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# An exploratory factor analysis of the Nerdy Personality Attributes Scale in a sample of self-identified nerds/geeks

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## ABSTRACT

In the past, the terms ‘geek’ and ‘nerd’ had negative social connotations, but so-called ‘Geek’ subculture is becoming increasingly mainstream, and its social and economic influence is expanding. There has been very little psychological research into this subculture and its associated personality types, but some authors have reported links with narcissism, extraversion, openness to experience, depression and subjective wellbeing. In a sample of 425 self-identified geeks/nerds registered with the Facebook community Geek Asylum and the Facebook page of the Manchester 2019 Comic-Con, we explored the factor structure of the Nerdy Personality Attributes Scale. Using exploratory factor analysis, we find that the scale items load onto three factors – ‘Social awkwardness’, ‘Interest in learning and science’ and ‘Interest in books’, with all correlating weakly to moderately with self-reported nerdiness. This scale may form a useful starting point to further assess the personality and behavioural characteristics of nerdiness.

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## Introduction

One of the challenges faced by individuals in (radicalised) Modern societies is the construction of one’s own identity (e.g., Bauman, 1988; Giddens, 1991). One source via which individuals can construct their own identity is via consumption (e.g., Campbell, 1995; Warde, 2005), including cultural consumption. Many social theorists, including, for example, Baudrillard (1970) and Bourdieu (1979), argue that such consumption is also an act of communication, a cultural discourse (review in Featherstone, 2007). Media play a fundamental role in the (re)production of such cultural discourses (e.g., Hall, 1997), including those of youth subcultures.

Studies of youth subcultures have traditionally been strongly focused on popular music preferences and their associated fashions (e.g., Bennett, 1999, review in Bucholtz, 2002). More recent analyses have, however, concentrated on a much broader range of subcultural affiliations reflecting the negotiations of social identities within various cliques or groups (e.g., Hodgkinson, 2002; McArthur, 2009). One highly influential subculture is that of the nerd/geek (e.g., Kendall, 1999; Lane, 2017; Woo, 2015). Both terms have less than positive origins, with the term ‘geek’ initially referring to a carnival sideshow freak (Sugarbaker, 1998), and the term ‘nerd’ referring to a socially awkward and overly intellectual student (e.g., Tocci, 2009; Yu, 2007). Now, both terms are often used interchangeably to refer to an individual who is enthusiastic and highly knowledgeable about science/technology/engineering; and who is also devoted to a range of interests associated with science fiction/fantasy/digital realms, such as, for example, Star Trek/Star Wars, Japanese animation, comic books, costume-play (cosplay), fantasy gaming and role-playing games, etc. (reviews in McCain et al., 2015; Woo, 2015). While the stereotypical geek is often depicted as a heterosexual white male (the so-called ‘geek masculinity’ – Braithwaite, 2016; Kendall, 2011; Murray, 1993;

A. Salter & Blodgett, 2017), research is increasingly reflecting the significant contribution of females to geek culture (Cameron, 2019; M. Salter, 2018), with ‘geek feminism’ attaining increasing prominence (Reagle, 2017).

While such interests and activities were once marginalised, science-fiction and fantasy-themed video games and comic book movie adaptations are multi-billion dollar industries. For example, from its small beginnings in San Diego in 1970 as a comic book convention (review in Woo et al., 2020), ‘Comic Con’ is now the largest convention of its kind in the world, hosting over 130,000 attendees, generating over 150 USD million in revenue, and has diversified into a broad pop-cultural phenomenon covering horror, anime, manga, toys, collector’s cards, video games, and cosplay (<https://www.comic-con.org/about>). The video games industry itself contributes around 11.7 USD billion to the United States economy and video gaming is considered a ‘regular’ activity in 65% of households (Entertainment Software Industry, 2019). The expansion of this industry has led researchers to question whether geek/nerd culture remains a subculture or is now mainstream (Woo, 2015).

Despite the growing popularity and influence of so-called ‘geek culture’ in industry, comparatively little attention has been paid to it by the social sciences. Anthropologists, sociologists and communication/media researchers have focussed on the reasons for its growing appeal (e.g., Lane, 2017; Tocci, 2009), but also on the intersections between nerd/geek identity and the constructs of race and gender (e.g., Bucholtz, 2001; Eglash, 2002; Kendall, 2011). In anthropology and sociology, research has focussed on the process associated with identity construction of geeks/nerds (e.g., Eglash, 2002; Kinney, 1993). In communication/media studies, research has tended to focus on the dynamics of (participatory) fandom (e.g., Booth, 2018; Duffett, 2013; Shefrin, 2004), but has also explored the depiction of nerds/geeks in popular media (e.g., Quail, 2011). For example, scholars have discussed masculinity and gender stereotypes in ‘Big Bang Theory’ (e.g., Blosser, 2018; Morgan, 2014; Sartain, 2015; Weitekamp, 2015).

Given the depiction of a consistent, but stereotypical, personality type of nerds/geeks, and the finding that adolescents recognise and label such personality types (e.g., Kinney, 1993), characterising it with traits, such as, shyness, pedantism, quirkiness, it is interesting that there is relatively little psychological research. In particular, there is a paucity of research in the field of the psychology of individual differences. One line of inquiry has suggested that geekiness is associated with the autism spectrum – reflecting the stereotypical geek as being brilliant with science/technology but inadequate in social graces and awareness (Baron-Cohen, 2012 but see Draaisma, 2009). In a sample of males self-identifying with autism and asked to select a series of personality traits from an online dating website, two of the most popular selections were ‘gamer’ and ‘geek’ (Gavin, Rees-Evans, Brosnan et al., 2019; also see Gavin, Rees-Evans, Duckett et al., 2019). Several hypotheses have been proposed to account for why an individual might engage in geek culture, with the personality trait of narcissism emerging as a key predictor variable (e.g., Andrews & McCann, 2020; McCain et al., 2015; Stopfer et al., 2015). For example, McCain et al. (2015) relying on several large samples of self-identified geeks have reported significant positive associations between scores on the Narcissistic Personality Inventory (NPI) and self-identified geekiness (measured by the Geek Culture Engagement Scale: GCES and the Geek Identity Scale: GIS), independent of other demographic variables. These authors also reported that geekiness was associated with extraversion, openness, sub-clinical depression, and subjective wellbeing, which makes greater understanding of geekiness, and its possible personality/behavioural correlates, particularly relevant to personality and clinical psychologists alike.

An alternative assessment of individual differences in geekiness is the 26-item Nerdy Personality Attributes Scale (NPAS), a non-psychometrically validated scale reported on the Open Source Psychometrics Project (<https://openpsychometrics.org/>). This scale was developed in 2015 to quantify what ‘nerdiness’ is. An initial 445 items were presented to online participants (ranging in N from 161–13,543) and each item correlated with two assessments of self-reported nerdiness; the top 26 items correlating highest with the two self-reported nerdiness measures being used in the final version of the scale.

The aim of this study was to investigate the psychometric properties of the NPAS via exploratory factor analysis in order to establish the possibility of using this questionnaire to investigate potential links between nerdiness/geekiness and other psychological/behavioural characteristics in future studies.

## Method

### *Participants and procedure*

Participants consisted of a convenience sample. Participants were recruited via two Facebook pages. The first page is the Facebook community page of Geek Asylum (<https://www.facebook.com/groups/geekasylum/>) which has over 32,000 members and lists as their description: 'Welcome to the Geek Asylum! We're a Facebook community for geeks all over the world into Marvel, DC, Disney, Star Wars, Dr Who, Anime, Console gaming, Cosplaying and crafts to do with these fandoms!'. The second page is the Facebook page of the Manchester 2019 Comic-Con (>24,000 follows, <https://www.facebook.com/ManchesterComicCon/>), the site does not provide a further description apart from contact details and a link to an external page (<https://www.mcmcomiccon.com/manchester>). These Facebook sites were chosen due to their size, location, and engagement with these sites by the first author, therefore allowing us to advertise the study.

The study was approved by the local ethics committee of the first author's institution. Participants had to self-identify as nerd/geek in order to take part and also had to be aged 18 or over. Participants completed the survey online via Qualtrics (Qualtrics, 2020), after having clicked a link in the study advert. After providing informed consent, 472 participants completed the survey, the vast majority of participants were currently residing in the UK ( $N = 426$ , 90%). We therefore chose to restrict our sample to those participants residing in the UK, in order to achieve a more homogeneous sample. We excluded one participant who listed their age as 15 years old, as our exclusion criteria stated we would remove these participants who were below 18 years of age. There were 314 participants who identified themselves as female, 102 as male, and 9 who preferred not to say or indicated 'other' ( $M = 30.45$  years;  $SD = 8.74$  years).

### *Materials*

Participants completed the 26-item Nerdy Personality Attributes Scale (NPAS) measure (Open Psychometrics, 2015), which is summarised in Table 1 and rated on a 1 (Disagree) to 5 scale (Agree) and sociodemographic measures (e.g., age, gender, educational attainment). Participants also indicated how much of a self-identified nerd they were ('I see myself as nerdy') on a 1 (Disagree strongly) to 7 (Agree strongly) scale ( $M = 6.195$ ;  $SD = .930$ ) and a personality questionnaire (not discussed here, Gosling et al., 2003). The full questionnaire used and data can be found on the Open Science Framework (<https://osf.io/5njdx/>).

### *Analysis*

To our knowledge, the NPAS measure has not been validated. We therefore performed exploratory factor analysis (Mair, 2018) in the programming language R (3.5.1) using the 'psych' package (Revelle, 2016). The purpose of this exploratory factor analysis is to evaluate if and how the 26 items can be meaningfully grouped together. As this was an exploratory analysis, we performed factor analysis with varimax rotation, using the minimum residual ('minres') method. A varimax rotation is among the most common methods for factor extraction (Mulaik, 2009). Simply put, this technique maximises the degree to which factors are distinct from each other ('orthogonal'). As our research is exploratory, we also ran an oblique rotation (oblimin), which

**Table 1.** Factor loadings for NPAS-26 (Loadings >.4 bolded).

	NPAS Item	Factor 1	Factor 2	Factor 3
1	I am interested in science.	<b>0.643</b>	−0.093	0.005
2	I was in advanced classes.	<b>0.461</b>	−0.141	0.118
3	I like to play RPGs. (Ex. D&D)	<b>0.459</b>	0.289	−0.136
4	My appearance is not as important as my intelligence.	0.252	0.084	0.237
5	I collect books.	0.061	0.035	<b>0.567</b>
6	I prefer academic success to social success.	0.308	0.212	0.354
7	I watch science related shows.	<b>0.591</b>	−0.041	0.113
8	I spend recreational time researching topics others might find dry or overly rigorous.	<b>0.490</b>	0.137	0.267
9	I like science fiction.	0.310	0.116	0.074
10	I would rather read a book than go to a party.	−0.009	0.291	<b>0.637</b>
11	I am more comfortable with my hobbies than I am with other people.	−0.041	<b>0.597</b>	0.337
12	I spend more time at the library than any other public place.	0.057	0.183	<b>0.511</b>
13	I would describe my smarts as bookish.	0.220	0.039	<b>0.680</b>
14	I like to read technology news reports.	<b>0.568</b>	0.036	0.005
15	I have started writing a novel.	0.161	0.161	0.233
16	I gravitate towards introspection.	0.180	0.233	0.271
17	I am more comfortable interacting online than in person.	−0.049	<b>0.564</b>	0.150
18	I love to read challenging material.	<b>0.455</b>	0.029	0.370
19	I have played a lot of video games.	0.316	<b>0.400</b>	−0.227
20	I was a very odd child.	0.213	<b>0.550</b>	0.070
21	I sometimes prefer fictional people to real ones.	0.016	<b>0.613</b>	0.253
22	I enjoy learning more than I need to.	<b>0.483</b>	0.197	0.338
23	I get excited about my ideas and research.	<b>0.436</b>	0.256	0.211
24	I am a strange person.	0.116	<b>0.571</b>	0.068
25	I care about super heroes.	0.017	0.347	0.058
26	I can be socially awkward at times.	0.003	<b>0.641</b>	0.158

allows factors to be correlated. This approach revealed some changes, but the same structure and largely the same magnitudes (reported in full at the Open Science Framework (OSF, <https://osf.io/5njdx/>). The data and analysis document can be found on the OSF.

## Results

### Factorability

The Bartlett test (Bartlett's  $\chi^2(25) = 622.07, p < .0001$ ) indicated that the 26 items were factorable. The Kaiser-Mayer-Olkin test for factor adequacy also suggested good factorability (all items  $\geq .71$ ).

### Exploratory factor analysis

Parallel analysis suggested up to six factors (Horn, 1965), but as suggested by Revelle (2015) for larger samples, such as ours, this approach will lead to too many factors. The Very Simple Structure tests suggested either one or four factors (Revelle & Rocklin, 1979). The scree plot indicated three factors (Figure 1). Similarly, the Kaiser criterion (Eigenvalue > 1, Kaiser, 1960) and the Velicer MAP test (Velicer, 1976) pointed to three factors. We therefore settled on three factors which explained 32% of the total variance (RMSEA = .069; TLI = .764). Table 1 shows the items and the three factors. These factors can be tentatively labelled as 'Interest in learning and science', 'Social awkwardness', and 'interest in books'. However, there were several items which did not load well onto any particular factor, therefore we removed items which did not load >.4 (Comrey & Lee, 2013) and reran our factor analysis.

### Exploratory factor analysis – reduced items

Table 2 contains the factor loadings for the factors based on the reduction of the original set of items. These three factors explain 37% of total variance (RMSEA = .082; TLI = .765). These factors can be tentatively

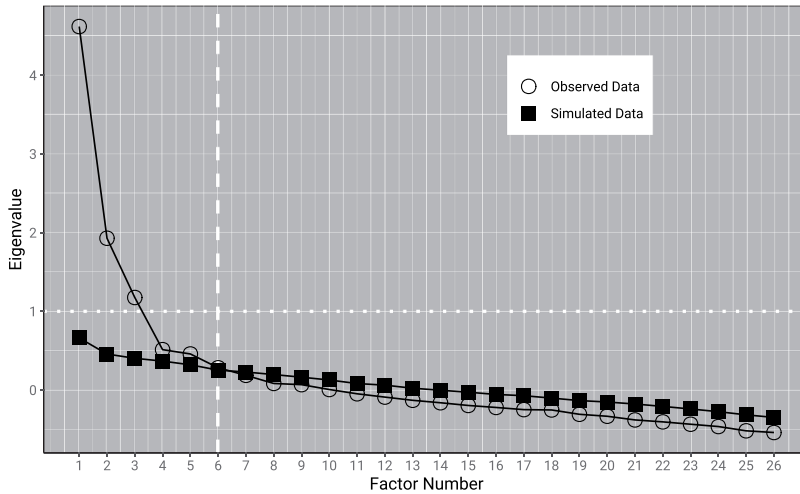


Figure 1. Parallel analysis for NPAS.

Table 2. Factor loadings for revised NPAS (Loadings >.4 bolded, with the exception of item of item 14, .398).

NPAS Item	Social awkwardness	Learning & Science	Books
1 I am interested in science.	-0.077	<b>0.624</b>	-0.013
2 I was in advanced classes.	-0.120	<b>0.474</b>	0.085
3 I like to play RPGs. (Ex. D&D)	0.291	<b>0.432</b>	-0.141
4 I collect books.	0.040	0.079	<b>0.600</b>
5 I watch science related shows.	-0.034	<b>0.579</b>	0.097
6 I spend recreational time researching topics others might find dry or overly rigorous.	0.173	<b>0.503</b>	0.228
7 I would rather read a book than go to a party.	0.302	0.001	<b>0.636</b>
8 I am more comfortable with my hobbies than I am with other people.	<b>0.608</b>	-0.052	0.317
9 I spend more time at the library than any other public place.	0.193	0.076	<b>0.496</b>
10 I would describe my smarts as bookish.	0.066	0.253	<b>0.682</b>
11 I like to read technology news reports.	0.059	<b>0.562</b>	-0.036
12 I am more comfortable interacting online than in person.	<b>0.567</b>	-0.067	0.111
13 I love to read challenging material.	0.049	<b>0.488</b>	0.359
14 I have played a lot of video games.	<b>0.398</b>	0.296	-0.226
15 I was a very odd child.	<b>0.564</b>	0.217	0.053
16 I sometimes prefer fictional people to real ones.	<b>0.602</b>	0.003	0.237
17 I enjoy learning more than I need to.	0.222	<b>0.496</b>	0.300
18 I get excited about my ideas and research.	0.277	<b>0.458</b>	0.180
19 I am a strange person.	<b>0.579</b>	0.108	0.049
20 I can be socially awkward at times.	<b>0.647</b>	-0.013	0.150

labelled as ‘Social awkwardness’, ‘Interest in learning and science’ and ‘Interest in books’ (notice the different ordering). One item scored slightly below the cutoff of .4 (*I have played a lot of video games.*).

### Correlations with self-identified nerdiness

All three factors correlated weakly to moderately with self-identified nerdiness (all  $p$ 's <.001). Among the three correlations, Social Awkwardness correlated the weakest with self-identified nerdiness (Pearson  $r = .17$ , 95% CI = .08 to .26). This was followed by an Interest in Books

(Pearson  $r = .19$ , 95% CI = .10 to .28), which was of similar strength. The strongest association was between 'Interest in learning and science' and self-identified nerdiness (Pearson  $r = .32$ , 95% CI = .23 to .40).

## Discussion

So-called 'Geek' subculture is becoming increasingly mainstream, and its social and economic influence is rapidly growing. In contrast, there has been very little psychological research into this subculture and its associated personality types, but its apparent links with narcissism, extraversion, openness to experience, depression and subjective wellbeing (McCain et al., 2015), mean that further research is timely. As a starting point for additional research it is important to be able to measure the personality attributes of geek/nerd subculture. Here, we explored the factor structure of an existing (unpublished) scale, the 26-item Nerdy Personality Attributes Scale reported on the Open Source Psychometrics Project (<https://openpsychometrics.org/>). We find that the scale items load onto three factors, which we labelled: 'Social awkwardness', 'Interest in learning and science' and 'Interest in books', with all correlating weakly to moderately with self-reported nerdiness. Our three factor structure explained 37% of the total variance which suggests that the scale, with some further revision, may form a useful tool to begin to further assess the personality and behavioural characteristics of nerdiness. The NPAS measure could be used alongside measures tapping more directly into the social identity of popular culture fans (Vinney et al., 2019).

A limitation is that there is potential range restriction in self-reported nerdiness (Sackett & Yang, 2000), most individuals scored close to the maximum of the scale (but see OSF for additional analyses). We have also not differentiated further within our sample based on further subcultures. A broad range of subcultures as diverse as Sherlockians (Pearson, 2007), Potterheads (Peyron, 2018), Tolkieners (Peyron, 2018), Whedonites (McCormick, 2018), Trekkies (Pearson, 2007), Whovians (Vargas-Barraza et al., 2017), Bronies (Edwards et al., 2019), all fit under the broad label of 'geek/nerd'. Moreover, we did not examine how our sample of self-identified geeks or nerds perceive themselves in relation to mainstream culture (Quail, 2011). An additional limitation is the composition of our sample. It is a convenience sample and in addition our sample is restricted to the UK. It is therefore unclear whether these findings generalise to other countries (Henrich et al., 2010; Simons et al., 2017). For example, it is currently unclear whether nerd/geek culture is the same between for example, the US and the UK. It is necessary to establish the degree to which these constructs are the same in each culture (Byrne & Campbell, 1999). Finally, it is possible that the factor structure we found within a 'nerd/geek' population could be very different from the general population. Future work is also necessary to establish whether a distinct nerdy personality exists and how it relates to 'traditional' personality models such as the 'big five' (John & Srivastava, 1999) or 'big six' (Ashton & Lee, 2007) and/or traits of interest such as narcissism (e.g., Andrews & McCann, 2020). For now, we propose that a fruitful avenue could be to further explore these three proposed factors which we uncovered via exploratory factor analysis from NPAS items: 'Social awkwardness', 'Interest in learning and science' and 'Interest in books'.

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