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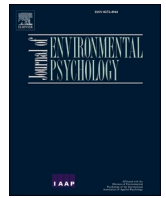
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# Comparing thematic and search term-based coding in understanding sense of place in survey research

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## ABSTRACT

Sense of place is a fundamental concept in human geography, yet challenging to measure given its intangibility and idiosyncrasy. Meanwhile, there are increasing opportunities for social scientists to utilize big data and automated approaches to data analysis, albeit with some wariness, but few researchers directly compare automated to manual analysis in the context of sense of place. This study applies two analytical approaches to a survey question on sense of place: semi-automatic search term analysis around semantic fields, and inductive thematic analysis. Results show high agreement between the approaches, with more tangible aspects of place (recreation) better correlated than more abstract concepts (appreciation). Variation mainly relates to the ability of inductive coding to address false negatives, implied meaning, or obscure search terms. This demonstrates the potential value of hybridizing to improve the accuracy of a search term-based approach, and overcome the limitations, such as subjectivities, of one analytical approach.

## 1. Introduction

Existing research has shown sense of place to be a central concept worldwide in shaping public perceptions of environmental change, as well as of climate mitigation and adaptation options (Lewicka, 2011; Quinn et al., 2019). It is therefore important that public perceptions of place are measured and accounted for in environmental decision-making, despite the challenges of doing so given its intangibility and subjectivity as a concept (Hay, 1998). Sense of place can be understood as an individual's notions and relationship with their local environment (Relph, 1976; Hay, 1998), to which multiple facets of the broader sense of place concept exist, such as place attachment and place identity (Hashemnezhad et al., 2013). Although sense of place is predominately measured through quantitative assessments, such as combinations of various Likert or other scale-based methods in surveys (Hernandez et al., 2020), a wide range of qualitative approaches also exist, from interviews and focus groups to more innovative methods such as participatory mapping and photo diaries (Lewicka, 2011). Several methodological challenges persist in understanding sense of place, which include the many different, interrelated concepts in the

place literature that are debated and vary by academic discipline, such as place attachment, place identity and place satisfaction (Qazimi, 2014; Erfani, 2022; Hernandez et al., 2020), lack of standard measurement of place (Boley et al., 2021), and the extent to which sense of place can be represented, for example, through brief Likert statements (Hernandez et al., 2020). Shamai and Ilatov's (2005) analysis of different scale variations to measure sense of place reveals that, given the multi-faceted nature of the concept, each scale focuses on a specific aspect of place to the detriment of other dimensions. Qualitative methods are more nuanced (Lewicka, 2011), and offer a richer understanding of human-place relationships through insights into the meanings or significance derived from place (Manzo & de Carvalho, 2020), but present additional challenges around sample size and access to interviewees, as well as analytic subjectivity and sample representativeness (Malterud, 2001).

While it is common for research on place to combine multiple data collection methods (for example Devine-Wright & Howes, 2010; Pette-way, 2019; Komossa et al., 2020), it is typical to use just one analytical approach, of which the most common is a coding framework that is both inductive (empirically informed) and deductive (derived from theory)

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(for example Amundsen (2013)). Hybrid analytical approaches have been recently applied in the context of cultural ecosystem services (Baer et al., 2024), but reviews on qualitative approaches to analysing place (such as Manzo & de Carvalho, 2020) highlight the contribution of qualitative analysis, but do not explore the merit of different qualitative analytical approaches.

This paper compares two different methods to qualitatively analyse sense of place through coding: thematic analysis and search term-based analysis. Search term-based analysis uses codes that are often pre-assigned and adapted to the dataset, whereas codes in thematic analysis are empirically generated and/or induced through the data analysis process (Neuendorf, 2018). By strictly adhering to lexical terms to inform codes, search term-based analysis is argued to be less subjective, but thematic analysis can reveal deeper insights into meaning around subject matter (Neuendorf, 2018). A search term-based approach can reduce bias and crucially offers speed in analysing social datasets (Seale et al., 2006), and is related to content analysis, which has been applied previously to understand sense of place. Traditionally content analysis has been done manually by the researcher; for example, Buchanan (2009) investigated the construction of sense of place in media reporting using content analysis, where specific keywords such as place names were used in coding.

In recent years, the emergence of big data has offered social scientists the opportunity to work with increasingly large datasets (such as social media, Zhao et al., 2023), but to do so using traditional manual coding remains time consuming. As a result, there is a growing interest in the effectiveness of automated approaches to coding to speed up the process and reduce subjectivity (Crowston, Liu, Allen, & Heckman, 2010; Patel et al., 2011; Rietz & Maedche, 2021). Research on the merit of automated coding approaches is particularly needed with regards to sense of place, given the concept is context-specific and thus not easily transferable between locations (Hay, 1998). Improved automated approaches to coding in qualitative analysis could transfer to big data analysis, and potentially offer new insights on critical people-place relations (Erfani, 2022). Therefore, research that directly compares the merit of automated and manual approaches to coding in the context of sense of place is needed. In this paper, we use a mixed methods approach to statistically compare the level of similarity between search term-based and thematic analysis to an open-text survey question on sense of place, using the unique landscape context of the Bay of Fundy in Atlantic Canada as a case study. We illuminate the sensitivities of each analytical approach, and whether certain dimensions of place are more represented in a particular coding approach.

## 2. Materials and methods

### 2.1. Study context

This paper analyses responses ( $n = 196$ ) to an open-text survey question on sense of place, from a household survey on climate adaptation strategies to residents in Nova Scotia, Canada (Howard, 2023; data available at Howard et al., 2024). The province of Nova Scotia contains unique dykeland landscapes created by Acadian settlers in the 1600s, some of which are being reverted to salt marshes and tidal wetlands to adapt to climate change impacts and enhance ecosystem services (Sherren et al., 2021). 70% of dykelands in Nova Scotia are at flood risk by mid-century, despite reinforcement works (van Proosdij et al., 2018). To investigate public perceptions of climate change impacts and adaptation efforts, a hybrid online and mailout survey was delivered from June to September 2022 via random sampling to local residents of single households in Kings, Hants, Colchester and Cumberland County, neighbouring the Minas Basin in the Bay of Fundy. Invited residents were sent reminder postcards about the survey in subsequent weeks (Howard, 2023). The survey explored public perceptions of their local environment, and perspectives on two local climate adaptation strategies: flood risk mapping and dyke realignment.

The open-text question on sense of place analysed in this paper was adapted from Tenbrink and Willcock, 2023: "Please describe your local area, in terms of what it means to you personally and how you use it". An open-text question was used to explore individuals' sense of place unconstrained by pre-formulated scales, given its multidimensional nature (Manzo & de Carvalho, 2020). A total of 243 respondents completed the survey, a response rate of approximately 21%. The 196 responses to the survey question on place consisted of a total of 2959 words collectively, an average of 15 words per response but ranging from 1 to 171.

### 2.2. Data analysis

The survey question was analysed using two different approaches, search term-based analysis and thematic analysis, and results were compared statistically, detailed as follows.

#### 2.2.1. Search term-based analysis

Search term-based analysis follows the rationale for Cognitive Discourse Analysis outlined in Tenbrink, 2020. Central to this approach is the insight that linguistic discourse details systematically reflect the speaker/writer's concepts in ways that may be missed when focusing solely on content. The exact wording and formulations matter in a range of ways, revealing conceptual aspects such as perspective, level of granularity or certainty. Here, the focus is on the place-based associations represented in responses to the question asked, as determined by lexical indicators belonging to a certain semantic field (for example, the word 'swim' as an indicator for the field of 'experience and activities'). Search terms were adapted from a previous study in Wales (Tenbrink and Williams, 2022), based on discussion and a review of responses. Groups of search terms were identified that represented relevant semantic place-based fields emerging from the data, falling into 13 categories: 'visual appreciation', 'history', 'experiences and activities', 'economy', 'emotional impact', 'environment and nature', 'transport', 'culture', 'homes', 'the waters', 'auditory aspects', 'health and safety', and 'family', each with a set of indicator search terms (see supplementary material 1 for the full list of search terms). Survey data were exported into Excel, and simple formulas were generated to count search terms (see supplementary material 1 for the formulas used). Categories were mutually exclusive in that a specific lexical item only counted as indicator for one category. However, a single response could include indicators of multiple categories, to allow for flexibility where respondents expressed multiple themes. There could also be more than one count per category, if more than one word in the category was used by a respondent, or the same word was used multiple times.

#### 2.2.2. Thematic analysis

Separately, an inductive, thematic approach to coding was applied, where the survey question was imported into NVivo and responses were coded into thematic groups. An initial reading of respondents' answers was used to develop codes of main themes, which were refined over subsequent analysis. An inductive, manual coding approach was chosen to contrast with the more rigid codes used in the search term-based approach (section 2.2.1). In total, six themes (parent codes) were developed, and eight child codes of more specific sub-themes. The six main themes were 'recreational', 'relational', 'restorative', 'small-town identity', 'cultural heritage' and 'other' (see supplementary material 2 for the full list of parent and child codes, and the number of respondents that expressed each code). Codes generated in the thematic analysis were not mutually exclusive, to allow for flexibility where respondents describe more than one theme. Different researchers conducted the thematic and search term-based analysis.

### 2.3. Comparison

Utilizing the thematic analysis, six binary variables were generated with the respondent receiving a 1 if their response was coded to the

corresponding theme. A tetrachoric correlation analysis was then run using Stata BE18 (StataCorp, 2023) to examine the relationships between the binary thematic variables and their associated binarized search term indices. This test was chosen rather than Pearson's correlation test to give more accurate correlation scores for binary variables. The results of the two coding approaches were also reviewed manually, to explore why differences in coding occurred. A search term list was developed from the thematic analysis approach, supported by the generation of word clouds in NVivo of the top 30 most common words in each theme (see supplementary material 3), to compare with the original list from the search term-based approach. This allowed for iteration, where the search term-based approach could be re-run, adding words uniquely picked up through the thematic analysis approach.

### 3. Results

Table 1 lists the statistical correlation scores of comparable codes ('pairs') from the search term-based analysis and thematic analysis. Table 1 reveals moderate to high correlation scores, even where themes and categories do not share the exact same framing. There was a perfect correlation (1.00) between the 'cultural heritage/history and legend' pair, and strong correlations between the 'relational/family' (0.95) and 'recreational/experiences and activities' (0.74) pairs. Conversely, weaker relationships were found between 'cultural heritage' to 'economy' (0.49) and the 'restorative' theme with the closest search term-based categories: 'visual appreciation' (0.53) and 'emotional impact' (0.41).

The comparative analysis revealed systematic causes for coding differences between each approach that led to less than perfect correlation scores. Firstly, search term-based analysis was found to be insensitive to negatives (for example the category 'activities' was identified automatically from the phrase 'do not partake in any activities'). Furthermore, search term-based analysis failed to recognize where respondents' answers were indirect or could be inferred (answers such as 'I live along a river and enjoy trails' or even 'accessible to nature' which imply recreation, but do not directly refer to walking or other hobbies). It was also challenging for the search term-based approach to predict more obscure or context specific pastimes (e.g. 'cutting firewood') or local cultural aspects (e.g. 'blueberry producing') not present on the pre-defined indicator list. Conversely, thematic analysis was found to be less systematic in coding, particularly for rich respondent answers where thematic content overlapped. There is also a risk of inconsistency, warranted or not, where respondents who referred to 'home' were coded variously depending on the context of the sentence and the degree to which emotion was being expressed (see Supplementary Table 2). Secondly, thematic analysis was found to overlook less prominent themes (such as references to work, which were captured in the search term-based analysis), potentially due to a focus on other more prominent themes in survey responses. Lastly, there were some scalar differences between the search term-based and thematic analysis on social aspects, where the former focused on respondent references to family and

**Table 1**

Correlation scores (column 2) for comparable codes from the thematic analysis (column 1) and search term-based analysis (column 3). Non-comparable codes were: 'Small town identity' and 'other' (from the thematic analysis) and 'environment and nature', 'transport', 'culture', 'homes', 'the waters', 'auditory aspects' and 'health and safety' (from the search term-based analysis).

Thematic analysis codes	Correlation scores (before iteration)	Search term-based analysis codes
Recreational	0.74	Experience and activities
Relational	0.95	Family
Restorative	0.53	Visual appreciation
Restorative	0.41	Emotional impact
Cultural heritage	1.00	History and legend
Cultural heritage	0.49	Economy

friends, whereas the latter also picked up community or neighbor references (plus one respondent who simply described fellow 'human beings').

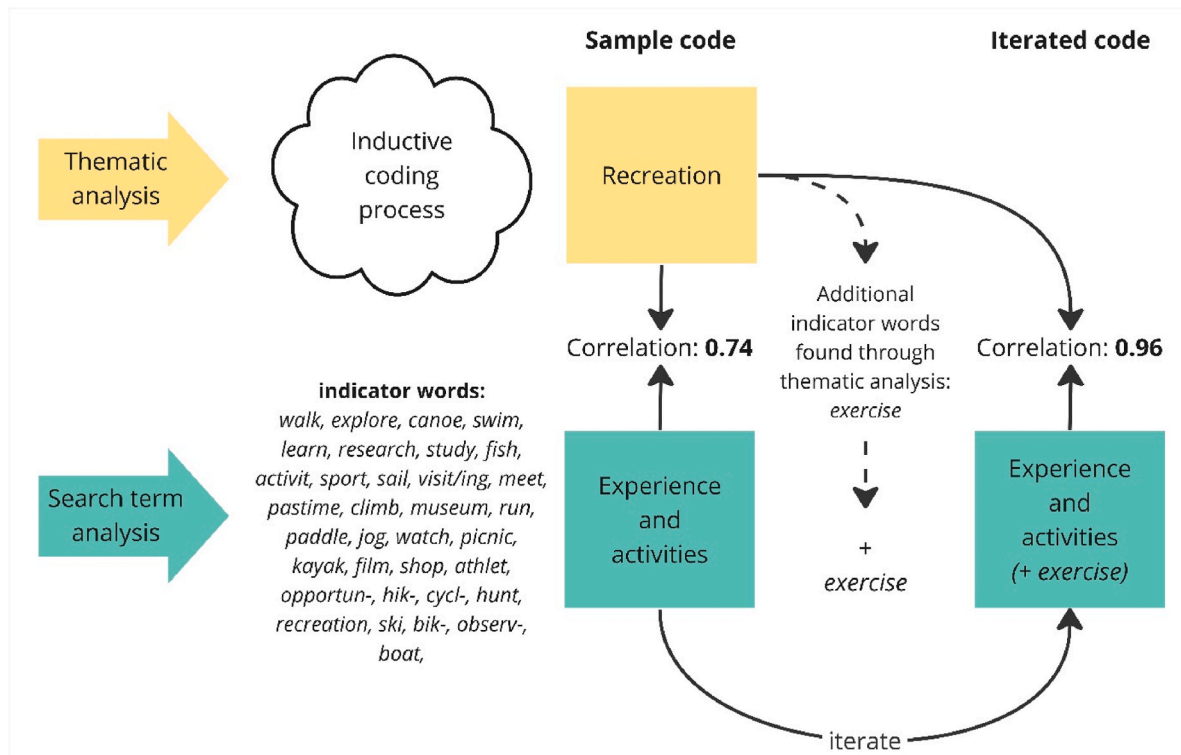
A manual and independent review of initial results was conducted to improve the search term-based approach. For example, to address the insensitivity to negatives in the search term-based approach, another set of negatives (such as 'not' or 'don't') could identify negative expressions in answers. Fig. 1 illustrates the results of iteration for the 'experience and activities' category, following comparison with the thematic analysis coding. Adding 'exercise' to the search terms increased the correlation score between the 'recreation/experience and activities' codes from 0.74 to 0.96. See supplementary material 1 for the full list of revised search terms for all codes.

### 4. Discussion

The results reveal that search term-based and thematic analysis have their relative strengths in analysing sense of place, and a large overlap in coding results can be observed. Previous research from the health literature comparing thematic and comparative keyword analysis (Seale et al., 2006) concur that both analytical approaches can lead to similar findings. Our results reveal that different aspects of place may be identified depending on the researcher's choice of analytical approach. The strongest correlation between the two approaches occurred for categories (for example recreation/activities) that concerned tangible or substantive aspects of place (such as actions in one's local environment), lending themselves to detection by specific lexical indicators. Conversely, restorative or cultural aspects of place can be more abstract and showed weaker correlations in our analysis. Our analysis therefore reveals which aspects of sense of place are sensitive to a certain coding approach. A lower correlation between the 'cultural heritage/economy' pair, for instance, may simply be due to the unique geographical context in Nova Scotia compared with Wales where the starting search term list originated.

The results demonstrate some superficial rather than fundamental differences in categorizing sense of place across the two approaches as applied here, along with several directly corresponding categories. As similarly argued by Neuendorf (2018), thematic analysis has the advantage of human insight into the meaning of responses in context, due to the inductive approach and careful reading of each response (for example, recognising the use of negatives as well as indirect responses relevant to a theme or category). Inconsistency in coding can also be alleviated through intricate inter-coder reliability tests (Krippendorf, 2012). Regarding search term-based analysis, the risk of false negatives and missing subtleties in the meaning of words found by this study has equally been raised elsewhere (Seale et al., 2006; Kitchin, 2014). For example, Jenkins et al. (2016) similarly report false positives in their study on the extent to which Twitter posts and Wikipedia reflect the perceived identity or use of specific locations, such as tweets mentioning reading in airports incorrectly resulting in airports being coded as education centres, given the association of reading to learning. There are therefore trade-offs in the choice of analytical approach, and our findings here concur with that of Seale et al. (2006) that combining approaches offers optimum rigor and transparency. As the results highlight, the search term-based approach struggled with obscure or context-specific pastimes, and it is therefore difficult for a comprehensive search term list to be transposed across geographies. This also highlights that in the context of sense of place, a semi-automatic approach is better than machine learning approaches: analysts need to be able to iterate their search algorithms and case-specific (especially place-based) data renders general word lists ineffective.

Overall, the above findings highlight the value of combining search term based and thematic analysis in studies on sense of place, where induction of a sample of responses and iteration with word lists can improve the accuracy of a semi-automatic search term approach. This will be of use for place researchers interested in methodological insights



**Fig. 1.** Illustrated process of iteration. The coding results were examined to investigate what indicator words led to coding in each approach. This allows an opportunity for iteration, where indicator words can be added to the search term-based approach (in green), informed by thematic analysis (in orange). This is demonstrated in Fig. 1 for the 'experience and activities' category, where 'exercise' was added after a first iteration as a frequently occurring search term that had been missed previously. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

on qualitative (coding) analysis of place, and provides a robust approach to applied researchers such as those involved in social impact assessment, where place is an important predictor of values and behaviour (Erfani, 2022). With several iterations of exploring manually identified themes and adjusting search terms for related categories, it is highly likely that very strong alignment between the two approaches could be achieved. This could then serve as a reliable basis for analysing a larger data set using the semi-automatic approach. Given the context-specific nature of sense of place, this enriched combined approach (if not the search term lists) could potentially be applied to a different geographical context than Atlantic Canada.

Although both analyses were undertaken separately by different researchers, the researchers were part of the same team, and had read existing and similar work prior to starting thematic analysis. This is always likely to be the case; even inductive approaches do not typically presuppose a completely blank starting position. The study's findings are also sensitive to the limitations of surveys as a research method, which include the extent of participant answers and how the question is interpreted (Fowler, 2009). While our paper considers automated approaches for smaller amounts of text (free-text survey responses), the insight may well be transferrable to larger volumes of rich data such as interviews or social-media discourse, and applying this study's methodology to other research methods could be an area of further research. Additionally, whilst this paper has focused on categorizing aspects of place, counts and distributions of lexical indicators can also be used to measure strength of place attachment (Tenbrink and Willcock, 2023), and an opportunity for future research could be to compare the semi-automatic search term approach with conventional quantitative place metrics, such as Likert scales.

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#### Ethics statement

The survey received ethics approval from Dalhousie University's Social Sciences and Humanities Research Ethics Board, #2022–6088.

#### CRediT authorship contribution statement

**Isabel Cotton:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing, Funding acquisition. **Brooke McWherter:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Thora Tenbrink:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Kate Sherren:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

## Declaration of competing interest

The authors declare no conflict of interest.

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## Appendix A. Supplementary data

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