#Menopause: examining the frequency and sentiment of communications about menopause on Twitter

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Abstract

This study explored 1) the use of Twitter to communicate about menopause, and 2) the sentiments of those messages. Tweets posted between 2014-2021 with the hashtag "menopause" were identified and extracted from Twitter in four countries. Results showed 281,409 communications over this period, an average 35,176 tweets per year. Twitter usage appeared to be reducing overall, but this varied between countries. Using a computational linguistic methodology, natural language processing, more positive than negative tweets about menopause were found. Positive tweets have grown more rapidly than negative messages, and neutral tweets have reduced over time. The implications and future researcher needs are discussed.

Keywords: menopause; social media; Twitter; sentiment analysis

Introduction

Twitter is a popular social media platform with an estimated 436 million active users [1] providing a microblogging and social network service where users can communicate via "tweet" messages with a 280-character limit. The present paper aimed to explore: 1) Twitter use to communicate about the menopause, and 2) the sentiments of those messages.

Method

Tweets posted between 1 January 2014 and 21 December 2021 where the hashtag included the word "menopause" were extracted from Twitter (API v.2). Extracted data were saved into an Excel file for analysis. Descriptive analyses were performed to explore the frequency of tweets

globally and to compare four countries where English is widely spoken - United Kingdom (UK), United States of America (US), Canada (CA), and Australia (AU). Tweets with geotags (information about their location and country of origin) were used to identify these countries. Natural Language Processing (NLP) was performed using Python 3 to carry out an analysis of sentiment (positive, negative, or neutral tone) [2]. To check reliability, three authors (CH, ET, MEH) assigned a "positive", "neutral" or "negative" sentiment code to 100 randomly selected tweets. Fleiss' kappa [3] showed moderate agreement [4] between raters and the computer-generated sentiments: κ=.502 (95% CI, .417-.587), $p < .0001$.

Results

A total of 281,409 tweets about menopause were identified in the selected time period using data from all countries (see Figure 1). Tweets about menopause were posted on average 35,176 times per year. Nearly 15% of these tweets were identified as originating from the four countries selected for further examination. The US posted an average of 2,595 tweets each year over the selected period, contributing 7.4% of all menopause tweets globally. The UK closely followed, with an average 2,219 tweets per year (6.3% of all posts about menopause). Canada and Australia posted fewer tweets for this purpose, with yearly averages of 280 and 109 posts, respectively.

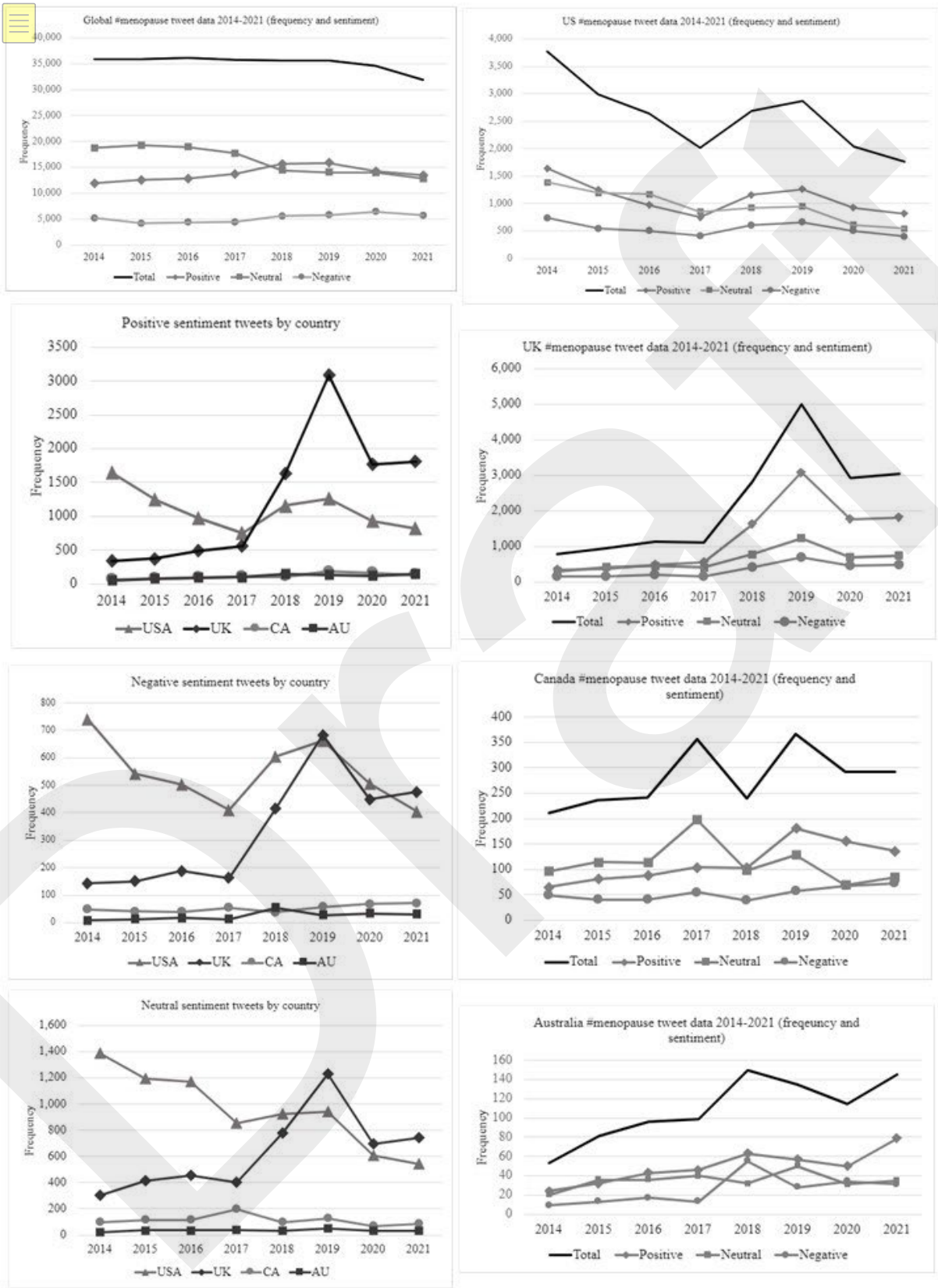

Figure 1. #menopause tweets between 2014-2021 (Global, US, UK, Canada, Australia) and their sentiments

The global use of tweets to communicate about menopause decreased slightly between 2014 and 2021, from 35,881 to 31,936. The number of tweets from the US halved (by 53.2%) from 3,765 to 1,762, **with an average reduction of 13.6% tweets per year.** However, not all countries showed this trend over the period between 2014 and 2021. The number of menopause tweets in the UK increased by an average 9.7% increase per year, from 790 to 3,032, as did Australia with average increase of 11.3% each year from 52 to 145. Canada's communications remained largely unchanged over time (a slight increase of 0.8% per year).

There were more than twice as many positive than negative menopause tweets globally (39.0% vs 15.0%, respectively). Just under half were considered neutral in sentiment (46.0%), and posted on an average of 16,222 tweets per year. but reduced overtime by, on average, 5.9% per year. Positive tweets were posted an average 13,752 times per year but increased by an average of 1.4% per year. Negative tweets were posted on average 5,202 times per year and stable overtime (0.4% average yearly change).

When just the four countries were examined, variations in sentiment were apparent. The US tweeted most positively (42.2% of all their menopause tweets), closely followed by neutral tweets (36.7**%). Overtime, all sentiment types tweets reduced fairly equally, between 12-16% fewer tweets in each sentiment type.** Canada's data revealed equal numbers of tweets with positive and neutral sentiments (40.8% and 40.3%, respectively). They also had the fewest negative tweets. Overtime, CA's average yearly tweets grew by 7.8%, reflecting a growing number of positive and negative tweets by an average year rate of 7.8% and 2.5% (respectively), whilst neutral tweets fell by 12.6% per year. The UK showed an annual growth in all sentiment

types, mainly positive tweets (by 12.1%), followed by negative TWEETS (by 8.9%) and some neutral tweets (by 5.2%) per year. Australia also showed growth in all sentiment types, the largest annual growth in positive tweets (by 13.8%), and small growths in neutral (by 2.2%) and negative tweets (1.6%).

Discussion

This study found that Twitter is being used to communicate about menopause, which support the finding by Arseneau et al [5] about the platform Instragram. Globally, Twitter may be getting used less frequently than in the past, although for certain countries Twitter communications are growing. Overall, there were more positive than negative menopause tweets, with positive communications growing more **each year** than negative ones. Neutral tweets made up almost half of all tweets, yet they are being less each year. Again, variations between countries show some message sentiments differ.

[I THINK THIS PARA ABOVE SHOULD BE MORE PRECISE. How about instead:

Strengths of the study include its originality and large dataset, spanning a time period of six years. Given the time and resources required to carry out the sentiment analysis by hand, the computing methodology used. offered an efficient and acceptably reliable way to understand social media content in a big dataset. However, limitations should be noted. The character limit for tweets restricts the amount of information provided to make judgements sentiment, resulting in a neutral code. Further tweets about menopause would have been missed “menopause” was

misspelt or did not use this hashtag. Tweets without geotags to allow their location to be identified may have resulted in fewer tweets from the selected countries.

More in-depth analysis on the data than offered here would be valuable in future research. For example, examining a wider group of countries, the content of tweets and their possible impact on recipients' knowledge, attitudes and behaviors. A greater understanding of how such a platform is being used may not only be useful for researchers, but also for practitioners and policy makers to support evidence-based messages about the menopause that in turn, may be more helpful ~~and health~~ for end-users. [304]

Contributors

Claire Hardy contributed to the concept, analysis, and writing of the manuscript.
Mahmoud El-Haj contributed to the concept, analysis, and writing of the manuscript.
Eleanor Thorne contributed to the concept, analysis and gave final approval of the manuscript.
Amanda Griffiths contributed to the concept and writing of the manuscript.
Myra S. Hunter contributed to the concept and writing of the manuscript.

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Ethical approval

The study protocol was approved by the Faculty of Science and Technology Ethical Committee at Lancaster University, UK (Ref: FST-2021-0629-RECR-1).

Research data (data sharing and collaboration)

There are no linked research data sets for this paper. Tweet IDs can be made available on request.

Declaration of competing interests

CH is owner of the company Hardy People Ltd. ET is the owner of Example Coaching and Consulting Ltd. The authors MEH, AG and MSH declare that they have no competing interests.

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