may vary across population groups and settings, there is a need to establish a rigorous way to classify content and help identify which messages are persuasive and for whom. Adapting the CAATSPEC approach to persuasive materials, the present study categorised the content of recreational walking brochures using a novel coding taxonomy drawing on five theoretically-based superordinate categories. Two research questions were addressed: Firstly, can the content of recreational walking brochures be reliably categorised? Second, if so, what persuasive messages are included in recreational walking brochures?

**METHOD**

CAATSPEC is an application of quantitative content analysis to persuasive texts and can be used to outline messages used in health promotion materials. It uses mutually exclusive coding categories to classify text so no piece of text can be coded as more than one persuasive message. It was suited to this study as recreational walking brochures are persuasive texts that may promote a change in a health behaviour pattern (uptake of walking). This is the first application of CAATSPEC to materials in which health promotion was not necessarily the aim.

**Sampling**

Brochures were collected from July to December 2013 in the county of <COUNTY>, UK. Convenience sampling was employed; sourcing brochures from councils and tourism establishments. The following inclusion criteria were applied: a) the brochures (printed or digital) advertised recreational walking in natural environments including mixtures of urban and natural environments and; b) brochures had to be available free of charge to ensure they could have the widest readership. Twenty-six brochures were collected; details of which can be found in the supplementary materials (S-1). Brochures had a range of 54 to 712 paragraphs and 524 to 17,126 words (*M*=3,539). Two pages from a brochure are displayed in the supplementary materials (S-2).

**Taxonomy**

Following a reading of selected brochures, the CAATSPEC was modified to correspond to specific messages included in the brochures. All categories were arranged under superordinate headings that encompass the key components of behaviour change in a variety of evidence-based theories, namely, *providing information, highlighting potential consequences and opportunities, establishing normative beliefs, promoting intentions and planning,* and *enhancing self-efficacy* (Albarracín *et al*., 2005; Fisher and Fisher, 1992)*.* The final taxonomy had three further levels of specificity arranged hierarchically and can be viewed in Figure 1.

We attempted to map brochure text onto previous definitions of behaviour change techniques using established taxonomies (Abraham and Michie, 2008; Michie *et al*., 2013). A taxonomy emerged where each category represented a distinct persuasive message. However, categories warranted greater specificity than techniques defined in general taxonomies. To take an example, Abraham and Michie identified the general change technique “provide information on consequences” as derived from explanatory theories (Abraham and Michie, 2008). The authors defined the technique as, “information about the benefits and costs of action or inaction, focusing on what will happen if the person does/ does not perform the behaviour.” (p.382). This technique was rendered domain-specific by Michie and colleagues (Michie *et al*., 2013) who identified the technique as comprising health, social, environmental, and emotional consequences (p.92). In the present study, we further adapted the technique to better represent persuasive messages found in recreational walking brochures. Specifically, consequences of recreational walking in the present taxonomy comprised health, social, environmental, financial, heritage, aesthetic, and recreational consequences (see definitions below).

In a modification to CAATSPEC, categories were created to classify pictures of people walking (modelling behaviour) and graphics of maps (aids to planning). Listed below are details of categories under each superordinate from the finalised taxonomy. The full coding manual can be viewed in the supplementary materials (S-3).

**Providing information**

Category 1 reflected information on PA recommendations or the prevalence of PA or walking in a population. Categories 2-7 detailed characteristics of the route such as the terrain or distance. Categories 8-11 concerned amenities such as public transport links or the availability of refreshments on the route.

**Highlighting potential consequences and opportunities**

Categories 12-17 concerned general consequences of PA or walking including: financial (e.g. saving money over car trips); environmental (e.g. more sustainable travel mode than car use); physical and mental health (e.g. improving cardiovascular health; feeling happier); and social (e.g. family enjoyment). Categories 18-26 described cultural ecosystem services (Church *et al*., 2011) such as heritage features (e.g. historical sites); aesthetics (e.g. wildlife, scenery); sociability (e.g. family enjoyment); and recreation (e.g. leisure opportunities).

**Establishing normative beliefs**

Categories 27-34 outlined general normative information about PA or walking, or the consequences of these including: expert recommendations on PA, and financial, environmental, health, and social consequences. In a similar way to highlighting potential consequences and opportunities, categories 35-43 detailed normative information about consequences related to cultural ecosystem services.

**Promoting intentions and planning**

Categories 44-47 prompted general behaviours related to PA or walking including: setting goals based on distances (e.g. decide how far you will walk); or times (e.g. consider freeing up some time for walking); reducing barriers (e.g. think what would make being active easier for you); or prompting activity maintenance (e.g. make sure to keep up your walking once you have started). Categories 48-57 were designed to identify messages specific to the advertised route such as prompting goals based on distance (e.g. try breaking up the route into segments); attending to signage (e.g. use the waymarkers); or managing the terrain (e.g. be careful of the busy road).

**Enhancing self-efficacy**

Following CAATSPEC, most categories under this superordinate were dichotomised as *encouraging* or *guiding* behaviour. *Encouragement* categories conveyed the sense that behaviour was easy to execute, and *guidance* categories instructed on how to execute behaviour. Categories 58-68 related to building confidence for PA or walking in general and included: guidance on reducing barriers to activity, for example not knowing where to walk (e.g. go to a website and you can find guided walks in your area); encouraging setting walking goals based on time (e.g. it easy to find everyday opportunities to go walking); or modelling walking pictorially. Categories 69-87 related to building confidence for completing the advertised route and included: guidance on maintaining recreational walking behaviours (e.g. purchase more outdoor walking brochures from the visitor information kiosk in the city centre); encouraging the use of appropriate equipment (e.g. it is simple to get walking boots from your local outdoors shop); or guidance on direction taking (e.g. turn left at the end of the road). As can be imagined, this last category was likely to be central to recreational walking brochures.

**Coding procedures**

A pilot coding manual was tested by two coders but demonstrated insufficient reliability. To improve the manual, categories were added and deleted, definitions were revised, and coding procedures were modified. With the revised manual, and in accordance with a previous content analysis (Gainforth *et al*., 2011), a line-by-line coding procedure was utilised in order to facilitate inter-coder reliability testing. Sentences acted as ‘units of analysis’ and coders were instructed on how to detect changes in semantics within and across sentences, and how to code these accordingly. Importantly, categories were exclusive; text could only be coded under one category. The manual also provided specific guidance on distinguishing semantically similar categories. For example, some messages *prompted* behaviours whilst others provided *guidance* on the same behaviours e.g. category 53 refers to messages suggesting ways to deal with the terrain on the advertised route whereas category 79 refers to messages explicitly providing guidance on how to deal with these. Coders were instructed that any category prompting behaviour will refer to specific behaviour (e.g. be careful climbing the muddy hill) but any category guiding behaviour will inform them on *how to* execute that behaviour (e.g. taking shorter strides will ensure you do not slip up on the muddy hill). Coding instructions can be seen in the supplementary materials (S-3). Coding a brochure took approximately 90 minutes.

**Reliability**

Inter-coder reliability was assessed using the *AC1* statistic (Gwet, 2002). The prevalence of some categories was very small and *AC1* adjusts reliability accordingly where alternatives (e.g. Cohen’s Kappa) (Cohen, 1960) would not. The protocol for reliability testing was as follows: Two brochures were selected by LRE on the basis that they varied in style, length and publisher; thus potentially encompassing the broadest range of categories. Two coders (including LRE) would code the brochures, line-by-line, as described above. If reliability was established at all hierarchical levels (*AC1*≥0.7, *p*<.05), testing would stop, providing that individual categories demonstrated reasonable reliability too (*AC1*≥0.6; *p*<0.2). This generous alpha level was selected so that categories with only one agreed instance (identified by both coders) were judged reliable despite the lack of more instances to determine reliability at conventional alpha levels. This is because coders selecting one piece of text and identifying it as the same category of a possible 87 was unlikely to be due to chance. If any individual categories did not meet this criterion, consensus would be sought using an independent coder (MPW) and the category dropped if agreements on disagreed instances were not reached. If any level of the hierarchy demonstrated unsatisfactory reliability, then the manual would be revised and testing repeated with two further brochures. If any individual category’s *AC1* exceeded the alpha level (*p*>0.2), or if there were no instances of a category found, the category was deemed a ‘potential category of persuasive message’, but with insufficient data to determine reliability.

**Analysis strategy**

To examine frequently employed persuasive messages, only categories which appeared in more than three brochures were included in the main content analysis. Categories which appeared in more than three brochures but had insufficient data to determine reliability in the testing phase were noted as requiring further reliability testing. We examined frequencies and proportions of content firstly across and then within superordinate categories.

**RESULTS**

**Reliability**

Reliability statistics can be viewed in the supplementary materials (S-4). 476 category instances (9.3% of all content) were double-coded. Coders agreed on the same categories for 363 (76.26%) of these. Satisfactory reliability was achieved at all levels of the hierarchy (superordinate level: *AC1*=0.77, 95% CI 0.73, 0.82; individual category level: *AC1*=0.76, 95% CI 0.72, 0.80). There were only 35 categories (including an ‘uncoded text’ category) that contained enough instances to confidently confirm reliability. We believe this reflects the lack of diverse persuasive messages used in brochures and not inadequate sampling. The number of additional categories for which reliability could have been established through double-coding more brochures did not justify the labour involved in further line-by-line double-coding.

Individually, there were six categories that did not meet our reliability criteria (*AC1*≤0.6; *p*<0.2). All textual instances coded under these categories were discussed between LRE and MPW, and categorisations agreed for all, so no categories were dropped. Afterwards, 448 of the 476 category instances were agreed upon and the reliability of all levels of the hierarchy had improved significantly (superordinate level: AC1=0.96, 95% CI 0.94, 0.98; individual category level: AC1=0.94, 95% CI 0.92, 0.96). As a consequence of this resolution phase, two further categories did not meet our reliability criteria (category 53: *prompting ways to overcome difficulties with the terrain on the advertised route*; category 73: *encouraging attention to signage on the advertised route*). In total however, these categories only comprised five disagreements, so in line with previous content analyses (Abraham *et al*., 2007), decisions of the primary coder were accepted as they had the benefit of coding all brochures in the sample.

**Content analysis**

All percentages reported reflect subordinate categories which were included in more than three brochures in the sample. Using this criterion, 33 of the original 87 categories formed a useful taxonomy of potentially persuasive messages frequently used in recreational walking brochures. Descriptive statistics for these 33 categories are displayed in Table 1 and descriptive statistics for all categories are provided in the supplementary materials (S-5). Of these 33, seven had insufficient data in the reliability phase to determine reliability (categories 3, 18, 49, 55, 70, 77, and 81). Category 53 (see above) was also contained in these 33. Interpretations on all of these categories need therefore to be considered cautiously. Of the 25 with sufficient data in the reliability phase, *AC1*’s ranged from 0.69 to 1.00, so good reliability can be assumed for the rest of the categories included here. There were 4,800 instances of coded text within these 33 categories (94% of all content). Messages providing information accounted for 30.92% of all coded content (*M*=57 instances per brochure). Messages highlighting consequences accounted for 26.94% (*M*=50 instances). Messages promoting intentions and planning accounted for 5.58% (*M*=10 instances). Messages enhancing self-efficacy accounted for 36.56% (*M*=68 instances). No categories pertaining to messages establishing normative beliefs appeared in more than 3 brochures.

**Messages providing information**

The most prevalent types of messages under this superordinate were those categorised as *information about the overall course of the advertised route* (category 6)*,* accounting for 26.48% of all content which provided information, and 8.19% of content overall. This included summaries of where the route would take the reader e.g. ‘this walk explores an inland section of the <TOWN> Canal on the <COUNTY> border’ or information on the location e.g. ‘<TOWN> is a gateway town’. Other widely used categories included *information about public transport options related to the advertised route* (category 8) e.g. ‘many of the trails have convenient parallel public transport routes - bus or train’, *information about the terrain of the advertised route* (code 4) e.g. ‘mostly level and easy although there is one steep climb on an inclined plane’, and *information about the distance of the advertised route* (category 2) e.g. ‘a 13km/8 mile circuit’.

**Messages highlighting potential consequences and opportunities**

The most frequently occurring types of messages were those categorised as *viewing historical points of interest as consequences of walking the advertised route* (category 19) accounting for 51.28% of content which highlighted consequences and 13.81% of content overall*.* This was also the only individual category to appear in every brochure. This incorporated descriptions of geology e.g. ‘celebrating 95 miles of internationally important rocks displaying 185 million years of the Earth's history, the <PLACE NAME> is a geological walk through time’. It also detailed historical facts about the advertised route e.g. ‘in 1861, the arrival of the railway, linking the town with <CITY>, brought with it a dramatic population explosion’. Other common categories included *viewing scenery as a consequence of walking the advertised route* (category 21) e.g. ‘the <PLACE NAME> Coast Path is a superb way to experience a range of fine <COUNTY> scenery, from cliff tops to wide estuaries, sandy bays to wooded valleys’, and *leisure opportunities as consequences of walking the advertised route* (category 26) e.g. ‘the estuary is a hub of activity for recreational activities; such as sailing, canoeing, windsurfing, fishing and scuba diving’.

**Messages promoting intentions and planning**

*Prompting repeated recreational walking similar to the advertised route* (category 52) was the most widely used message category, responsible for 39.18% of promoting intentions and planning content and 2.19% of content overall. This included the promotion of related brochures *without* instruction on how to obtain these e.g. ‘an introductory leaflet and a detailed route book on the <PLACE NAME> are both available’. It also included ways to enjoy the advertised walk, again *without* instruction on how to do so e.g. ‘why not try your hand at Geocaching when on the trail’? It further included contact details on guided walks e.g. ‘why not join one of a number of free guided tours’? Another often used category was *prompting ways to overcome difficulties with the terrain on the advertised route* (category 53). This included directions to ‘be aware’ or ‘take care’ e.g. ‘care should be taken at all times when walking on roads’, or, ‘take care crossing the <RIVER NAME> over <TOWN> Bridge’. Another common category was *prompting barrier reduction on the advertised route* (category 57) e.g. ‘you can pick up short sections of the trail from a number of easily accessible points’.

**Messages enhancing self-efficacy**

The most often used category was *guidance for direction taking on the advertised walk* (category 85). This category was present in 23 of the brochures and accounted for 90.20% of all self-efficacy content, and 32.98% of content overall. It embodies the nature of walking brochures; instructing on how to progress through a route. This is different from provision of route information as it builds confidence for wayfinding. Examples include, ‘just before you reach a cattle grid turn left alongside a bank’, or, ‘go through the gate at the top left corner of the next field, to the road’. In a similar way to messages promoting intentions and planning, other common categories included *guidance on repeated recreational walks similar to the advertised route* (category 76). This is qualitatively different from the promotion of repeated recreational walks as it provides means by which the reader can access further walking information. For example, ‘free booklets about <COUNTY> coast and countryside including walking trails, cycling, horse riding and wildlife can be ordered through the <COUNTY> County Council website at <WEBSITE>’, or, ‘leaﬂets on all of these walks are available from <CITY> City Council and the Visitor Information Centre’. Other frequently used message categories were *guidance on ways to overcome difficulties with the terrain on the advertised route* (category 79) e.g. ‘this route is closed during the shooting season from 1st October to 1st February, and walkers should follow the alternative route along the quiet road instead at that time’, or, ‘aim to walk this part of the route within two hours of low tide (see local press or visit <WEBSITE>)’, and *modelling walking on the advertised route pictorially* (category 77).

**Uncategorised content**

4.04% of all content was unable to be categorised under any of the 87 categories. This equated to 206 instances of uncategorised text compared to 4,893 instances of categorised text. The proportion of text which went uncategorised per brochure ranged from 0% to 10.71%. Examination of this text revealed no systematic exclusion of content related to recreational walking. The majority of this text related to authorship credits, website addresses unrelated to walking, and advertisements for holiday attractions. The only recurring behavioural message types that went uncategorised concerned the advertisement of cycle routes and the prompting or instructing of environmental behaviours e.g. ‘support local shops and services’ or, ‘take your litter home and recycle it where possible’.

**An illustrative brochure**

<BROCHURE NAME> stood out as the brochure having both the best category-to-instance ratio (24 categories featured comprising 51 textual instances) and the most even distribution of categories across superordinate content areas. This brochure was also largely devoted to the promotion of walking more generally as opposed to its related recreational walking routes (around the city of <CITY>, UK). For example it outlined physical health consequences (category 14) e.g. ‘walking can help you live longer, helps protect you from heart disease, diabetes, cancer, osteoporosis and much more’ and included four references to mental health consequences (category 15) e.g. ‘walking can activate the happy hormone which makes you feel good, improves your mood and reduces stress’. It contained normative information on walkings’ benefits to children (category 34) e.g. ‘children like to walk to school so they can chat to their friends.’ Furthermore it included text reducing general barriers to walking (category 46) e.g. ‘walking need not require any special equipment’, and provided guidance on walking goals based on time management (category 63) e.g. ‘by walking to work, school, the shops or the station you can get your daily exercise as part of your normal routine’. It was also one of only two brochures in the sample to explicitly state PA guidelines; in this case providing guidance how someone could achieve them (category 59): ‘Doing 10,000 steps per day will contribute to the recommendation of moderate-intensity physical activity for at least 30 minutes on 5 or more days per week’.

**DISCUSSION**

This is the first study to develop a specific coding taxonomy for, and conduct a content analysis of, recreational walking brochures. Acceptable reliability of this taxonomy was established at each hierarchical level and for most frequently occurring categories. The content analysis suggested that brochures promoted walking in natural environments through messages which provide information on the route, highlight potential consequences and guide on wayfinding. However, they lacked variety in message types; frequently omitting information which could raise normative beliefs, promote intentions, or enhance self-efficacy, for walking.

**How do brochures encourage recreational walking in natural environments?**

Brochures often provided information that aims to facilitate easier access to a walking route, as opposed to information about PA more generally. They also provided information on the course, distance, duration, and terrain of a route, seemingly in order to detail the amount of time and level of expertise required to undertake the walk. In contrast to traditional PA promotion, messages highlighting consequences often framed cultural ecosystem services as motives to walk rather than potential health gains. Importantly, previous research has demonstrated that for people who visit natural environments infrequently, subjective qualities like this are more important motivators for visiting than the achievement of physical fitness (Dallimer *et al*., 2014). Thus, highlighting cultural services may persuade less frequent visitors, who are also more likely to be less active (Richardson *et al*., 2013), to visit natural environments. Promoting intentions and enhancing self-efficacy superordinate content areas in the brochures were mainly used to draw the reader’s attention to other recreational walking materials and how to access them. Whilst this could support walking maintenance behaviours, the aim of those messaging strategies may have been simply to drive further interest in a destination or organisation.

**Do brochures conform to national guidance?**

A key public health priority is to encourage those who are least motivated, to engage in recreational walking (Ogilvie *et al*., 2007), and natural environments could support this. Considerable investment has been directed towards improving natural environments and opening up walking routes (Hunter *et al*, 2015) but little is known about how to sell these opportunities through printed media to those who are less motivated to walk. In the present study, walking brochures lacked general and normative information about PA for health, behavioural prompts and efficacy information (especially content encouraging walking behaviours). Most brochures and much of the content therein, whether intentionally or not, was therefore intended for people who already do recreational walking in the natural environment. This is at odds with national guidance on walking (NICE, 2012). While further research is needed to explore which messages may be most effective, there appears to be more scope in the brochures to change cognitions about recreational walking (e.g. build confidence to complete walks, raise descriptive norms about outdoor walking), and encourage behavioural strategies (e.g. provide walking goals in terms of distance or time). The illustrative brochure discussed earlier is one example demonstrating how this could be achieved. Naturally, many more considerations are involved in creating a recreational walking brochure. The overall layout, typesetting, language style and numerous other features are important in attracting or deterring a potential reader from picking up a brochure or persuading them to change their behaviour (Abraham and Kools, 2012). Nonetheless, the selection of appropriate behavioural antecedents to write into messages remains important (Brawley and Latimer, 2007).

**Strengths, limitations, and future research**

The main strength of this study is that it has produced a coding taxonomy that can be used or modified to analyse materials that advertise recreational PA in a variety of different media. Furthermore, it has identified for the first time the range of messages used in walking brochures that attempt to persuade people to walk in natural environments. The coding taxonomy was meant to be flexible to suit the needs of different settings by maintaining stable superordinate content areas but individual categories which could be adapted to cater for specific needs. It was however, developed with a geographically specific set of brochures and therefore generalisation to other locations is uncertain. Nonetheless, the brochures did cover a variety of areas from small cities to rural towns and villages in both inland and coastal areas. For different environments and PA conventions present in other countries or larger urban areas, the taxonomy may have to be adapted.

Although the taxonomy was reliable at all levels of the hierarchy, eight of the 33 frequently occurring categories did not meet our reliability criteria. Although this suggests inadequate sampling, not one of these categories alone accounted for more than 1% of all content, suggesting that further reliability testing may still not have yielded enough instances for confident reliability assessments. Perhaps in the future a combination of traditional presence-or-absence methods (Abraham *et al*., 2007) supplemented by line-by-line procedures (Gainforth *et al*., 2011) could ameliorate reliability protocols in comparable content analysis studies. Nevertheless, categories may need to be omitted or revised in any future applications of the coding taxonomy should they fail to meet acceptable reliability criteria.

The coding taxonomy maintains some degree of convergent validity with previous content analysis schemes (Abraham *et al*., 2007) and behaviour change technique taxonomies (Abraham and Michie 2008; Michie *et al*., 2013) upon which it is based.The aim of the study was not to fully validate the taxonomy, but future research could undertake this. Developing the categories in the present taxonomy was achieved by expanding behaviour change techniques in more comprehensive taxonomies (Abraham and Michie 2008; Michie et al., 2013). This suggests that in any context-specific content analysis, especially those examining materials which are not ostensibly affiliated with health promotion, such taxonomies could possible only be used to derive more relevant message categories.

In future, controlled trials could use the taxonomy prospectively as a guide to creating intervention materials that target different antecedents of behaviour change, and test with more precision which ‘ingredients’ are most effective and appealing to different groups (eg, urban *vs.* rural dwellers, tourists *vs.* home based, disadvantaged *vs.* affluent communities). Future research might also wish to test different types of brochure in terms of their ability to alter attitudes towards walking or intentions to walk. For example, controlled studies could administer brochures which were identical in style but varied in terms of the type of message employed. This would allow researchers to test how original *vs.* tailored information could be differently persuasive and thus inform guidelines on how to produce recreational walking brochures.

**Conclusion**

Content in recreational walking brochures sampled from <COUNTY>, UK, can be coded for the presence of potentially persuasive messages using the coding taxonomy developed here. These brochures’ principle persuasive strategies are to guide wayfinding, provide information on amenities and access, and enhance the appeal of various properties of natural environments. Whilst highlighting attractive properties could motivate inactive people, omitting messages related to the promotion of intentions or self-efficacy and failing to raise normative beliefs may equally fail to encourage inactive people to engage in recreational walking in natural environments. In future, brochures could utilise a wider variety of message strategies in their text in order to engage such populations. Simultaneously, public health campaigns to increase walking could learn from initiatives used in the promotion of health behaviours for other ends, such as enhancing cultural ecosystem services that could support walking.

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| *Figure 1.* Hierarchical coding taxonomy. |
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| Table 1 |  |  |  |  |  |
| *Frequency of category inclusion* |  |  |  |  |  |
| Message | No. of brochures | No. of instances | Max instances | % all content | % of superordinate |
| Providing information | 26 | 1484 | 299 | 30.92 | - |
| 2. Information on the distance of the advertised route | 24 | 221 | 44 | 4.60 | 14.89 |
| 3. Information on the length it may take to complete the advertised route | 7 | 27 | 14 | 0.56 | 1.82 |
| 4. Information on the terrain of the advertised route | 22 | 228 | 48 | 4.75 | 15.36 |
| 5. Presence of a map | 22 | 106 | 12 | 2.21 | 7.14 |
| 6. Information on the overall course of the advertised route | 23 | 393 | 91 | 8.19 | 26.48 |
| 7. Information on maps related to the advertised route | 13 | 54 | 19 | 1.13 | 3.64 |
| 8. Information on public transport options related to the advertised route | 16 | 254 | 54 | 5.29 | 17.12 |
| 9. Information on parking provision related to the advertised route | 10 | 42 | 9 | 0.88 | 2.83 |
| 10. Information about provision of toilets on the advertised route | 12 | 47 | 18 | 0.98 | 3.17 |
| 11. Information on refreshments on, or at the end of, the advertised route | 15 | 112 | 29 | 2.33 | 7.55 |
| Highlighting consequences | 26 | 1293 | 361 | 26.94 | - |
| 18. Viewing a monument as a consequence of walking the advertised route | 13 | 44 | 13 | 0.92 | 3.40 |
| 19. Viewing historical features as consequences of walking the advertised route | 26 | 663 | 187 | 13.81 | 51.28 |
| 20. Viewing wildlife as a consequence of walking the advertised route | 20 | 85 | 20 | 1.77 | 6.57 |
| 21. Viewing scenery as a consequence of walking the advertised route | 24 | 300 | 98 | 6.25 | 23.20 |
| 22. Botanical points of interest as consequences of walking the advertised route | 20 | 60 | 13 | 1.25 | 4.64 |
| 25. Accommodation at the destination as a consequence of walking the advertised route | 6 | 17 | 6 | 0.35 | 1.31 |
| 26. Leisure opportunities as consequences of walking the advertised route | 11 | 124 | 30 | 2.58 | 9.59 |
| Promoting intentions and planning | 26 | 268 | 55 | 5.58 | - |
| 48. Prompting distance goals for the advertised route | 7 | 16 | 5 | 0.33 | 5.97 |
| 49. Prompting time goals for the advertised route | 6 | 13 | 6 | 0.27 | 4.85 |
| 50. Map key | 17 | 25 | 2 | 0.52 | 9.33 |
| 51. Prompting attention to signage on the advertised route | 10 | 27 | 8 | 0.56 | 10.07 |
| 52. Prompting repeated recreational walking similar to the advertised route | 19 | 105 | 17 | 2.19 | 39.18 |
| 53. Prompting ways to overcome difficulties with the terrain on the advertised route | 9 | 37 | 12 | 0.77 | 13.81 |
| 55. Prompting map reading for the advertised route | 5 | 7 | 3 | 0.15 | 2.61 |
| 56. Prompting direction taking for the advertised route | 5 | 7 | 2 | 0.15 | 2.61 |
| 57. Prompting barrier reduction on the advertised route | 9 | 31 | 13 | 0.65 | 11.57 |
| Enhancing self-efficacy | 26 | 1755 | 403 | 36.56 | - |
| 70. Guidance on distance walking goals for the advertised route | 7 | 11 | 3 | 0.23 | 0.63 |
| 74. Guidance on attending to signage on the advertised route | 5 | 5 | 1 | 0.10 | 0.28 |
| 76. Guidance on repeated recreational walks similar to the advertised route | 12 | 65 | 20 | 1.35 | 3.70 |
| 77. Modelling walking on the advertised route pictorially | 8 | 35 | 12 | 0.73 | 1.99 |
| 79. Guidance on ways to overcome difficulties with the terrain on the advertised route | 14 | 50 | 8 | 1.04 | 2.85 |
| 81. Guidance on equipment necessary for the advertised route | 4 | 6 | 3 | 0.13 | 0.34 |
| 85. Guidance for direction taking on the advertised walk | 23 | 11 | 362 | 32.98 | 90.20 |
| “No. of brochures” refers to the number of brochures in which the category (or superordinate content area) featured.  “No. of instances” refers to the number of instances of the category (or superordinate content area) that were present in all 26 brochures.  “Max instances” refers to the maximum number of instances of the category (or superordinate content area) in any one brochure.  “% all content” refers to the percentage of all content (encompassed by these 33 categories) which is accounted for by the category (or superordinate content area).  “% of superordinate” refers to the percentage of superordinate content which is accounted for by the category. | | | | | |