Abstract

With nearly 3.5 billion people now using some form of social media, understanding its relationship with personality has become a crucial focus of psychological research. As such, research linking personality traits to social media behaviour has proliferated in recent years, resulting in a disparate set of literature that is rarely synthesised. To address this, we performed a systematic search that identified 182 studies relating extraversion to social media behaviour. Our findings highlight that extraversion and social media are studied across six areas: 1) content creation, 2) content reaction, 3) user profile characteristics, 4) patterns of use, 5) perceptions of social media, and 6) aggression, trolling, and excessive use. We compare these findings to offline behaviour and identify parallels such as extraverts' desire for social attention and their tendency to display positivity. Extraverts are also likely to use social media, spend more time using one or more social media platforms, and regularly create content. We discuss how this evidence will support the future development and design of social media platforms, and its application across a variety of disciplines such as marketing and human-computer interaction.

Keywords: Personality, Big Five, OCEAN, Social Media, Facebook, Extraversion

How is extraversion related to social media use? A literature review

1. Introduction

Whilst social media use is greater in economically developed regions such as Europe, Eastern Asia, Oceania, and the Americas (Kemp, 2019), the total number of social media users is now approaching half the global population. Facebook is the most popular social media platform, with more than 2 billion users and a mission to help people 'to discover what's going on in the world' (Facebook, 2019). Although its global influence is still growing, in America a majority of adults already use Facebook as a source for news (Matsa and Shearer, 2018). The ubiquity of social media, and Facebook in particular, means that these platforms have also become an important way for organisations to communicate externally: more than $55 billion was spent on Facebook advertising in 2018 alone (PR Newswire, 2019). Understanding how social media users behave therefore has practical importance for organisations and society.

A number of reviews have identified social media usage patterns among different demographic groups (such as Hinds & Joinson, 2018) and have explored the prediction of personality traits from digital traces (see Azucar *et al.* 2018; Hinds & Joinson, 2019; Tskhay & Rule, 2014). Likewise, hundreds of studies have explored how personality and social media behaviour are related. However, to our knowledge, no research has synthesised these vast and disparate findings across psychology, communications, or other areas within the social sciences. Social media is often associated with extraversion (such as Seidman, 2013), because social media platforms provide a mechanism for socialising and interacting. The purpose of the present review is to systematically explore the varied ways extraversion is related to social media and synthesise the most prominent trends. Further, we consider whether typical aspects of

extraversion, such as 'enthusiasm' and 'assertiveness' (DeYoung, Quilty, Peterson, 2007) are reflected in social media behaviour.

1.1. Origins of trait extraversion

Descriptive language has long been used to identify different 'types' of person; however, the 20th century saw a concerted effort to condense thousands of descriptors into the core components that identify human 'personality'. The term 'extraversion' was used by Carl Jung as far back as 1912 (Jung, 2014); later described as a trait by Eysenck (1947), who presented a continuum (Eysenck, 1992) for rating extraversion.

More recent research has investigated the origin of these observable personality traits, and there are now known to be neurobiological differences between extraverts and introverts. For example, extraverts have increased grey matter in the left amygdala (Omura, Constable & Canli, 2005), right amygdala (Cremers *et al.*, 2011), and in the orbitofrontal cortex area of the frontal lobes responsible for decision-making (Cremers *et al.*, 2011; Rauch *et al.*, 2005). There is also evidence of a link between extraversion and the chemical responsible for motivation [dopamine] (Wacker & Smillie, 2015), as well as the hormone responsible for love [oxytocin] (Andari *et al.*, 2014).

Finally, trait extraversion has been shown to be partially genetic (Bouchard Jr & Loehlin, 2001). For example, studies of monozygotic twins have demonstrated heritability through similarities in personality by a correlation of .45 compared to a correlation of only .20 for non-identical twins (Munafo, 2009). There is also evidence that the facets leading to five-factor model extraversion are genetic (Jang *et al.*, 2002). However, Fleeson (2001) has demonstrated that although average personality trait tendencies are stable, there is a degree of variance according to context such as situational cues.

1.2. Measuring extraversion

The identification of extraversion and other traits was initially reached by ascertaining the 4,500 descriptors of human 'personality' in the English dictionary (Allport & Odbert, 1936). These descriptors have since been condensed through factor analysis. Extraversion is present in each of the frequently-used models of personality, either labelled as 'surgency' (Norman, 1963) or the more common term 'extraversion' (Fiske, 1949). Goodness of fit testing supports the inclusion of extraversion in a five-factor model of personality (Corr & Matthews, 2009), commonly referred to as the 'Big Five' (Goldberg, 1981) or OCEAN model. Some researchers have suggested that these five traits contribute to two higher order factors: plasticity [extraversion and openness] and stability [neuroticism (reversed), agreeableness and conscientiousness] (DeYoung, 2006; DeYoung, 2013). Others (such as Specht *et al.*, 2014) have provided evidence of broader personality 'types' comprising combinations of traits. The combination of traits is a controversial area of research though with disagreement on reliability and reproducibility (Donnellan & Robins, 2010; McCrae *et al.*, 2006). As supporting research in this area is still limited, this literature review has focused on extraversion as an independent trait.

Observable behaviour is known to relate to personality traits. The 'three-tiered' level of abstraction suggested by Norman (1967) explains how behaviour (or situational 'responses') might first lead to habits. Such habits contribute to behavioural 'facets' (McCrae and Costa, 2003) which then support the identification of a corresponding trait. Within the five-factor model (Costa & McCrae, 1992a; McCrae & Costa, 1997), the facets of extraversion are warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotion. Using five-factor scales, many behaviours have been correlated with high scores for extraversion, including social activities (Eaton & Funder, 2003; Wilt & Revelle, 2019), as well as other behaviours that are intuitively linked to sociability, such as alcohol consumption (Martsh & Miller, 1997) and

leadership (Spark, Stansmore & O'Connor, 2018). See Wilt and Revelle (2009 and 2017) for reviews.

1.3. Extraversion and social media

As described previously, social media might naturally appeal to extraverts, who tend to desire social attention (Paunonen, 2003). Whilst there is plenty of evidence suggesting that behaviour on social media is linked to the OCEAN personality traits (such as Matz *et al*, 2017), the present review employs a systematic search to identify specific links to extraversion. This is an important and topical area of study given the recent increased public awareness of personality data use and collection through social media. For example, some news coverage of the Cambridge Analytica 'scandal' (BBC News, 2019) gave the impression that personality is a reliable predictor of interaction with social media content (Cadwalladr & Graham-Harrison, 2018). An investigation of the consistency and replicability of such evidence relating personality to social media behaviour is therefore crucial to support meaningful public discussion about the ethics of collecting such data. That is, if personality is not a strong predictor of social media behaviour, then data-mining tactics to determine personality could potentially be less intrusive or effective than many typical headlines suggest.

2. Method

The present review has taken a traits-based approach to the identification of extraversion, presenting research that is based on self-reported personality as identified through one of several commonly-used questionnaire-based tests. The methods are presented in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher *et al.*, 2009).

2.1. Eligibility criteria

To be included in this literature review, studies were required to: a) quantitatively examine the relationship between social media use and extraversion as defined through the five-factor model; b) measure extraversion using a published scale associated with the five-factor model (see measures below); c) be published on or before 5 July 2019, inclusive; d) be published in a peer-reviewed journal or in peer-reviewed conference proceedings. Studies were required to include a quantifiable measure of social media use, although the scale and measurement tool varied depending on the type of social media use.

Papers are not included where the Big Five traits are mediating variables. Where papers identify correlations between traits and behaviour in order to contribute ground truth for a machine-learning algorithm, these are also removed.

2.2. Search strategy and information sources

The following databases were searched up to and including 5 July 2019: Scopus, Web of Science, ACM digital library, PsychInfo and Pubmed. The search strategy involved identifying papers that combine *personality* as defined through the five factor model, and *social media use*, including both titles and abstracts. The Boolean search performed in each database was: ["social media" OR "social network*" OR instagram OR facebook OR twitter OR youtube AND personality OR extraver* OR neurotic* OR agreeable* OR conscientious* OR open* OR ocean OR “big five”].

2.3. Study selection

The search was firstly performed within the Scopus database, with all 16,502 citations downloaded into a single Mendeley library. The results of additional databases were then added, with automated removal of duplicates. This resulted in 25,209 papers to be reviewed.

The abstracts and titles were then screened by a researcher (first author), who examined the titles and abstracts of the papers and removed those that were not specifically researching five-factor personality and social media behaviour. This left 494 papers to be reviewed. Figure 1 displays the PRISMA flowchart with full detail of this process.

The remaining papers were then reviewed by two researchers (first and second authors) independently to select those where personality predicts behaviour (rather than identifying personality *from* behaviour). In order to be eligible for this literature review, participants must have undertaken a self-report personality test and then provided evidence of their social media behaviour either through answering a questionnaire (n=133), some form of observation (n=45), an experiment (n=3), or an interview (n=1). In some cases (such as Tadesse *et al*., 2018) the studies reported *both* personality predicting social media use *and* how patterns of use could predict personality. In these cases, the papers were included in the review, but only the results from the former analyses integrated rather than the latter. Finally, Cohen's Kappa was used to assess interrater agreement, and demonstrated high levels of consensus, k =0.82.

The remaining 190 papers included findings for any (or all) of the five personality traits, as results for extraversion were sometimes reported despite not reporting this specifically in a title or abstract. However, for this literature review only the 182 papers including results for extraversion were taken through to the analysis stage.

INSERT FIGURE 1 ABOUT HERE

2.4. Analysis

The analysis consisted of five stages. First, a researcher (first author) independently read through the manuscripts and developed a comprehensive codebook, which recorded reference information (title, authors, publication year), sample sizes, platform (such as Facebook or Twitter), measures used (such as Costa & McCrae [1992b] or John *et al*. [1991]), and outcome behaviour (such as frequency of use, addiction, or commenting). Second, the outcome behaviours extracted were refined into a series of distinct codes. Two researchers (first author – a PhD candidate researching personality and systematic reviews, and second author – a postdoctoral researcher experienced in performing systematic reviews) identified conceptually similar or equivalent variables and merged these into independent categories, for example "addiction" and "excessive use" were grouped into an overall "excessive use" code.

Third, 25 per cent of randomly selected studies were second coded (by the second author) to assess reliability. Cohen's *k* was used to assess interrater agreement, and demonstrated moderate levels of consensus, $k = 0.58$. All discrepancies that occurred in data extraction were resolved through discussion[1]. Fourth, the outcome behavioural codes were grouped into themes according to their commonalities. For example, "trolling", "excessive use", and "aggression" were grouped into an "anti-social" theme. Finally, these themes were reviewed once more to generate a series of higher-level, overarching, themes which are used to organise our findings

[1] The discussion revealed that differences in coding resulted when the researchers interpreted behavioural outcomes in slightly different ways (such as coding a behaviour reported as 'mild use' in one paper as 'frequency of use' by one researcher, and 'time spent' by another), or when studies that reported many behaviours (which caused the researchers to code a different number of behaviours) . Thus, such differences were mostly due to subtle differences in assigning behaviours to categories, rather than actual 'disagreements'

and discussion. An overview of the themes is provided in Table 2, and all studies included in the analysis are provided in the Supplementary Materials.

3. Results

3.1. Study characteristics

Overall, Facebook was the most studied social media platform (n=101), in comparison to other platforms, which were substantially fewer, such as Twitter (n=12), and Instagram (n=6). The full range of platforms studied is outlined in Table 1. Further, questionnaires were the most common method used to collect information about participants' social media use (n=134). Where reported, the majority of the samples in the research we reviewed included 'students' (n=98) and/or participants recruited though Facebook (n=32).

The reviewed studies focused on a variety of dependent variables (see Table 2), with easily-measurable outcomes the most common, such as network size (n=34), followed by time spent on social media (n=20), update frequency (n=18), and more general frequency of use (n=16).

There are a variety of scales used to measure extraversion as part of the five-factor model. Where reported, the most popular (n=18) was Costa and McCrae (1992b), followed by Goldberg *et al* (2006) and John and Srivastava (1999) (both n=17). The full range of measures and their frequency of use is shown in Figure 2.

INSERT TABLE 1 ABOUT HERE

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3.2. Major findings

We identified six overarching themes within the papers reviewed. These themes encapsulated the main trends and commonalities amongst the behavioural outcomes identified, and are outlined as follows:

1. Content creation. These are studies therefore which find that extraverts create content in order to 'manage' the impression given to others (Goffman, 1978; Kaplan & Haenlein, 2010).
2. Content reaction. This theme presents research showing how extraverts manage their image through visibly reacting to social media content produced by others.
3. User profile characteristics. These are studies that relate extraversion to the factual information revealed within a user's profile information.
4. Patterns of use. These are studies of unconscious patterns of behaviour, known as 'residue' (Gosling *et al*, 2002), displayed through social media use.
5. Perceptions of social media. These are studies which investigate the motivations and attitudes towards the value of social media, as previously related to demographics (Joinson, 2008).
6. Aggression, trolling and excessive use. The studies within this theme investigate anti-social or 'dark' (Baccarella et al, 2018) uses of social media as previously attributed to demographics (Thacker and Griffiths, 2012; Kirik *et al*, 2015).

We also identified a number of methodological insights, as outlined for each outcome behaviour (code) within Table 2. First, self-report is the most popular means of understanding the behavioural outcome (for example the frequency of updating one's status), including data collection through surveys (n=133), self-reported content analysis (n=6), and self-reported

observation (n=3). Examples of studies where the outcome did not rely on self-report include word use (n=9) and a number of studies of network size (n=10).

The disclosure of non-significant results is a topic of much wider debate within academia (see Franco, Malhotra & Simonovits, 2014). In the studies reviewed here, where non-significant results are not reported (n=47), it is unclear in most cases whether this is because there were no further results to report, or because of a 'file drawer' problem (Franco, Malhotra & Simonovits, 2014) whereby the authors chose only to report the significant results. A related explanation for this lack of non-significant findings could be the tendency to 'p-hack' the results (Nuzzo, 2014) without reporting various previous attempts.

Sampling is another important area of consideration when comparing studies. Although a sample size of at least 384 is advised to reliably represent populations of 100,000 or more with 95 per cent confidence (Krejcie & Morgan, 1970), many studies (n=36) had a sample size below this. We give the overall sample size for each outcome behaviour in Table 2. Furthermore, few studies (n=7) explicitly stated that they had randomly selected a sample, or deliberately intended to represent a wider population (n=2).

3.2.1. Extraversion and content creation

The studies we reviewed consistently found a link between extraversion and the regularity of posting new content on social media. This is unsurprising given that 'sociability' and 'activeness' are facets of extraversion (Eysenck *et al.*, 1992). Extraverts are not only sociable and gregarious, but are often energetic and engaged, as reflected in their social media content posting behaviour. Offline, trait extraversion is also known to predict conversing and spending time with people (Mehl *et al.*, 2006), which are two of the primary functions of social media.

Extraverts update their status or tweet frequently (such as Bachrach *et al.*, 2012) [but see Große Deters, Mehl & Eid (2016) for a study that did not report this association]. These patterns occur regardless of age, across platforms, and are seen cross-culturally. One study (Rollero, Daniele & Tartaglia, 2019) reported a significant association between the frequency of 'active use' (profile updating or posting new content) and extraversion for females, but not for males.

There is also a clear relationship between extraversion and the quantity of images posted (such as Eftekhar, Fullwood & Morris, 2014). Extraverts tend to post pictures of: (1) people and objects (Kim & Kim, 2018); (2) faces showing all emotions except neutral and surprised (Kim & Kim, 2018); and (3) animals (Ferwerda *et al.*, 2018) such as pets (Yang, 2019). Extraverts take personal (such as Guo *et al.*, 2018) and group selfies (Kim & Chock, 2017), supporting the 'gregariousness' facet (Costa & McCrae, 1992b). They also frequently edit selfies (Wang, 2019). Qiu *et al* (2015) did not find any association between the type of selfie (such as duckface, or amount of body shown) and extraversion, a result they explain is due to the preponderance of positive images shared by all social media users in the form of selfies.

Positive emotions are generally known to be a facet of extraversion (Costa & McCrae, 1992b), and many studies do reflect the positivity previously shown offline (Rothbart, Ahadi & Evans, 2000); for example, our review has identified a number of studies linking extraversion to the use of positive words (such as Hall, Pennington & Lueders, 2014).

Several other studies in our findings associated extraversion with social words or processes (such as Qiu *et al.*, 2012). Although Bai, Gao & Zhu (2012) suggested that extraverts use the second person singular infrequently to refer to others on social media, other studies (such as Tadesse *et al.*, 2018) found the opposite, supporting the trait characteristics previously-identified offline such as socialising (Olson & Weber, 2004) and encouraging conversation

(Mehl, Gosling & Pennebaker, 2006). In return, Shena, Brdiczka and Liu (2015) found that extraverts do receive more comments and likes on social media, specifically from friends. Extraverts are also more likely to use sexual words (such as Kern *et al.*, 2014) or refer to other biological processes (such as Schwartz *et al.*, 2013). Park *et al* (2017) also relate extraversion positively to use of future tense and negatively to use of the past tense.

The findings above show clear evidence of extraversion associated with specific word usage on social media. There is likewise evidence that extraversion is related to the overall topic that people post content about. For example, Marshall, Lefringhausen and Ferenczi (2015) showed that extraversion is related to an increased frequency of updates about social activities, achievement, diet and exercise. On the service 'Weibo', Zhou, Xu and Zhao (2018) identified a greater likelihood of sharing music amongst extraverts. On Instagram, Ferwerda *et al* (2018) reported an association between extraversion and content around electronics. Lastly, Roulin (2014) reported that extraversion predicts the likelihood of posting inappropriate content and with posts about alcohol or drugs in particular (Stoughton, Thompson & Meade, 2013).

For those high in extraversion, social media provides an opportunity to present themselves to others. This is unsurprising, given that previous offline research has found extraverts to be motivated by social power and status (Olson & Weber, 2004). Extravert adolescents engage in more self-presentation activities on Facebook (such as adding profile pictures and status updates, [Ong *et al.*, 2011]), although the impact of extraversion on these activities is reduced when narcissism is added to the statistical model. Extraverts are also more likely to engage in broadcasting [one-to-many] behaviour (Kabadayi & Price, 2014) and exhibitionism on WeChat (Wang, 2017), supporting the gregariousness facet (Costa & McCrae, 1992b). Extraversion is also related to the likelihood of sharing videos (Zhou *et al.*, 2018),

including longer videos on Facebook and Weibo (Shena. Brdiczka & Liu, 2015). Furthermore, there is some limited evidence to suggest that the self-presentation of introverts creates a 'false' self on social media (Michikyan, Subrahmanyam & Dennis, 2014).

On Facebook, extraversion is significantly correlated with the expression of emotion, although openness to experience showed a stronger relationship (Farnadi *et al.*, 2014), suggesting that a personality type combining extraversion and openness (described as 'plasticity' in a two-factor model proposed by DeYoung [2006, 2013]) would be associated with high expression of emotions on social media. McCann (2014) identified a correlation between neuroticism and the expression of negative emotions on Twitter, but no other correlations between emotion expression and personality, including extraversion.

3.2.2. Extraversion and reaction to content

Offline studies have shown that extraverts are likely to experience positive affect (Costa and McCrae, 1980; Lucas & Baird, 2004; Watson & Clark, 1992), both in moments (Lucas & Baird, 2004; Uziel, 2006) and over time (Costa & McCrae, 1992a; Spain, Eaton & Funder, 2000). Extraverts even judge neutral events more positively than introverts (Uziel, 2006). Given that their experience of the world is likely to be positive, a positive reaction to content posted online is to be expected. There is some, although limited, supporting evidence for this on social media, connecting the use of the 'liking' function and extraversion, (such as Lee, Ahn & Kim, 2014).

Shi, Yue and He (2013) and Hwang (2017) have demonstrated that extraverts tend to give feedback on social media, and there is a link between extraversion and the volume of comments posted (such as Wang, Lv & Zhang, 2018). Große Deters, Mehl and Eid (2016) also identified a

correlation between extraversion and positive valence of comments given; however, they report a series of non-significant relations between extraversion and responses to content online (such as 'liking' and giving feedback).

Sharing is a slightly different mechanism to reacting through a comment, 'like', or an equivalent show of praise. Sharing involves identifying a piece of content that is then posted within a user's own update. Although one study (Dupre *et al*, 2018) suggested a weak link, several studies relate extraversion positively to public sharing on social media (such as Jain, Gera & Ilavarasan, 2016), but not sharing rumours (Lynn *et al.*, 2017). Hwang (2017) found that extraversion predicts sharing of photos and images in particular: a social behaviour that evidently supports the 'social behaviour' offline trait characteristic (Argyle & Lu, 1990). Extraverts are also likely to retweet 'social' Twitter messages (Hodas, Butner and Corley, 2016).

The limited research on personality and marketing content on social media shows a relationship between extraversion and both sharing of sponsored stories and liking adverts (Clark & Calli, 2014), reaction to content specifically for extraverts (Matz *et al*, 2017), and a general positive link between extraversion and consumer engagement online (Islam, Rahman & Hollebeek, 2017). This supports previous links identified offline between extraversion and so-called 'market mavenism' (Mooradian, 1996; Steenkamp & Maydeu-Olivares, 2015) whereby trusted experts (mavens) collect this market information to use in 'social exchanges' (Feick & Price, 1987), supporting extraverts' desire to behave sociably (Eysenck *et al.*, 1992).

3.2.3. Extraversion and user profile characteristics

A social media user's profile is the part of their 'page' or 'account' that displays factual information about themselves and their social media usage. For example, Twitter displays

information relating to a user's number of followers, number of followed users, their home location, and the date on which they began using Twitter. User profile characteristics are distinct though from users' 'patterns of use' (see Section 3.2.4), which relate to research that examines users' behavioural patterns, such as the number of times the account has actually been used since the creation date.

Extraversion is found to positively correlate with social media users' friend quantity (see Amichai-Hamburger & Vinitzky, 2010; Gosling *et al*, 2011; Ong *et al*, 2011). Furthermore, for extraverts many of these friends seem to consist of other extraverts on social media (Noë, Whitaker and Allen, 2016). Similarly, introverts are found to connect with other introverts (Lönnqvist & Itkonen, 2016). Together, such findings exhibit a phenomenon known as 'homophily' – the notion that people who are similar tend to socialise or be attracted to one another (in some form or another) (McPherson *et al.*, 2001). Thus, this can be explained through the known tendency for extraverts to both display (Rothbart *et al.*, 2000) and be attracted to positivity (Derryberry & Reed, 1994). In other words, the extravert display of positivity attracts people who are also express positive characteristics.

Finally, Noë, Whitaker and Allen (2018) also showed that pairs of extraverts using social media tend to be geographically closer together, suggesting that offline and online social contact are mirrored, although Zhou, Xu and Zhao (2018) identified a higher likelihood that extraverts move location.

3.2.4. Extraversion and patterns of use

In contrast to the way individuals attempt to make themselves appear online, or the factual information shown within a user's profile, extraversion is also related to individuals'

behavioural patterns on social media. The process of managing one's identity means that individuals display patterns of behaviour (such as number of logins, photos) – a form of 'residue' (Gosling, 2002) that relates to their personalities. Extraversion is related to a number of social media usage patterns including membership of a platform (such as Brailovskaia & Margraf, 2016), frequency of use (such as Correa, Hinsley & de Zúñiga, 2010), duration of each use (Caci *et al.*, 2014), time spent using social media (such as Moore & McElroy, 2012), and both group membership (such as Ross *et al.*, 2009) and group interaction (such as Kelsen & Flowers, 2018).

These findings therefore reflect many facets of extraversion that manifest in offline relationships and interactions. That is, extraverts are sociable (Eysenck *et al*., 1992), they have many friends (Watson & Clark, 1997), they are 'bold' (Cattell, Eber & Tatsuoka, 1980) and they enjoy meeting new people. Further, these behavioural patterns are evident across numerous platforms (including Facebook, Twitter, Instagram, and Snapchat). Extraverts also frequently use social search services (Uesugi, 2011), play games (Wang *et al*, 2012), and use entertainment services (Deng *et al.* 2013). These patterns furthermore reflect the classic tendencies of extraverts in offline settings to seek out stimulation and social activities with other people (Argyle & Lu, 1990; Paunonen, 2003).

Although the majority of these studies focus on student and WEIRD samples (Henrich *et al.* 2010), there is some evidence to suggest that these extraverted behavioural patterns exist across other demographics including teenagers (Cheevasuntorn *et al.*, 2018), elderly individuals (Mo *et al*., 2018) and Asian populations (such as Shi *et al*., 2013). These trends suggest that the general sociability aspects and behavioural patterns of extraversion extend beyond those typically studied. Further, while the majority of studies in our set find significant relationships between extraversion and various behavioural patterns of engagement, numerous studies find

evidence that counter these effects. For instance, McCreery and Krach (2018) found no significant relationship between extraversion and Facebook membership, and Pettijohn *et al*. (2012) found that extraversion was not related to frequency of use.

3.2.5. Extraversion and perceptions of social media

As extraverts are known to be motivated by social contact (Olson & Weber, 2004), they typically perceive 'social' media platforms positively. They also consider Facebook to be useful (such as Mouakket, 2016), valuable (Zou & Wu, 2018), satisfying (Deng *et al*, 2013), and easy to use (Rosen & Kluemper, 2008). Extraverts are motivated to use social media in order to socially connect (such as Bhattacharya, Sinha & Sheorey, 2014), socially interact (such as Eşkisu, Hoşoğlu & Rasmussen, 2017), and to share information about themselves (Mishra & Ayatham, 2017). This reflects offline findings that extraverts set social goals (Roberts & Robins, 2004) and are motivated by social contact (Olson & Weber, 2004). Extraversion also relates to communicating (such as Horzum, 2016) and 'messaging' (Tsai *et al*, 2017), supporting the offline desire to converse (Mehl, Gosling & Pennebaker, 2006). Signalling their enjoyment, extraverts use social media for recreation (Orchard *et al*, 2014), 'entertainment' (such as Lin *et al.*, 2017), or 'infotainment (Krishnan and Atkin, 2014).

In their desire to make social contact, extraverts disclose personal (such as Loiacono *et al.*, 2012), honest (Chen & Marcus, 2012), and accurate information (Chen, Pan & Guo, 2016), such as personal data (Quercia *et al.*, 2012) including a private address or political view (Schaar, Valdez & Ziefle, 2013), or intimate content (Hollenbaugh & Ferris, 2014). Yet some suggest that the relationship to self-disclosure is not significant (Aharony, 2016) or positive (such as Amichai-Hamburger and Vinitzky, 2010).

However, extraverts do have some concern for privacy, for example hiding religious views, and relationships (Kuo & Tang, 2013), deleting content and/or friends (Gerber, Gerber & Hernando, 2017) and amending privacy settings (Tsai *et al.*, 2017). Two studies suggest though that the correlation with privacy is not significant (Riera, Oberst and Carbonell, 2015; Osatuyi, 2015).

3.2.6. Extraversion and aggression, trolling and excessive use

Away from social media, extraverts are known to respond to positive stimuli (such as images of a happy couple [Canli *et al.,* 2001]). Given the positive affect associated with social media for extraverts therefore, it follows that extraverts pay particular attention to social media, leading to excessive use of Facebook (such as Atroszko *et al*, 2018) and of social media in general (such as Jaradat & Atyeh, 2017). However, non-significant relationships are identified on YouTube (Klobas *et al.*, 2018) and WeChat (Hou *et al.*, 2018). Looking at social apps on mobile specifically, Hsiao *et al* (2016) identified a relationship between compulsive usage and extraversion.

There is some evidence that low levels of extraversion are linked to 'problematic' (Marino *et al.*, 2016) or 'addictive' (Blachnio *et al.*, 2017) Facebook use, though several studies suggest that this relationship is not significant on social media in general (such as Hawi & Samaha, 2019), on Instagram (Kircaburun & Griffiths, 2018), on Tinder (Orosz *et al.*, 2018) or on Facebook (such as Blachnio & Przepiorka, 2016). The results generally in this area are therefore inconclusive. Technology addiction is in any case a contentious area of psychological research, so social media is therefore one of many contexts for future exploration within this field.

Extraversion appears to relate to proactive aggression online (McCreery & Krach, 2018), supporting previous offline findings that extraverts like to be 'socially dominant' (Olson & Weber, 2004). Yet, this finding seems at odds with other studies which found that extraverts generally do not bully (Kokkinos, Baltzidis & Xynogala, 2016), give 'uncivil' comments (Koban *et al.*, 2018), or troll (Seigfried-Sellar & Lankford, 2018) on social media. This suggests a subtle difference between 'socially dominant' or even 'aggressive' behaviour, and behaviour that is perceived to be 'bullying' or 'uncivil'.

4. Discussion

4.1. Major findings and implications

Our survey of the literature to date has provided consistent evidence that extraverts are more likely to use social media, use it frequently, and spend more of their time using one or more social media platforms. Further, extraverts create content regularly and the content they post uses social words and refers to social processes. Extraverts also comment frequently, provide feedback to others, and share content publicly. The attitudes expressed by extraverts indicate that they value social media and are motivated to use social media in order to achieve their 'social goals'; their conscious behaviour indicates a desire to interact, which is evidenced by their use of social language, status updates, sharing, and content generation (as a means of presenting themselves to others). The studies reviewed certainly appear to demonstrate that the ability to socialise through social media appeals to extraverts. In turn, the 'residue' (Gosling *et al*, 2002) left by extraverts indicates that they tend to have a larger network, are likely to search for contacts, and are likely to join groups, demonstrating a willingness to socialise that also typifies extraversion offline.

The review has further demonstrated consistent findings that, as offline, extraverts tend to display positivity through their social media use, using positive words in their updates and 'liking' content generated by others. The affect-threshold model (Rosenberg, 1998) explains that extraverts have a lower threshold for experiencing positive affect, either due to a higher baseline positivity (Gross, Sutton & Ketelaar, 1998) or due to a stronger reaction to positive stimuli and quicker conditioning by reward stimuli [Reinforcement Sensitivity Theory] (Corr, 2008).

These findings have important implications for organisations or individuals wanting to communicate with social media users, including educators, marketers, and communication professionals across a range of industries. For example, the findings suggest that a marketing campaign intended for a large audience, is likely to engage extraverts. In addition, knowing that extraverts are likely to be connected to other extraverts means that a message that appeals to one person, may also appeal to many others within their network. Similarly, as extraverts spend more time on social media, and engage with others frequently, they are more likely to see social media content. The psychographic profile of an audience is therefore an important consideration, alongside commonly-used profiling techniques such as demographics and geography.

The findings also pose a larger question for designers of social media platforms in respect of the development of tools that appeal primarily to extraverted users. In particular, we question whether the current designs of social media platforms adequately cater for a range of personality traits, or whether the function and purpose of *social* media inherently appeals to extraverts. Would it be possible to design a Facebook for introverts? In fact, do introverts fit the economic model supported by social media? Given the increasing desire by businesses to engage an audience online, perhaps this move towards an 'engagement economy' (Lucas, 2018) where

everyone and everything is connected, and the associated ‘surveillance capitalism’ (Zuboff, 2019) where private companies monetise consumer data, requires and encourages extraversion.

We also draw readers’ attention to some of the methodological issues we have identified. Much of the work we reviewed uses student or social media recruited samples, typically fulfilling the WEIRD sample criteria (Henrich *et al* .2010). Social media use is almost always based on self-report, despite evidence of the unreliability of such measures when people estimate their technology use (Ellis, Davidson, Shaw & Geyer, 2019; Hinds & Joinson, 2019). In many cases, non-significant findings are not presented or discussed at any length. Is there a possibility that the weight placed on the behaviour of extraverts is the result of publication bias? Where non-significant results are found, sometimes ostensibly similar papers produce significant findings elsewhere. This casts doubt on the replicability of some findings, encouraging further investigation of potential moderators or mediators. In these studies, it also appears that neither other traits nor social media use itself are controlled for, meaning that the results do not consider the effect of other traits in combination with extraversion. Similarly, these studies do not appear to control for social media use itself. This means that the high rate of a specific observed behavioural outcomes may actually be intrinsically linked to social media use itself as a mediating variable.

4.2. Limitations and future directions

Although our systematic approach to reviewing these articles has enabled us to explore the key trends and nuances across these studies to date, this research offers no quantifiable means of assessing the strength of effect sizes. Future research could explore such opportunities via

meta-analyses. A meta-analysis may also highlight statistical differences in outcomes due to data collection or sampling differences.

The vast majority of literature (n=101) focuses on Facebook. Just 12 studies investigate Twitter use, six investigate Instagram use and five Weibo. Given the constant evolution of social media, for example with the recent rise of TikTok, there is a need to review the applicability of these findings to a broader range of social media platforms, including how personality is associated with the adoption of different or new platforms. In addition, there is an opportunity for studies employing consistent sampling approaches and methodologies to investigate nuances in extravert behaviour between platforms and to assess the replicability of results across social media.

In relation to the many papers (n=47) where non-significant results are not reported, it is important that future researchers make efforts to demonstrate transparency. One solution attracting attention among researchers of psychology is the concept of 'preregistration' (Nosek et al, 2018) whereby exploratory studies are then followed by replication. We have not identified any evidence of preregistration currently being applied within this body of literature.

Aside from methodological considerations however, within the existing literature discussed there are some clear topics requiring greater investigation. There is an opportunity for further research into the drivers of social online behaviour among extraverts, testing for example whether the positive affect felt by extraverts is because they are social (Fleeson *et al.*, 2002).

Yet, there are also areas where details within the findings do not show obvious support for known offline behaviour, such as the general preference for displaying positive emotion. For example, why are extraverts more likely to post content relating to music, and why do extraverts use sexual words?

The apparent predisposition to post inappropriate content is also counterintuitive given that extraverts are keen to socialise, as is the willingness to disclose information (such as Loiacono *et al.*, 2012) despite concern for privacy settings (such as Kuo & Tang, 2013). Both need further investigation. Future research might also seek to understand the inconsistent findings that extraverts are proactively aggressive online (McCreery & Krach, 2018), yet do not bully (Kokkinos, Baltzidis & Xynogala, 2016), or give 'uncivil' comments (Koban *et al.*, 2018).

Despite the commercial drivers of social media use by organisations, there is also only a small number of studies investigating reaction to marketing content. This is particularly surprising, given the vast sums of money being spent on advertising (PR Newswire, 2019). Coupled with the opportunity to investigate the potential interaction between personality theory and other presentational theories from the behavioural sciences, this is a potentially rich area of research.

4.3. Conclusions

To our knowledge, this is the first literature review to systematically review the relationship between extraversion (according to the five-factor model of personality) and social media use. Whilst it has generally found that some of the trait characteristics relating to extraversion are also present in online behaviour, such as a tendency to display positivity and a desire to socially interact, there are also areas for further research, and at times contradictory results. These include the effect of combining traits and researching models that might amplify the relationship between traits and behaviour. The applications of this work have implications for numerous disciplines including psychology, marketing, healthcare, human computer interaction, and communications. For example, clinical practice may benefit from areas of this

review such as the contradictory evidence on addiction. Given the apparent general high level of use among extraverts though, future research may want to particularly focus on how social media could be better designed to support users who are low in extraversion [introverts] (as well as explore these aspects across other personality traits).

References

Allport, G.W. and Odbert, H.S. (1936) *Trait-Names; a Psycho-Lexical Study. A Study from the Harvard Psychological Laboratory.* Harvard Psychological Laboratory

Andari, E., Schneider, F.C., Mottolese, R., Vindras, P. and Sirigu, A. (2014) Oxytocin's fingerprint in personality traits and regional brain volume. *Cerebral Cortex* (New York, N.Y.: 1991). 24 (2), pp.479-486.

Argyle, M. and Lu, L. (1990) The happiness of extraverts. *Personality and Individual Differences.* 11 (10), pp.1011-1017.

Azucar, D., Marengo, D., & Settanni, M. (2018). Predicting the Big 5 personality traits from digital footprints on social media: A meta-analysis. *Personality and individual differences*, 124, pp.150-159.

Baccarella, C. V., Wagner, T. F., Kietzmann, J. H., & McCarthy, I. P. (2018). Social media? It's serious! Understanding the dark side of social media. *European Management Journal*, 36(4), pp.431-438.

BBC News (2019) Facebook 'to be Fined $5bn Over Cambridge Analytica Scandal'. Retrieved from: https://www.bbc.co.uk/news/world-us-canada-48972327?intlink_from_url=https://www.bbc.co.uk/news/topics/c81zyn0888lt/facebook-cambridge-analytica-scandal&link_location=live-reporting-story .

Bouchard Jr, T.J. and Loehlin, J.C. (2001) Genes, Evolution, and Personality. *Behavior Genetics*. 31 (3), pp.243-273.

Cadwalladr, C. and Graham-Harrison, E. (2018) Facebook and Cambridge Analytica face mounting pressure over data scandal. *The Guardian* [online]. Retrieved from:

https://www.theguardian.com/news/2018/mar/18/cambridge-analytica-and-facebook-accused-of-misleading-mps-over-data-breach .

Canli, T., Zhao, Z., Desmond, J. E., Kang, E., Gross, J., & Gabrieli, J. D. (2001). An fMRI study of personality influences on brain reactivity to emotional stimuli. *Behavioral neuroscience*, 115(1), 33.

Cattell, R.B., Eber, H.W. and Tatsuoka, M.M. (1980) *Handbook of the Sixteen Personality Factor Questionnaire* (16 PF). Champaign, IL: Institute for Personality and Ability Testing, Inc.

Corr, P.J. (2008) *The Reinforcement Sensitivity Theory of Personality* [online]. Cambridge: Cambridge University Press.

Corr, P.J. and Matthews, G. (2009) Editors' general introduction. In: Corr, P.J. and Matthews, G., eds. (2009) *Handbook of Personality Psychology*. Cambridge University Press, pp.xxii-xxxix.

Costa, P.T. and McCrae, R.R. (1980) Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology*. 38 (4), pp.668-678.

Costa, P.T. and McCrae, R.R. (1992a) Four ways five factors are basic. *Personality and Individual Differences*. 13 (6), pp.653-665.

Costa, P.T. and McCrae, R.R. (1992b) Normal Personality Assessment in Clinical Practice: The NEO Personality Inventory. *Psychological Assessment.* 4 (1), pp.5-13.

Cremers, H., van Tol, M., Roelofs, K., Aleman, A., Zitman, F.G., van Buchem, M.A., Veltman, D.J. and van der Wee, N.J.A. (2011) Extraversion is linked to volume of the orbitofrontal cortex and amygdala. *PLoS ONE.* 6 (12), pp.e28421-e28421.

Derryberry, D. and Reed, M.A. (1994) Temperament and Attention: Orienting Toward and Away From Positive and Negative Signals. *Journal of Personality and Social Psychology.* 66 (6), pp.1128-1139.

DeYoung, C. G. (2006). Higher-order factors of the big five in a multi-informant sample. *Journal of Personality and Social Psychology,* 91(6), pp.1138-1151

DeYoung, C. (2013). The neuromodulator of exploration: A unifying theory of the role of dopamine in personality. *Frontiers in Human Neuroscience*, 7, 1-26

DeYoung, C.G., Quilty, L.C. and Peterson, J.B. (2007) Between Facets and Domains: 10 Aspects of the Big Five. *Journal of Personality and Social Psychology.* 93 (5), pp.880-896.

Donnellan, M.B. and Robins, R.W. (2010) Resilient, Overcontrolled, and Undercontrolled Personality Types: Issues and Controversies: Personality Types. *Social and Personality Psychology Compass.* 4 (11), pp.1070-1083.

.

Eaton, L.G. and Funder, D.C. (2003) The creation and consequences of the social world: an interactional analysis of extraversion. *European Journal of Personality.* 17 (5), pp.375-395.

Ellis, D.A., Davidson, B.I., Shaw, H. and Geyer, K. (2019) Do smartphone usage scales predict behavior?, *International Journal of Human - Computer Studies*, vol. 130, pp. 86-92.

Eysenck, H.J.1. (1947) *Dimensions of Personality, a Record of Research Carried Out in Collaboration with H. T. Himmelweit [and Others].* England; United Kingdom: .

Eysenck, H.J. (1992) *A Hundred Years of Personality Research, from Heymans to Modern Times*. Houten: Bohn, Staeu Van Loghum.

Eysenck, H.J., Barrett, P., Wilson, G. and Jackson, C. (1992) Primary trait measurement of the 21 components of the P-E-N system. *European Journal of Psychological Assessment*. 8 (2), pp.109-117.

Facebook (2019) *Facebook FAQs.* Available from: https://investor.fb.com/resources/default.aspx .

Feick, L.F. & Price, L.L. (1987), The Market Maven: A Diffuser of Marketplace *Information, Journal of Marketing,* vol. 51, no. 1, pp. 83-97.

Fiske, D.W. (1949) Consistency of the factorial structures of personality ratings from different sources. *The Journal of Abnormal and Social Psychology.* 44 (3), pp.329-344.

Fleeson, W. (2001). Toward a structure-and process-integrated view of personality: Traits as density distributions of states. *Journal of personality and social psychology*, 80(6), p. 1011.

Fleeson, W., Malanos, A.B. and Achille, N.M. (2002) An Intraindividual Process Approach to the Relationship Between Extraversion and Positive Affect: Is Acting Extraverted as "Good" as Being Extraverted? *Journal of Personality and Social Psychology.* 83 (6), pp.1409-1422.

Franco, A., Malhotra, N., & Simonovits, G. (2014). Publication bias in the social sciences: Unlocking the file drawer. *Science,* 345(6203), 1502-1505.

Goffman, E. (1978). *The presentation of self in everyday life* (p. 56). London: Harmondsworth.

Goldberg, L.R., Johnson, J.A., Eber, H.W., Hogan, R., Ashton, M.C., Cloninger, C.R. & Gough, H.G. (2006), The international personality item pool and the future of public-domain personality measures, *Journal of Research in Personality,* vol. 40, no. 1, pp. 84-96.

Goldberg, L.R. (1981) Developing a Taxonomy of Trait-Descriptive Terms. *New Directions for Methodology of Social & Behavioral Sciences.* 9 pp.43.

Gosling, S.D., Ko, S.J., Mannarelli, T. & Morris, M.E. (2002) A Room With a Cue: Personality Judgments Based on Offices and Bedrooms, *Journal of Personality and Social Psychology,* 82 (3), pp. 379-398.

Gross, J.J., Sutton, S.K. and Ketelaar, T. (1998) Relations between Affect and Personality: Support for the Affect-Level and Affective-Reactivity Views. *Personality and Social Psychology Bulletin.* 24 (3), pp.279-288.

Henrich, J., Heine, S.J. & Norenzayan, A. (2010) The weirdest people in the world?, *Behavioral and Brain Sciences,* 33 (2-3), pp. 61-83.

Hinds, J., & Joinson, A. (2019). Human and computer personality prediction from digital footprints. *Current Directions in Psychological Science,* 28(2), 204-211.

Hinds, J. and Joinson, A.N. (2018) What demographic attributes do our digital footprints reveal? A systematic review. *PloS One*. 13 (11), pp.e0207112.

Jang, K.L., Livesley, W.J., Angleitner, A., Riemann, R. and Vernon, P.A. (2002) Genetic and environmental influences on the covariance of facets defining the domains of the five-factor model of personality. *Personality and Individual Differences.* 33 (1), pp.83-101.

John, O.P., Hampson, S.E. and Goldberg, L.R. (1991) The basic level in personality-trait hierarchies: Studies of trait use and accessibility in different contexts. *Journal of Personality and Social Psychology.* 60 (3), pp.348-361.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. *Handbook of personality: Theory and research*, 2(1999), pp.102-138.

Joinson, A. N. (2008, April). Looking at, looking up or keeping up with people? Motives and use of Facebook. In *Proceedings of the SIGCHI conference on Human Factors in Computing Systems* (pp. 1027-1036).

Jung, C. G. (2014). *The Collected Works of CG Jung: Symbols of Transformation* (Vol. 5). Routledge

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business horizons,* 53(1), pp. 59-68.

Kemp, S., (2019) *Digital 2019* [online]. London: We Are Social. Retrieved from: https://wearesocial.com/global-digital-report-2019

Kirik, A., Arslan, A., Çetinkaya, A., & Mehmet, G. Ü. L. (2015). A quantitative research on the level of social media addiction among young people in Turkey. *International Journal of Sport Culture and Science*, 3(3), 108-122.

Krejcie, R.V. & Morgan, D.W. 1970, "Determining Sample Size for Research Activities", *Educational and Psychological Measurement*, 30 (3), pp. 607-610.

Lucas, S. (2018). *Engage to Win: A Blueprint for Success in the Engagement Economy*. Green Leaf Press.

Lucas, R.E. and Baird, B.M. (2004) Extraversion and Emotional Reactivity. *Journal of Personality and Social Psychology.* 86 (3), pp.473-485.

Martsh, C.T. and Miller, W.R. (1997) Extraversion predicts heavy drinking in college students. *Personality and Individual Differences.* 23 (1), pp.153-155.

Matsa, K.E. & Shearer, E. (2018) *News Use Across Social Media Platforms 2018*, Pew Research Center.

Matz, S.C., Kosinski, M., Nave, G. and Stillwell, D.J. (2017) Psychological targeting as an effective approach to digital mass persuasion. *Proceedings of the National Academy of Sciences of the United States.* 114 (48), pp.12714-12719.

McCrae, R.R. and Costa, P.T. (1997) Personality Trait Structure as a Human Universal. *American Psychologist.* 52 (5), pp.509-516.

McCrae, R.R. and Costa, P.T. (2003) *Personality in Adulthood: A Five-Factor Theory Perspective*. 2nd ed. London; New York: Guilford Press.

McCrae, R.R., Terracciano, A., Costa, P.T. and Ozer, D.J. (2006) Person‐factors in the California Adult Q‐Set: closing the door on personality trait types? *European Journal of Personality*. 20 (1), pp.29-44.

McPherson, M., Smith-Lovin, L. & Cook, J.M. (2001) Birds of a Feather: Homophily in Social Networks, *Annual Review of Sociology*, 27(1), pp. 415-444.

Mehl, M.R., Gosling, S.D. and Pennebaker, J.W. (2006) Personality in Its Natural Habitat: Manifestations and Implicit Folk Theories of Personality in Daily Life. J*ournal of Personality and Social Psychology*. 90 (5), pp.862-877.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine,* 151(4), 264-269.

Mooradian, T.A. (1996) The Five Factor Model and Market Mavenism, *Advances in Consumer Research*, 23, pp. 260.

Munafo, M.R. (2009) Behavioral Genetics: from variance to DNA. In: Corr, P.J. and Matthews, G., eds. (2009) *Handbook of Personality Psychology.* Cambridge University Press, pp.287-304.

Norman, W.T. (1963) Toward an adequate taxonomy of personality attributes: Replicated factor structure in peer nomination personality ratings. *The Journal of Abnormal and Social Psychology.* 66 (6), pp.574-583.

Norman, W.T. (1967) *2800 Personality Trait Descriptors: Normative Operating Characteristics for a University Population*. United States: University of Michigan.

Nosek, B. A., Ebersole, C. R., DeHaven, A. C., & Mellor, D. T. (2018). The preregistration revolution. *Proceedings of the National Academy of Sciences,* 115(11), pp.2600-2606.

Nuzzo, R. (2014). Scientific method: statistical errors. *Nature News,* 506(7487), 150.

Olson, K.R. and Weber, D.A. (2004) Relations between Big Five Traits and Fundamental Motives. *Psychological Reports.* 95 (3), pp.795-802.

Omura, K., Todd Constable, R. and Canli, T. (2005) Amygdala gray matter concentration is associated with extraversion and neuroticism. *Neuroreport.* 16 (17), pp.1905-1908.

Paunonen, S.V. (2003) Big Five Factors of Personality and Replicated Predictions of Behavior. *Journal of Personality and Social Psychology.* 84 (2), pp.411-424.

PR Newswire. (2019) Facebook Reports Fourth Quarter and Full Year 2018 Results. *PR Newswire* [online]. Retrieved from: https://investor.fb.com/investor-news/press-release-details/2019/Facebook-Reports-Fourth-Quarter-and-Full-Year-2018-Results/default.aspx

Rauch, S.L., Milad, M.R., Orr, S.P., Quinn, B.T., Fischl, B. and Pitman, R.K. (2005) Orbitofrontal thickness, retention of fear extinction, and extraversion. *Neuroreport*. 16 (17), pp.1909-1912.

Roberts, B.W. and Robins, R.W. (2004) Person‐Environment Fit and Its Implications for Personality Development: A Longitudinal Study. *Journal of Personality.* 72 (1), pp.89-110.

Rosenberg, E.L. (1998) Levels of Analysis and the Organization of Affect. *Review of General Psychology*. 2 (3), pp.247-270.

Rothbart, M.K., Ahadi, S.A. and Evans, D.E. (2000) Temperament and Personality: Origins and Outcomes. *Journal of Personality and Social Psychology.* 78 (1), pp.122-135.

Seidman, G. (2013) Self-presentation and belonging on Facebook: How personality influences social media use and motivations. *Personality and Individual Differences* [online]. 54 (3), pp.402-407. [Accessed 1 July 2019].

Spark, A., Stansmore, T. and O'Connor, P. (2018) The failure of introverts to emerge as leaders: The role of forecasted affect. *Personality and Individual Differences.* 121 pp.84-88.

Specht, J., Specht, J., Luhmann, B.M., Luhmann, M., Luhmann, M., Geiser, C. and Geiser, C. (2014) On the consistency of personality types across adulthood: Latent profile analyses in two large-scale panel studies. *Journal of Personality and Social Psychology*. 107 (3), pp.540-556.

Steenkamp, J.E.M. & Maydeu-Olivares, A. (2015), Stability and Change in Consumer Traits: Evidence from a 12-Year Longitudinal Study, 2002-2013, J*ournal of Marketing Research,* 52 (3), pp. 287-308.

Tadesse, M.M., Lin, H., Xu, B. and Yang, L. (2018) Personality Predictions Based on User Behavior on the Facebook Social Media Platform. *IEEE Access.* 6 pp.61959-61969.

Thacker, S., & Griffiths, M. D. (2012). An exploratory study of trolling in online video gaming. *International Journal of Cyber Behavior, Psychology and Learning (IJCBPL)*, 2(4), 17-33.

Tskhay, K. O., & Rule, N. O. (2014). Perceptions of personality in text-based media and OSN: A meta-analysis. *Journal of Research in Personality,* 49, 25-30.

Uziel, L. (2006) The extraverted and the neurotic glasses are of different colors. *Personality and Individual Differences.* 41 (4), pp.745-754.

Wacker, J. and Smillie, L.D. (2015) Trait Extraversion and Dopamine Function. *Social and Personality Psychology Compass.* 9 (6), pp.225-238.

Watson, D. and Clark, L.A. (1992) On Traits and Temperament: General and Specific Factors of Emotional Experience and Their Relation to the Five-Factor Model. *Journal of Personality.* 60 (2), pp.441-476.

Watson, D. and Clark, L.A. (1997) Chapter 29 - Extraversion and Its Positive Emotional Core. In: *Handbook of Personality Psychology* (1997). Academic Press, pp.767-793.

Wilt, J. and Revelle, W. (2009) Extraversion. In: Leary, M.R. and Hoyle, R.H. 2009, *Handbook of Individual Differences in Social Behavior*, Guilford Publications, New York.

Wilt, J. and Revelle, W. (2017) Extraversion. In Widiger, T.A. *The Oxford Handbook of the Five Factor Model of Personality*, 1st edn, Oxford University Press.

Wilt, J. and Revelle, W. (2019) The Big Five, everyday contexts and activities, and affective experience. *Personality and Individual Differences*. 136 pp.140-147.

Zuboff, S. (2019). *The age of surveillance capitalism: The fight for a human future at the new frontier of power.* Profile Books.

Tables

Table 1

Focus, method, and sample of studies. Please note that the sample of some studies included more than one group of people.

Social media platform	**Data collection method**	**Included in sample**
Facebook (101)	Questionnaire (71) MyPersonality database (16) Observational data (5) Content analysis (3) Creation of an app (3) Experiment (1) Photo evaluation (1) Interview (1)	Students (55) Facebook users (28) Not reported (7) US public (2) Taiwanese public (2) Greek public (1) Malaysian public (1) New Zealand public (1) Turkish public (1) Social media users in South East Asia (1) Twitter users (1) Reddit users (1) Social networks users (1) Teenagers (1) KnowledgePanel (1) Qualtrics panel (1)
Twitter (12)	Questionnaire (6) Content analysis (3) Observational data (2) Lab experiment (1)	Students (4) Twitter users (4) Not reported (2) Qualtrics panel (1) Macromill (1) Facebook users (1) Google+ users (1)
Instagram (6)	Questionnaire (4) Content analysis (2)	Students (3) Instagram users (1) Facebook users (1) Amazon MTurk (1) Social network users (1)
Weibo (5)	Questionnaire (2) Access to the Weibo API (2) Content analysis (1)	Weibo users (4) Not reported (1)
RenRen (4)	Questionnaire (2) Content analysis (2)	Students (3) Not reported (1)
WeChat (3)	Questionnaire (3)	Students (3)
YouTube (2)	Questionnaire (2)	Students (2)
Google+ (1)	Questionnaire (1)	Twitter users (1)

		Google+ users (1)
LINE (1)	Questionnaire (1)	Facebook users (1)
LinkedIn (1)	Questionnaire (1)	Not reported (1)
Pinterest (1)	Questionnaire (1)	US public (1)
StudiVZ (1)	Content analysis (1)	StudiVZ users (1)
Tumblr (1)	Questionnaire (1)	Students (1)
Xing (1)	Questionnaire (1)	Students (1)
YikYak (1)	Questionnaire (1)	Students (1)

Table 2

Codes and themes identified

Theme	Code	Quantity	Self-reported outcome	Total sample size	Non-significant results reported	Example
Patterns of use	Duration of session	1	1	654	1	Caci B., Cardaci M., Tabacchi M.E., Scrima F. (2014)
	Direct messaging	3	3	845	2	Wang L., Qu W., Sun X. (2013)
	Events	1	1	111	1	Tsai T.-H., Chang H.-T., Chang Y.-C., Chang Y.-S. (2017)
	Feature use	5	4	2,369	3	Deng S., Liu Y., Li H., Hu F. (2013)
	FOMO	1	1	207	1	Blackwell D., Leaman C., Tramposch R., Osborne C., Liss M. (2017)
	Frequency of use	16	15	8,172	12	Correa T., Hinsley A.W., de Zúñiga H.G (2010)
	Games	2	2	593	2	Shi Y., Yue X., He J. (2013)
	Groups	9	7	4,181,236	9	Ross C., Orr E.S., Sisic M., Arseneault J.M., Simmering M.G., Orr R.R. (2009)
	Location usage	1	0	218	1	Chorley M.J., Whitaker R.M., Allen S.M. (2015)
	Search	1	1	215	0	Uesugi S. (2011)
	Social use	1	1	300	1	Hughes D.J., Rowe M., Batey M., Lee A. (2012)
	Time spent	20	20	19,426	18	Wilson K., Fornasier S., White K.M. (2010)
	Use of social media (membership)	4	4	3,104	4	Ryan T., Xenos S. (2011)
	Video consumption	1	1	656	0	Yeo T.E.D. (2010)
User profile characteristics	Geographical distance	1	0	313,669	1	Noë N., Whitaker R.M., Allen S.M. (2018)
	Homophily	3	1	323393	3	Lönnqvist J.-E., Itkonen J.V.A. (2016)
	Music preference	1	1	22,252	0	Nave G., Minxha J., Greenberg D.M., Kosinski M., Stillwell D., Rentfrow J. (2018)

	Network size	34	24	4,675,344	31	Bachrach Y., Kosinski M., Graepel T., Kohli P., Stillwell D. (2012)
	Profile content	1	0	28	1	Hall J.A., Pennington N., Lueders A. (2014)
	Profile image	8	5	15,058	4	Wu Y.-C.J., Chang W.-H., Yuan C.-H. (2015)
	Profile updates	2	2	1,320	2	Bogg T. (2017)
Content creation	Broadcasting behaviour	1	1	269	1	Kabadayi S., Price K. (2014)
	Emotion	3	0	10,005,893	2	McCann S.J.H. (2014)
	Exhibitionism	1	1	810	0	Wang D. (2017)
	Images posted	12	8	182,706	9	Muscanell N.L., Guadagno R.E. (2012)
	Language	1	1	164	0	Kao P.C., Craigie P. (2014)
	Questions	1	1	145	1	Katrimpouza A., Tselios N., Kasimati M.C. (2017)
	Selfie use	7	7	3,215	4	Sorokowska A., Oleszkiewicz A., Frackowiak T., Pisanski K., Chmiel A., Sorokowski P. (2016)
	Self-presentation	1	1	184	1	Seidman, G. (2013)
	Topic	7	4	74,019	6	Marshall T.C., Lefringhausen K., Ferenczi N (2015)
	Update frequency	18	13	4,186,392	15	Wang J.-L., Jackson L.A., Zhang D.-J., Su Z.-Q. (2012)
	Video posted	2	0	1,457	1	Eftekhar A., Fullwood C., Morris N. (2014)
	Word use	11	1	154,928	10	Schwartz H.A., Eichstaedt J.C., Kern M.L., Dziurzynski L., Ramones S.M., Agrawal M., Shah A., Kosinski M., Stillwell D., Seligman M.E.P., Ungar L.H. (2013)
Reaction to content	Buying	1	1	808	1	Leong L.-Y., Jaafar N.I., Sulaiman A. (2017)
	Commenting	12	10	3,326	11	Große Deters F., Mehl M.R., Eid M. (2016)
	Emoticon use	2	0	86,730	1	Oleszkiewicz A., Karwowski M., Pisanski K., Sorokowski P., Sobrado B., Sorokowska A. (2017)
	Immediate response	1	1	283	1	Mori K., Umemura H. (2017)
	Liking	4	2	181,621	4	Lee E., Ahn J., Kim Y.J. (2014)
	Political engagement	1	1	345	1	Quintelier E., Theocharis Y. (2013)

	Rating retailers	1	1	122	1	Hu R., Pu P. (2013)
	Response to adverts	4	3	3,130,851	1	Clark L., Çalli L. (2014)
	Sharing	7	6	1,316	4	Hodas N.O., Butner R., Corley C. (2016)
	Use of stickers	1	1	452	0	Chang Y.-C., Lee J. (2016)
Perceptions of social media	Envy	1	1	625	1	Wallace L., James T.L., Warkentin M. (2017)
	Grieving	1	1	158	0	Kuznetsova E., Ronzhyn A. (2016)
	Motivation to use	16	16	6,689	12	Orchard L.J., Fullwood C., Galbraith N., Morris N. (2014)
	Platform perception	8	8	2,429	5	Pentina I., Zhang L., Basmanova O. (2013)
	Privacy conscious	10	9	2,835	5	Amichai-Hamburger Y., Vinitzky G. (2010)
	Reaction to monitoring	1	1	240	1	Sayre G.M., Dahling J.J. (2016)
	Self-disclosure	11	10	4,026	9	Hollenbaugh E.E., Ferris A.L. (2014)
	Social etiquette	1	1	184	1	Seidman,G. (2013)
	Social or informational use	1	1	492	1	Eşkisu M., Hoşoğlu R., Rasmussen K. (2017)
	Social support	1	1	278	1	Giota K.G., Kleftaras G. (2013)
	Support satisfaction	1	1	460	1	Pornsakulvanich V. (2017)
Aggression, trolling and excessive use	Aggression	1	1	106	1	McCreery M.P., Krach S. (2016)
	Excessive use	22	22	16,460	22	Wang C.-W., Ho R.T.H., Chan C.L.W., Tse S. (2015)
	Trolling	4	4	1,151	2	Kokkinos C.M., Baltzidis E., Xynogala D. (2016)

Figures

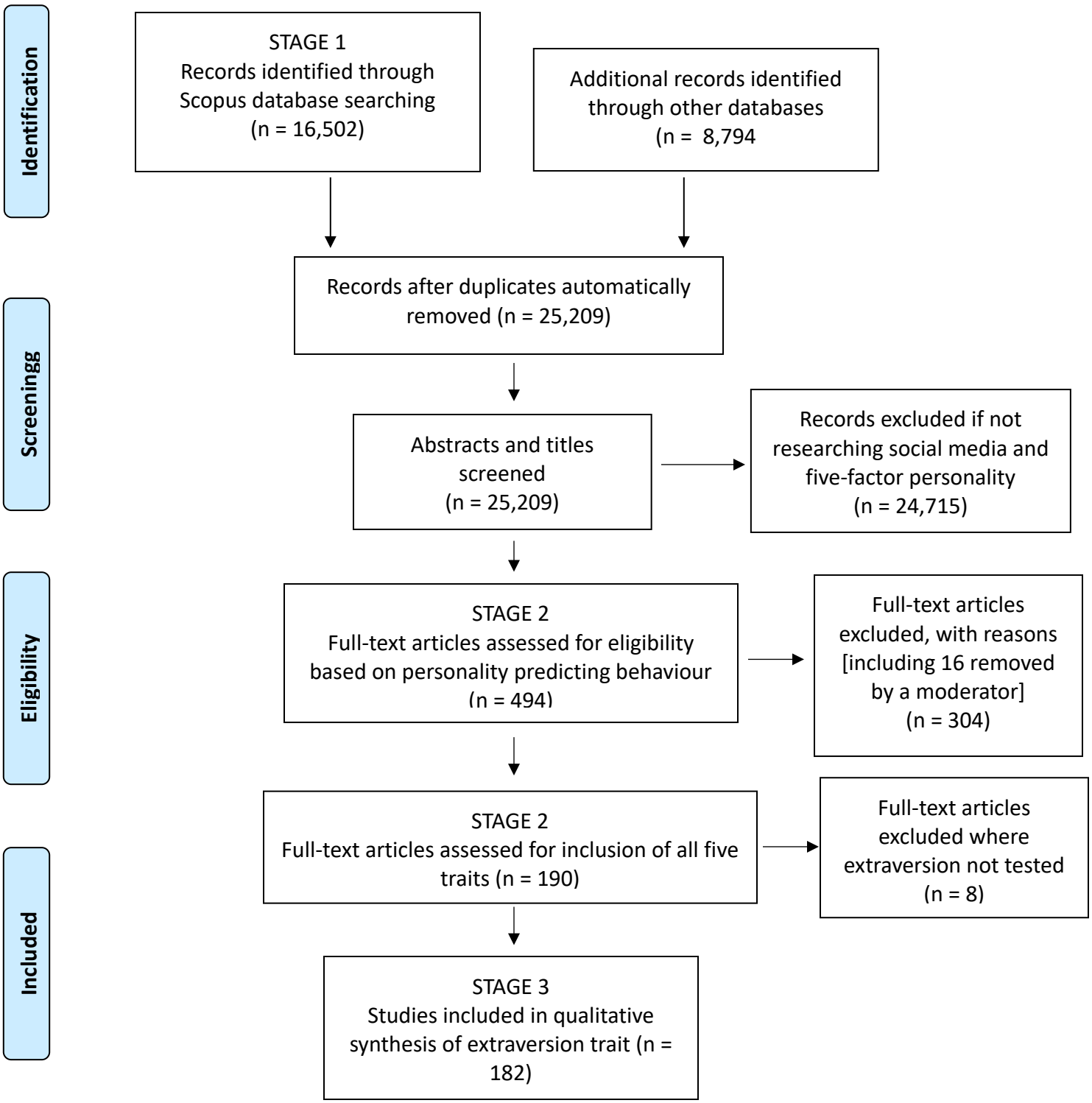

Figure 1. PRISMA flow diagram

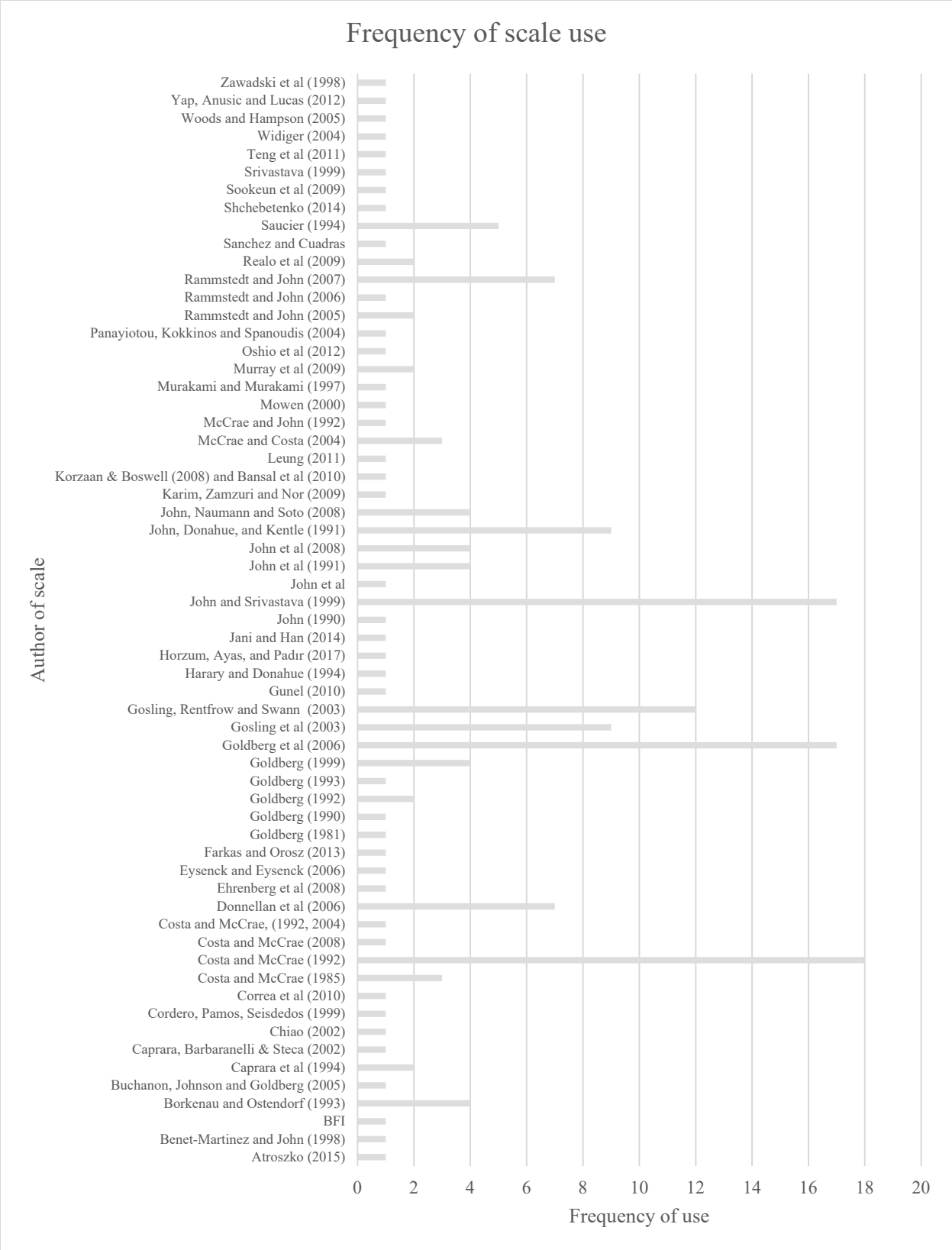

Figure 1. Frequency of scale use for Big 5 measures