

Social media offers new insights into human and animal behaviour: How to harness them scientifically

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Background

New, inexpensive opportunities for studying the behaviour of humans, animals and almost anything else, from machines to geophysical phenomena, are arising from social media sources [1]. The most obvious sources of behavioural data are video repositories, YouTube being by far the largest to date, and thus they are the focus of this work. However, repositories of photographic or written descriptions of behaviour can also be informative, with written comments having special relevance to studies of human attitudes and trends.

Subjects so far have ranged from the fundamental to the applied in both human and animal behaviour, covering fields including medicine, psychology, national defence, animal behaviour and veterinary medicine. Seemingly, the first studies to code behaviour from YouTube were published in 2009 [2, 3], but only a small handful of studies have done so each year since.

This paper presents an encouraging but cautionary message. Social media can provide vast amounts of data ripe for surveying (e.g. about 100h of video footage is uploaded to YouTube every minute), but without careful design of such surveys, conclusions can be prone to bias and misinterpretation. Yet, prejudice against these data sources, based on a belief that they must be somehow ‘unscientific’, unnecessarily dismisses this rich new information. Here I discuss the strengths and limitations of surveying behaviour from online video repositories, illustrating the potential of the methodology with examples.

Strengths of online video data

While some researchers are initially sceptical about using data from social media, there are many parallels between its strengths and limitations and those of questionnaire data and epidemiological surveys, as compared to direct experimental manipulations. Some shared strengths are as follows:

- Large sample sizes may be possible. For example, the largest direct observation sample size of dogs that chased their tails was 32 [4], compared with 446 in a questionnaire [5], and >3500 hits in a YouTube survey, of which 400 were sampled [6].
- The method is inexpensive. Videos, e.g. on YouTube, Vimeo and DailyMotion, are currently free to view.
- The method is amenable to exploring human attitudes. On YouTube, attitude data can be collected from the uploader description of the video, viewer comments, and via observing the humans in the videos directly. Examples include: a study 115 videos of parents interacting with toddlers while playing with toy kitchens, revealing implicit gender- and dietary-biases in the subjects’ conversations, actions and choices of toys used [7]; and a study showing that 73 videos portraying negative views of immunisation received more viewings and higher star ratings than 49 videos portraying positive views [8].
- Rare and/or fleeting events can be studied. On video sharing sites, this relies on the phenomenon of interest being amenable to video capture. It also requires that it has searchable and widely used names or contexts, because without this, relevant videos will not be easily located.

Tail chasing is a good example, because most dogs perform it rarely and briefly, so it is difficult to research by direct observation (except in dogs who perform it compulsively) [6]. Yet the behaviour is

well known, so when people see it, they may well decide to video and upload it for others' amusement. 'Tail chasing' is also searchable, unlike another potentially compulsive canine behaviour, 'fly catching'/'fly snapping'/'fly biting': technical terms that the general public would not necessarily use.

Data collected from online videos has some further strengths that questionnaires usually do not. For example:

- The videos allow researchers to quantitatively record behaviour directly, in just the same ways as they would any other videos. Researchers can apply their own objective criteria and descriptions of the relevant behaviour, and can measure frequencies, durations etc. directly. They can see for themselves what viewers are commenting on. An example is the objective assessment of true 'motor entrainment' to music in animals described as 'dancing' by uploaders; that study reported motor entrainment to occur only species capable of vocal mimicry (eight parrot species and one elephant species), but never in the >600 video sample of non-mimicking species [2].
- Unlike questionnaires, the data are not prompted by the study itself. This points to a paradoxical situation whereby data are submitted to public viewing and yet the process of data collection is unobtrusive. This can remove bias that is created by the phrasing of questionnaires. For example, in the tail chasing study, >20% of videos showed people encouraging the behaviour in a manner that could compromise dog welfare (e.g. pulling the tail, attaching objects to it, or 'growling' at the dog). Also uploaders were over six times more likely to describe dogs as 'stupid' if they tail-chased compulsively than if they performed it rarely. Another example is the study by Lynch [7] showing parents reinforcing gender stereotypes and setting unhealthy examples of food choice whilst playing with their toddlers. In both examples, a questionnaire would likely have prompted people to reflect on their actions and how they might be perceived, whereas – perhaps surprisingly – deciding to publicly display video footage evidently seems not to prompt reflection in the same way.
- YouTube with its vast viewing figures has a special quality in that it not only offers insight into the real world, but it can also influence it. Many viewers use YouTube as a source of information, so the behaviour they see and the comments they hear or read, may alter their perceptions, reactions to, or participation in that type of behaviour if they encounter it in the real world. Linkletter et al. [9] found that 65 videos of an asphyxiation 'game' in teenagers were collectively viewed 173550 times, and warned of the potential of these videos to normalize and even propagate the behaviour. A similar phenomenon was seen with self-harm videos, where the top 100 videos were viewed >2 million times, and selected as user 'favorites' over 12 000 times [10]. A further sinister example is the use of YouTube for promoting violent terrorism [3]. Positive influences are also possible via videos that accurately raise awareness of important issues or teach beneficial skills to viewers.

Limitations of online video data and what to do about them

Questionnaires and epidemiological methods have been used for long enough now that there is an understanding of how best to conduct them and to interpret the resulting data [e.g. 11]. Many of the same principles can actually be applied to social media data as well. Again many of the limitations of social media data are shared with questionnaires and many other surveys, namely:

- Non-random sampling. Like most respondents to questionnaires, social media data are only collected from people who voluntarily submit their 'data'. The normal way to deal with this in questionnaires is to describe the demographics as far as possible, and to discuss any likely factors that might have biased the sample population. This approach can be used for social media also. On YouTube, clicking on the uploader username reveals volunteered information on their age, sex and nationality. Conclusions should be restricted to populations resembling the sampled one and any likely biases discussed. Depending on the question being asked in the study, the biases might restrict the conclusions very little, and in some cases an appropriate control group may be possible to help correct for it, e.g. the prevalence of 'dancing' in the vocal mimicking species compared with the non-mimics [2].

- It is good practice to assess any data for internal validity, to ensure that what is being measured actually reflects the intended construct. The validity of noisy data like that often collected from social media may be questioned, so it is wise to take several measures relevant to the phenomenon of interest if possible. Statistical tests can then be used to assess whether the measures correlate with each other in the manner expected. For example, two measures of compulsive behaviour in the tail-chasing dogs correlated positively, while they correlated negatively with playful behaviour [6].
- Untruthful descriptions or opinions are always a risk with questionnaires, and this may be no less true with social media studies. Social media studies have the aforementioned advantage of being unobtrusive, but when people upload videos and comments, they intend them to be viewed by ‘the public’ (they proactively select this option from a drop down list on YouTube). Therefore, an element of self-consciousness is still intrinsic to the data. Case by case judgement is required as to how much the phenomena under study will be influenced by this, and it should be discussed with respect to interpreting the data.

As with questionnaires and some direct observations, the background context is often unknown. In the case of videos, many circumstances surrounding the recording are unknown, and the ground truth for the behaviour recorded can be hard to determine (e.g. a video starts at a certain moment and it remains unknown what happened before that moment).

Falsified footage is a new concern specific to audio-visual data, but since most videos uploaded to YouTube and other video-sharing websites are amateur, alterations are currently usually quite obvious and easy to identify. Again, certain research questions will be more prone to this problem than others.

- While some data collected from social media will be standardized and structured across the sample population (e.g. each video has a title, category and number of views, and users have demographic information), much of it will not be. There may be many missing data for some variables. Videos may be of different lengths and different qualities, and text will normally be free form. Setting inclusion criteria helps quality control which videos or other data are included in the sample, as does recording data in a form that enables extraneous variation to be taken into account in analyses (e.g. recording behaviour frequencies relative to the video duration, or describing vocalization data only for the subset of videos that had audio associated with them). With regards to free text, there are numerous techniques from the field of social science that can be applied to help quantify such qualitative data, such as thematic analysis [e.g. 12]. Researcher bias can affect qualitative data, because interpretation occurs both before and after any statistical analysis, but again methods to control this, and to make any likely influences transparent, can be employed [e.g. 13].

Discussion

In conclusion, using data from social media offers some exciting and sometimes quite profound new opportunities for studying behaviour, as long as it is collected and interpreted with due scientific caution and integrity. In particular, shared video repositories can enable large sample sizes of sporadic behaviour episodes to be measured quite directly, which would be difficult or impossible to do any other way, and can reveal human attitudes towards those behaviours.

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