Identifying depression related behaviour in Facebook – an experimental study

Keywords: depression, Facebook, social media, digital data, survey

Extended Abstract

In the recent years, an increasing tendency of suicide has been observed in some western countries. In 2015, female suicide rate of the UK reached its highest point of a decade[1]. Suicide rates also increased in the US, especially in the young age cohorts. These tendencies drew the attention of social- and medical scientists, and several studies were published, in which they tried to understand this phenomenon. One of the research streams who picked up on the increasing trends, started to analyze the online footprints of suicide and depression. Internet and social media sites provide new ways for people to express their positive feelings, but they are also platforms to express suicide ideation or depressed thoughts. Suicide and depression related content varies among platforms and it is not evident, how a researcher can find these contents/behaviours in mass data of social media. In recent years Twitter [1,2,3] and Instagram were the most studied platform for investigate depression and suicide related behaviour [4,5,6]. Most of these studies focused on word usage and used only single source data. Another approach used by Cheng et al [7] as, they conducted an on-line survey among Weibo users (n=974), where beyond a classic questionnaire participants' Weibo posts published in the public domain were also downloaded.

As it can be seen, Facebook is rarely used for these kinds of analysis. The main challenge in the case of Facebook is the lack of available data. Our study uses a novel joint data source of combined Facebook and survey data. After an informed consent obtained, respondents were asked to log-in to FB on the interviewers' notebook and to download their FB profile archive. 150 respondents took part in our study. the data covers a wide range of Facebook activities: posts, comments, likes and reactions, pages, friends, profile, and ads data. The full friend list contains 116 000 names (anonymized), there are 83 000 page-like from more than 50 000 unique pages, and the database contains more than 1 800 000 reactions as well as all posts and comments of the participants. The data covers the whole time period of the participants' Facebook usage. Besides sharing their Facebook data, participants had to fill out an online questionnaire. Questions about politics, media usage, self-representation. spare-time activities and music preferences were asked from the participants. Above that, we asked the participants to fill out a modified version of Patient Health Questionnaire (PHQ-9).

In this study we use this slightly modified PHQ-9 questionnaire module. Two indicators of depression are extracted by ML Factor Analysis based on the PHQ-9 questions, a cognitive depression scale (CDS) and a psychosomatic depression scale (SDS) one. As mentioned above a wide range of data is available about each user. For this study we used the temporal dynamic of Facebook activity of the users and the ads interest categories. Facebook categorizes every user for sales for advertising. This is an algorithmic machine learning classification of the users

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[1] Suicides in the UK: 2015 registrations
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/suicidesintheunitedkingdom/2015registrations

based on their own likes, activities, and used keywords and also based on their friends' preferences [8].
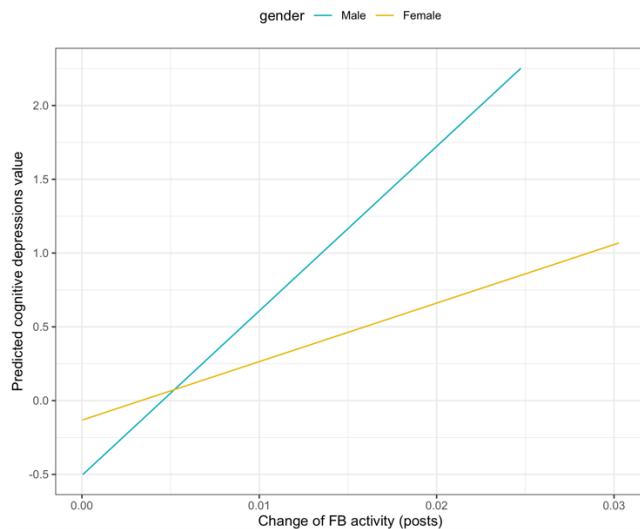
Figure 1 Marginal predicted cognitive depression by Facebook actvity change for Male and Female users

For the temporal analysis we selected the 2019 and 2018 years of Facebook usage, and calculated the ratio of days with Facebook usage. Then we calculated two indicators: the first one was the difference between active day ratio in 2019 and 2018. The second indicator was the absolute value of the previous indicator. The calculations were done separately for posts, reactions on friends and reactions on pages.

The analysis found a moderate but significant correlation (0.33) between cognitive depression level and absolute change of Facebook posting activity. The detailed analysis showed that the effect was stronger for males than females (see figure 1 for the marginal predictions)

The effect was much smaller in the case of reactions on friend and we didn't find significant relationship when we studied the reactions on groups data. Psychosomatic depression didn't correlate with any of the measures.

The second part of the study focused on the possible correlation between FB generated ads interest categories and depression level. We selected those ads categories where at least 10 percent of our sample were categorized in (N=1561). We calculated the relationship of each category belonging and the two depression scales (based on ANOVA and ETA statistics). Then we searched for patterns within the results. One interesting thing came out. Those who scored low on psychosomatic depression scale had higher probability to categorized into finance related categories by Facebook, like banking, finance or car renting.

Our study presents how Facebook data can be used to study depression related behaviour, and it also helps us to understand better how depression could be identified through social media usage.

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