Individual difference in perceptions of social presence

Research Article

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Individual Differences in Perceptions of Social Presence: Exploring the Role of Personality in Online Distance Learning

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Abstract: Social presence is a central concept relating to interpersonal aspects in online distance learning. However, the conditions and determinants of its emergence are not yet fully understood. As a construct rooted in social psychology, the potential of individual differences predicting perceptions of social presence has been largely neglected, thus, constituting a gap in our understanding. In a sample of 201 online distance education students, the merits of a trait-level view of social presence were investigated. To this end, personality was assessed using the Big Five personality inventory, exploring both a dimensional and a typological approach. Results suggest that specific personality typologies may be more prone to perceptions of social presence, thus calling for an extension of our theoretical modeling of the construct.

Keywords: social presence, personality, big five, online distance learning, personality types

1 Introduction

Today, distance education programs rely primarily on online technology to deliver instruction and mediate learning activities; hence, the term online distance learning (Chandrasekaran, Badwal, Littlefair, & Mühlfelder, 2016). However, there are concerns leveled at this mediated nature of learning. One such concern is that online and distance students may feel socially isolated or disconnected from fellow students (Rovai & Wighting, 2005; Boling, Hough, Krinsky, Saleem, & Stevens, 2012; Symeonides & Childs, 2015; Stürmer, Ihme, Fisseler, Sonnenberg, & Barbarino, 2018). Where face-to-face situations offer a rich social context and various avenues for non-mediated communication, online and distance learning often does not provide these perks. In online distance learning, social interaction with peers and instructors relies entirely on technology for mediation (Hillman, Willis, & Gunawardena, 1995; Weidlich & Bastiaens, 2018). Communication technologies in these learning contexts are often text-based and, thus, constrained in the number of social cues they can convey, compared to face-to-face settings. Due to this, rich socio-emotional experiences are more challenging to develop and sustain in online distance learning. Given the recent widespread adoption of remote learning and the central role of learning technologies as a result of this (Pelletier et al., 2021), it appears pertinent to investigate these socio-emotional aspects more deeply.

Social presence is a central concept to explain the challenges associated with the socio-emotional realm of online distance learning. It is a popular and widely-researched concept on how students interact with and relate to others in computer-mediated communication (CMC) and is considered an essential factor in online learning (Garrison & Arbaugh, 2007; Richardson, Maeda, Lv, & Caskurlu, 2017). It is also a key component of the Community of Inquiry Model, which postulates three fundamental presences needed for meaningful learning in online spaces (Garrison, Anderson, & Archer, 2000). Social presence is defined initially as "the degree of salience of the other person in the communication and the consequent salience of the interpersonal relationships" (Short, Williams, & Christie, 1976, p. 65), although today, many different definitions are used (Lowenthal & Snelson, 2017). In this study, in line with many calls for a more precise definition and usage of social presence (Biocca, Harms, & Burgoon, 2003; Öztok & Kehrwald,

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2017; Weidlich, Kreijns, Rajagopal, & Bastiaens, 2018), it is understood as the salience of the other person in mediated communication, thus leaving out more expansive conceptions that have been associated with drawbacks (Öztok & Kehrwald, 2017).

Social presence is frequently considered an imperative for good learning experience design. However, there are two arguments against this imperative. Firstly, it is not self-evident that all online/distance programs benefit from (very) high perceptions of social presence. For example, courses that are very short or do not rely on social interaction or collaboration for learning activities may be just fine without. There are also cost-benefit tradeoffs to be considered. Direct strategies for fostering and maintaining social presence can be time-intensive (for an overview of strategies, see Lowenthal & Dunlap, 2018), while more indirect strategies are still emerging and may yield smaller effects (Weidlich & Bastiaens, 2019). Secondly, not all students may be equally prone to engrossing themselves socio-emotionally in the online learning experience. The possibility of meaningful individual differences for social presence, for example, specific personality characteristics that account for how students interact with and perceive others in the learning environment, may play an important role. If so, the imperative of social presence may penalize or benefit students differentially for factors that are, by definition, outside of their control.

This second proposition, the possibility of individual personality differences that may be consequential for social presence experiences, constitutes a gap in research, as there are hardly any studies examining personality (or other individual difference constructs, for that matter) in relation to social presence. This exploratory study aims to address this gap in research by investigating how personality, as measured by the most prominent model, the Big Five (John & Srivastava, 1999), interacts with social presence. Results may be relevant for researchers and practitioners by providing answers to whether individual personality differences need to be considered when designing and researching socio-emotional aspects like social presence in online distance learning experiences.

2 Theoretical Foundations

Social Presence and the SIPS model. In 1976, Short, Williams, and Christie coined the term social presence in their book "The Social Psychology of Telecommunications" to explain how different telecommunication media affect communication. They defined it as "the degree of salience of the other person in the communication and the consequent salience of the interpersonal relationships" (p.65), positing that social presence is a quality of the communication medium itself. Accordingly, perceptions of social presence would be low in computer-mediated communication (CMC) because, unlike face-to-face communication, CMC usually conveys few socio-emotional cues.

Today, social presence is understood as less technologically determined and more as a function of social context, mediated by technology (Gunawardena, 1995). In time, the concept has been used to better understand all kinds of CMC, especially in online and distance education (for reviews, see Lowenthal, 2010; Cui, Lockee, & Meng, 2013). It is now considered an important aspect of the learning experience, especially for educational contexts that rely on text-based asynchronous communication (e.g. message boards) in learning management systems (LMS), which are still a large part of today's educational technology landscape (Legon & Garrett, 2018). Social presence has since been linked to important other variables of online distance education, e.g., satisfaction and perceived learning (Gunawardena & Zittle, 1997; Richardson & Swan, 2003; Richardson, Maeda, Lv, & Caskurlu, 2017), online course retention (Liu, Gomez, & Yen, 2009), participation (Cui, Lockee, & Meng, 2013), and online social interaction (Tu & McIsaac, 2002). In addition to this, social presence has a prominent role in the community of inquiry (COI) framework, alongside teaching presence and cognitive presence (Garrison, Anderson, & Archer, 2000; 2010). However, it should be noted the COI perspective on social presence is quite different, both in terms of conceptualization as well as measurement (Kreijns, Xu, & Weidlich, 2021), from the one presented in this study.

As a more recent development, social presence plays an essential role in the SIPS model, which consists of four primary variables: the *sociability* of the learning environment (S), social *interaction* among students (I), perceptions of other students being socially *present* (P), leading to a sound social *space* (S) (Weidlich & Bastiaens, 2017). Together, these variables explain interpersonal socio-emotional aspects of the online learning experience. It is a generalized and modified adaptation of the Kreijns, Kirschner, & Vermeulen (2013) framework for social aspects of CSCL. The SIPS model has recently been investigated on the structural level (Weidlich & Bastiaens, 2017), in terms of its central propositions (Weidlich & Bastiaens, 2019), and has been further elaborated in Kreijns and Kirschner (2018).

As a construct rooted in social psychology, it is implicitly assumed that social presence is highly context-dependent and situational and, thus, a variable to be fostered and maintained. However, this may only be one side of the coin. As our literature review will show, there is ample research showing how trait-level personality differences interact with perceptions and behaviors in social networking sites and online and distance learning. Thus, we contend that in order to get the complete picture of how social presence and related socio-emotional variables emerge in online learning, the trait-level view may need to be considered.

Personality. The personality of an individual reflects relatively enduring and automatic patterns of thoughts, feelings, and behaviors (Roberts, Lejuez, Krueger, Richards, & Hill, 2014). Consequently, personality differences are between-subject discrepancies of these patterns in trait-evoking situations. As a starting point for investigating these differences, the lexical hypothesis suggests that the most salient and relevant ways in which people may differ from each other are encoded in natural language (Boudreaux & Ozer, 2015). The systematic extraction of all personality-relevant terms from the dictionary is thus called the lexical approach (Goldberg, 1993). Pioneering work was done in German by Baumgarten (1933) and in English by Allport and Odbert (1936). Over the years, scholars have gradually condensed these descriptors into taxonomies with different overarching dimensions. Although this approach is not without criticism (lexical fallacy, see Fiske, 2018), it has successfully produced empirically supported psychological entities like emotions and personality dimensions.

After decades of research, the field of personality psychology has converged on a general and overarching taxonomy of personality traits (John & Srivastava, 1999). In their seminal work of the 1980s and 90s, Costa & McCrae developed the NEO Personality Inventory, which first consisted of three dimensions (1985), later adding two dimensions (1992), yielding the now widely known Five-Factor model of personality (FFM) or Big Five. Moreover, they found six facets representing each personality dimension, making up the NEO PI-R as it is known today (Costa & McCrae, 1995). The five personality dimensions are:

Openness to experience is the individual's interest in novel ideas and experiences. Individuals with high scores in openness are often creative, curious, flexible, and imaginative, whereas those with low scores tend to prefer familiar and more conventional experiences (McCrae, 1996).

Conscientiousness is the individual's tendency to engage in self-regulation. Individuals with high scores in conscientiousness are often orderly, dutiful, thorough, and deliberate, whereas those with low scores tend to demonstrate a lack of direction and self-control (Roberts, Lejuez, Krueger, Richards, & Hill, 2014).

Extraversion is the individual's inclination towards the social realm. Individuals with high scores in extraversion are often sociable, assertive, outgoing, and energetic. Conversely, individuals with low scores tend to direct their interests inwards (Watson & Clark, 1997).

Agreeableness is the individual's disposition to smooth interpersonal relationships. Individuals with high scores in agreeableness are often trusting, modest, compliant, and compassionate, while individuals with low scores tend to be more antagonistic (Graziano & Tobin, 2019).

Neuroticism is the individual's tendency to think and react in maladaptive ways. Individuals with high scores in neuroticism are often anxious, moody, self-conscious, and vulnerable. Conversely, individuals with low scores tend to be more emotionally balanced (Ng, 2015).

Research has produced ample evidence of relationships between behaviors and perceptions with personality. Meta-analytically supported links with FFM traits include job performance (Barrick & Mount, 1991), resilience (Saeed, Oshio, Taku, & Hirano, 2018), academic performance (Vedel, 2014; Schneider & Preckel, 2017), motivation (Judge & Ilies, 2002), creative self-beliefs (Karwowski & Lebuda, 2016), self-efficacy (Stajkovic, Bandura, Locke, Lee & Sergent, 2018), academic dishonesty (Giluk & Postlethwaite, 2015), physical activity (Wilson & Dishman, 2015), internet addiction (Kayis et al., 2016), and even humor style (Mendiburo-Seguel, Paez, & Martinez-Sanchez, 2015).

This history of well-supported relationships to perception and behavior suggests that personality may also have explanatory power in domains that are yet understudied regarding individual differences, including online distance learning. We suggest taking FFM as a starting point to investigate this relationship as this the most widely used and best-supported model of personality. For these reasons, the following literature review only includes research that has used the FFM, while other frameworks or models of individual differences like the Myers-Briggs Type Indicator or Learning styles will not be considered due to their problematic epistemic status (McCrae & Costa, 1989; Boyle, 1995; Kirschner, 2017).

3 Literature Review

Because there is ample evidence for relationships between personality traits and academically relevant variables (e.g., academic performance, motivation, self-efficacy), one might be tempted to generalize these results to online distance learning contexts. However, a comparative study by Varela, Cater, & Michel (2012) demonstrates that this may be a pitfall. The authors were able to show that, depending on the delivery mode of instruction (e.g., face-to-face versus online delivery), personality traits were differentially related to learning outcomes. For example, conscientiousness was a significant predictor for learning in online settings, but not in face-to-face settings. At the same time, gregariousness, a facet of extraversion, was negatively related to learning in an online setting but not face-to-face. Similarly, one sample may display divergent personality traits, depending on whether the items are worded to relate to face-to-face or online communication (Blumer & Döring, 2012). These findings can be explained by considering the differential properties of these trait-evoking contexts. For example, the permanent technological mediation characteristic of online distance learning makes connecting with other people more challenging (Weidlich & Bastiaens, 2018), thereby possibly benefitting extraverted students, as they might go the extra mile to interact with others. Conversely, one could also argue that behavioral patterns of extraverted students have less leverage in online settings and, thus, negate their usual advantage.

Therefore, the existing evidence of personality differences in experiences with online distance learning will be reviewed in section 3.1. Additionally, relationships between personality and social presence in these settings need to be reviewed. Because this latter literature is particularly sparse, with only very few scattered examples, we additionally reviewed more broadly perceptions and behaviors on Social Networking Sites (SNSs) in relation to personality. As SNSs are exemplary in terms of social interaction, sociability, and interpersonal relationships, we then synthesize findings regarding their relevance for online distance learning in section 3.2.

Personality in Online Distance Learning. Chen & Caropreso (2004) investigated how personality affected discussions in an online collaborative learning setting by grouping students in high, neutral, low, and high+low groups regarding Extraversion, Agreeableness, and Openness. Interestingly, they found more task-related communication in the high groups than in neutral and low groups, but most in high+low groups, indicating beneficial group dynamics emerging from these personality differences. Looking at online course impressions of students, Keller & Karau (2013) found conscientiousness to be the best predictor of self-report engagement, value to career, overall evaluation, anxiety, and preference for online over face-to-face instruction. They concluded that conscientiousness might be a fundamental trait for getting the most out of online courses. Shih, Chen, Chen, Chen, & Wey (2013) investigated motivation, satisfaction, and personality in online learning and found extraversion and conscientiousness to be predictive of motivation and satisfaction. Finally, looking at distance learning students at a vocational school, Randler, Horzum, and Vollmer (2014) found that personality predicted opinions towards distance learning. More specifically, openness to experience predicted distance learning willingness, and extraverted students reported less distance learning anxiety. In our literature search, we found only one study specifically looking at relations between personality and social presence (Hingorani, 2008). It concluded extraversion to be positively related to perceptions of social presence. The same was true for the dimension thinking/feeling. However, as this was investigated with the Myers-Briggs Type Indicator, the results need to be interpreted cautiously.

Although the literature is still sparse, evidence of the importance of personality for online distance learning experiences is accumulating. Preliminarily, it appears that conscientiousness emerges as the most consistently important personality dimension, indicating that conscientiousness students seem to benefit the most from learning in these settings. Extraversion and openness to experience appear to have predictive value as well, yet the evidence is still inconsistent. Neuroticism and Agreeableness showed no pattern of relationships with students' experiences.

Personality in Social Networking Sites. Social Networking Sites (SNSs) as highly social online platforms are, thus, perfect settings for expressing individual personality differences; that is, they are expected to be highly trait-evoking (Stopfer et al., 2013). To the extent that online learning environments share some of these trait-evoking properties, results of personality influencing behavior may be transferable to these contexts, too.

In an early study on personality and Facebook behavior, Ross et al. (2009) found that openness to experience predicted pro-social behavior such as posting on other's wall, commenting, and sending private messages. Similarly, Amichai-Hamburger & Vinitzky (2010) reported that openness to experience positively predicted sharing personal information, whereas extraversion negatively predicted sharing personal

information but positively predicted the number of friends. Gosling, Augustine, Vazire, Holtzmann, and Gaddis (2011), too, found extraversion to be related to different kinds of pro-social behavior on Facebook, like viewing pages of others, commenting, adding photos of oneself, number of friends, and hours spent on Facebook. Openness to new experiences also correlated with some of these behaviors but was a less salient predictor.

Focusing on self-disclosure, Hollenbaugh and Ferris (2014) reported that extroverted Facebook users displayed more depth in self-disclosure, whereas users with high scores on openness displayed more breadth in self-disclosure. In a more recent study comparing investigating Facebook and Pinterest, Lin, Lee, Yin, and Gilbreath (2017) found that, here too, extraversion and openness to experience were related to motivations for using these platforms. Recently, scholars have begun predicting personality traits from user-behavior data on SNSs. A meta-analysis by Azucar, Marengo, and Settanni (2018) showed that prediction coefficients obtained from data sources like textual posts and images largely corresponded to coefficients from offline behavior and that, in line with previous research, extraversion and openness to experience were predicted best by these digital footprints.

In conclusion, extraversion consistently emerges as the best predictor for pro-social behavior on SNSs like Facebook. As scholars have suggested, this may be because extroverts mirror their offline behavior in online setting and use SNSs as another way of satisfying social needs (Gosling et al, 2011). Openness to experience also emerged as a personality trait relevant for SNSs behavior, but less consistently so.

Depending on how online distance learning environments are designed and implemented, they may mirror properties and mechanisms that can be found in SNSs (Du, Fu, Zhao, Liu, & Liu, 2013; Garmendia & Cobos, 2013; Anderson & Dron, 2017, Weidlich & Bastiaens, 2019). Granting this, we hypothesize that when looking at social presence and other socio-emotional variables in online learning, there may also be differences in perceptions due to personality differences. More specifically, we chiefly expect extraversion and openness to experience to predict perceptions of social presence.

4 Research Questions

Among the identified studies investigating effects of personality in online distance learning, some have failed to report sufficient descriptive information of their sample (e.g., Keller & Karau, 2013; Shih et al., 2013; Chen & Caropreso, 2004). However, this information is critical to assess the extent to which these students represent the broader population, an assumption that may be doubted (Harris & Gibson, 2006). Thus, our first research question is concerned with the personality characteristics of online distance students:

> Research question 1: *What are the personality characteristics of online distance students?*

Our search efforts have yielded virtually no research that has considered personality as a predictor for social presence. The single exception being the study by Hingorani (2008), which, however was based on the Myers-Briggs Personality inventory. Thus, our second research question is concerned with the relationship of personality dimensions with social presence:

> Research question 2: *How are personality dimensions related to perceptions of social presence?*

As a final drawback of personality literature in online distance learning, investigations were limited to dimensional analyses. With these approaches, personality dimensions are analyzed separately with respect to the criterion variable. However, this fails to account for how personality is actually represented in each person, as a unique configuration of different personality dimensions, a typology (Schnabel et al., 2002). Thus, it may well be the case that changing the unit-of-analysis from single personality dimensions to distinct personality configurations will yield more valuable results. Thus, our third research question is concerned with the relationship of personality configurations with social presence.

> Research question 3: *How are different personality configurations related to experiencing social presence?*

5 Method

To answer our research questions, an explanatory correlational design was used (Creswell, 2004). To lay out our methodological approach, first we report on our sample, then we explain our procedure for sampling, and finally, we elaborate on the psychometric scales that are the basis of measuring our constructs of interest.

Sample. Respondents were 201 students at the largest distance university in Germany, FernUniverstität in Hagen.

Table 1: Overview of measures used in this study.

Variable	Description	#Items	Cronbach's Alpha
Openness	A general appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity, and variety of experience.	5	.87
Conscientiousness	A tendency to display self-discipline, act dutifully, and strive for achievement against measures or outside expectations.	4	.72
Extraversion	A preference for breadth of activities, from external activity/situations, and energy creation from external means.	5	.84
Agreeableness	A general concern for social harmony and valuation of getting along with others.	4	.69
Neuroticism	A tendency to experience negative emotions, such as anger, anxiety, or depression.	5	.78
Social Presence	The psychological sensation of the other being "there" and "real".	10	.91

This convenience sample consists of students enrolled in either B.A. Educational Science (173 students) or M.A. eEducation (28 students), collected over two semesters: winter semester of 2017/2018 and summer semester of 2018. Of these students, 176 were female, 24 were male. Student's ages ranged from 21 to 75 years (M=37, SD=9).

Procedure. Students were recruited for the survey through the learning management system Moodle, in which the activities of these courses took place. Nearing the end of each semester, they were asked to participate in the survey with no course credit or reward attached to participation. For a duration of two weeks, a link in the learning environment directed them to the survey, which was created via LimeSurvey (http://www.limesurvey.org). Students were informed that the questions are concerned with their subjective experiences and preferences and were asked to answer accordingly. Before starting the survey, they were informed about the goal of the study and aspects of data protection and privacy. All students provided informed consent and then proceeded to the actual survey. The survey took them a total of about 15 minutes to complete.

Measures. BFI-25 is a 25-item scale for assessing personality traits according to FFM. Each trait is assessed with five items. The German version of the BFI-25 has been validated in a randomly chosen and representative sample and shown adequate reliability and factor loadings (Gerlitz & Schupp, 2005). Out of the many choices of FFM inventories, this scale was chosen as a compromise between test duration and validity, as shorter inventories often display psychometric disadvantages (Rammstedt & John, 2007; Schupp & Gerlitz, 2008). Personality was measured on a 7-point Likert scale. Social presence measurement was based on a recently developed measure (Weidlich, Rajagopal, Kreijns, & Bastiaens 2018; Kreijns, Weidlich, & Rajagopal, 2018). Crucially, this measure is grounded in a narrow and precise definition of social presence that goes back to the original conception of Short et al. (1976), emphasizing the psychological sensation of the other being "real" and "there" in mediated communication. Social presence was measured on a 5-point Likert scale.

To assess the factorial structure of the FFM for the purposes of this study, an Exploratory Factor Analysis was conducted. Prior to this, one item (BF21) was removed due to low KMO measure of sampling adequacy (<.6, Hair et al., 2014). The remaining 24 items were entered. Bartlett's test of sphericity confirmed the factorability of the data. Because it is most robust to deviations from normality assumptions, principal axis was used as an extraction method. An oblimin rotation method was used due to expected correlations between some dimensions of FFM. The resulting analysis yielded a five-factor solution with factor loadings ranging from .44 to .95, with only one item showing substantial cross-loading (BF17). Therefore, this item was eliminated for the subsequent analyses. The five-factor structure explained 54.2% of the total variance. All measures showed sufficient internal consistency, with Cronbach's alpha ranging from .69 to .91 (see Table 1).

6 Results

Descriptive results of personality characteristics were such that Agreeableness was the most endorsed personality dimension, followed by Openness and Conscientiousness, whereas Neuroticism was the least endorsed personality dimension, followed by Extraversion (see Table 2). As a result, Openness and Agreeableness were strongly left-skewed with medians of between 5.2 and 5.75 (on a 7-point scale), respectively, indicating that a large proportion of

Table 2: Descriptive data of personality characteristics.

	Open	Consc	Extra	Agree	Neuro
Mean	5.14	5.12	4.21	5.69	4.03
Median	5.20	5.25	4.20	5.75	4.00
SD	1.16	1.06	1.27	.94	1.13
Skew	-.26	-.16	.06	-.97	-.02
Mean(male) (n=24)	5.30	4.90	4.07	5.44	3.58
Mean(female) (n=176)	5.12	5.20	4.22	5.73	4.11
Open	-	.31***	.28***	.21**	-.13
Consc		-	-.02	.33***	-.13
Extra			-	-.03	-.31***
Agree				-	-.06
Neuro					-

Note. **p < .01; ***p < .001

the sample was very open to experience and agreeable. Neuroticism and Extraversion were relatively normally distributed without skewness and yielded medians of 4 and 4.2, respectively. Factoring in the gender of students showed that the only considerable difference was with respect to Neuroticism, with a mean difference of approximately .5 *SD*, yielding a statistically significant effect at the .01 level. Bivariate Pearson correlations yielded five statistically significant relationships among personality dimensions, with effects between .21 and .33, one of which was negative (see Table 2).

In order to detect distinct groups of personality configurations, a cluster analysis was performed on all five FFM variables. Cluster analysis is similar to factor analyses, with the main difference in practice being, broadly speaking, that cases (i.e., respondents) instead of items are clustered into meaningful groups. A two-step clustering algorithm was chosen, which in a first step pre-clusters the data and then confirms the resulting structure in hierarchical clustering (Bacher et al., 2004). This approach has been shown to reliably reproduce subgroups of varying complexity (Kent et al., 2014) and overcomes limitations of other clustering techniques, including hierarchical or k-means clustering (Bacher et al., 2004; Everitt, 2011). Log-likelihood was chosen as distance measure, and Schwarz Bayesian Criterion was chosen as clustering criterion. The algorithm proposed a three-cluster solution with a silhouette coefficient of .3, indicating "fair" cluster quality. Silhouette coefficients can range from -1 to 1, with a higher positive value indicating greater compactness and separation of the proposed cluster solution (Han et al., 2011). The resulting clusters were roughly equal in size, with a ratio of largest to smallest cluster of 1.31. Inspecting the relative importance of the BFF variables with respect to cluster structure suggested that Agreeableness (Predictor Importance, PI: 1) was the strongest predictor, followed by Neuroticism (PI: .82) and Conscientiousness (PI: .68). Extraversion and Openness were relatively weak predictors, with PI's of .37 and .34., respectively. According to their primary characteristics as derived from the three strongest predictors, clusters were labeled (1) "unagreeable & unconscientious", (2) "agreeable & conscientious," and (3) "agreeable & neurotic" (see Table 3). Chi-square test of contingency across cluster membership and gender revealed no statistically significant relationship, $X2(2, 200) = 2.17$, $p = .34$. One-Way ANOVA suggested no age differences between clusters, $F(2,125) = 1.56$, $p = .21$.

In order to examine relationships between personality dimensions and social presence, bivariate correlations were calculated. The results suggested no significant associations between BFF dimensions and social presence, with the strongest association between Conscientiousness and social presence with r=.13, yet failing to reach significance. Similarly, linear multiple regression with BFI dimensions as predictors and social

Table 3: Personality clusters.

Cluster	1	2	3
Size	n=65 (32.3%)	n=59 (29.4%)	n=77 (38.3%)
Label	"Unagreeable & Unconscientious"	"Agreeable & Conscientious"	"Agreeable & Neurotic"
Prim. Characteristics	Low Agreeableness	High Agreeableness	High Agreeableness
	Med. Neuroticism	Low Neuroticism	High Neuroticism
	Low Conscient.	High Conscient.	Med. Conscient.
Second. Characteristics	Med. Extraversion	High Extraversion	Low Extraversion
	Low Openness	High Openness	Med. Openness

Note. 'Low' ≈ 25th Quartile, 'Medium' ≈ Median, 'High' ≈ 75th Quartile

Table 4: Personality clusters and social presence.

	Cluster	Label	n	Mean	SE	Post-hoc mean differences		
Social Presence	1	'-A & -C'	65	2.51	.09		n.s.	p = .027 (classic) p = .011 (excl. outliers) p = .003 (robust)
	2	'+A & +C'	59	2.56	.11	n.s.		
	3	'+A & +N'	77	2.82	.07			

presence as dependent variable showed a non-significant model F(5,195) = 2.04, p = .075, R2 = .05.

Using the results of the cluster analysis, we went beyond evaluating single personality dimensions in terms of social presence and instead investigated personality configurations. Thus, a one-way ANOVA with the three-level-factor 'personality cluster number' and social presence as dependent variable was calculated. ANOVA assumptions were met for normality, p = .131 (Shapiro-Wilk), but not for equality of variances, F(2, 198) = 4.01, p < .020 (Levene's Test). To account for unequal variances, Welch's test was used for omnibus analysis. Results indicated a significant difference between the three groups F(2, 122.36) = 3.71, p = .018, while post-hoc tests (Games-Howell) indicated a significant difference between cluster 1 and cluster 3, F(2, 125.07) = 2.61, p = .027. The remaining comparisons yielded no significant difference (see Table 4). Our analysis suggested four bivariate outliers (cases 5, 29, 30, and 93). To assess the robustness of our analysis, we repeated our analysis while excluding these outlier cases. Results indicated slightly stronger evidence against the null hypothesis, F(2, 51.91) = 4.90, p = .011, post-hoc test between cluster 1 and cluster 3 (Games-Howell), F(3, 56.63) = 2.95, p = .013.

Finally, using ANOVA and post-hoc tests from the family of robust methods that are known to yield better estimates under violated assumptions operating with trimmed means (trim level.2, Mair & Wilcox, 2019), we found stronger support for an effect, F(2, 198) = 5.31, p = .007. Post-hoc test yielded a significant mean difference in social presence between cluster 1 and 3, p = .003 with an effect size of psi-hat = .35, [95%CI:.07;.63], indicating a medium-sized effect (Mair & Wilcox, 2019).

7 Discussion

As a construct vernacular to social psychology, social presence has traditionally been conceptualized as a state variable, implying a certain degree of amenability to manipulation. This study aimed to investigate the potential value of adding a trait perspective that may place limits on the degree to which social presence is amenable to situation, context, and thus, intervention. Complementing our understanding of social presence, a trait-level view may introduce determinants outside of what is usually considered as influencing factors. In this study, personality was used as a starting point

to investigate social presence in relation to individual differences.

> RQ1: *What are the personality characteristics of online distance education students?*

Using the Big Five inventory to characterize the personality profile of this online distance sample, we found Agreeableness, Openness, and Conscientiousness to be the most endorsed personality dimensions, whereas Extraversion and Neuroticism were the least. These findings are in line with previous research in online education settings (Randler et al., 2014; Cohen & Baruth, 2017) and may be explained by selection effects due to the unique characteristics of online distance learning (Caspi et al., 2006). Meanwhile, the correlations among personality dimensions were largely consistent with the broader personality literature (Digman, 1997; Anusic et al., 2009). Together, the findings indicated that the present population is both relatively typical with respect to the expected population of online distance learning students and in terms of personality structure more generally.

Results of a cluster analysis suggested a three-cluster solution with clearly distinguishable personality profiles. Agreeableness being the strongest cluster predictor, we found one cluster with low Agreeableness and two clusters with high Agreeableness. The latter two can further be distinguished through one being high on Conscientiousness and the other being high on Neuroticism, with the remaining two personality dimensions adding little information. We can compare these clusters with the literature on personality prototypes that has consistently yielded three primary prototypes, *resilient*, *overcontrolled*, and *undercontrolled* (Asendorpf & van Aken, 1999; Schnabel et al., 2002, Alessandri et al., 2014). The *resilient* prototype is mainly characterized by low Neuroticism and high Conscientiousness, as well as medium to high scores on the remaining dimensions. Thus, it bears a strong resemblance to the cluster "Agreeable & Conscientiousness" (2) in our sample. The most indicative characteristic of the *overcontrolled* prototype is high Neuroticism and low Extraversion. Thus, it is similar to what we identified as "Agreeable & Neurotic" (3), the only slight deviation being the Agreeableness dimension. Finally, the *undercontrolled* prototype is characterized by low Conscientiousness and low Agreeableness, thus, mirroring our cluster "Unagreeable & Unconscientious" (1). These convergences lend support toward the validity of personality assessment in the present study, as it has yielded an analog of what is a prevalent set of personality configurations with wide-ranging real-world relevance, for example, with respect to understanding mental health (Bohane et al., 2017) or performance in simulator navigation training for candidate Navy Officers (Saus et al., 2012). Invariance of these configurations across gender and age further aligns these findings with the broader literature (Asendorpf & van Aken, 1999).

> RQ2: *How are personality dimensions related to perceptions of social presence?*

Results of correlations and linear regression suggested no straightforward relationships between a given personality dimension and social presence. This goes against our hypotheses of Extraversion and Openness predicting social presence experiences in online distance learning, based on the larger literature of how personality dimensions interact with interpersonal aspects in online distance learning (e.g. Hingorani, 2008; Randler et al., 2014) and SNSs (e.g. Seidmann, 2013, Hollenbaugh & Ferris, 2014). Thus, it appears that the dimensional perspective that has individual personality dimensions as unit-of-analysis provides little value in understanding the emergence of social presence perceptions.

> RQ3: *How are different personality configurations related to experiencing social presence?*

Extending our analysis to account for personality configurations, however, painted a slightly different picture. Comparing mean values of social presence experience, we found a significant difference between cluster 1 (-A & -C) and cluster 3 (+A & +N), such that relatively agreeable and neurotic students appeared more prone to experiencing social presence. The strongest cluster predictor, Agreeableness, being the most salient difference between these characteristics, one could intuit this to be the deciding factor. However, as cluster 2 (+A & +C) is similar in Agreeableness while failing to yield comparable social presence scores, this intuition should be discarded. In other words, it appears that no single cluster criteria can account for differences in social presence, but instead, the whole configuration must be considered.

Drawing on the literature of personality prototypes, we arrive at further interpretations. Our results suggested that overcontrolled students, that is, neurotic, introverted, and agreeable students were most prone to experiencing social presence. This finding is interesting, as various interpersonal and social variables like trust in other people or participation in social events are usually weakly represented in overcontrollers compared to the other prototypes (Steca et a., 2010). With particularly

low scores on Extraversion, overcontrollers are expected to be relatively socially reclusive and, thus, less prone to prosocial behavior. With these characteristics in mind, it is surprising that this personality prototype reported the most social presence. One explanation may come from the degree of sociability offered by an online environment compared to real-world interactions. Some research has found that high Extraversion not always translated to prosocial behavior in online environments, as extraverted users will not use the platform as an alternative to social activities (Amiel & Sargent, 2004; Ross et al., 2009). On the other hand, introverted users may be relatively more likely to satisfy their social needs in online environments (Amichai-Hamburger et al., 2002; Ebeling-Whitte et al., 2007; McIntyre et al., 2015), thereby, over time, exercising more adaption to the unique specifics of mediation communication. Experience of heightened social presence may be a result of this.

This study should be considered a proof-of-concept for the notion that social presence is not exclusively socially and contextually determined. It appears that, in addition, there are also meaningful individual difference factors at work, which are currently still underexplored. Future research may want to further investigate trait-level differences with respect to social presence experiences, for example, by delving deeper into what accounts for the observed differences between personality prototypes. This may be done by including into analyses known correlates of social presence, as represented in the SIPS model (Kreijns et al., 2013; Weidlich & Bastiaens, 2017). It is possible that precursors of social presence, sociability, and social interaction may account for social presence differences. Another fruitful approach may be a qualitative investigation of these personality prototypes to arrive at a more in-depth understanding of their differential perceptions.

For practitioners in online distance learning, the results of this study suggest that fostering social presence in their course offerings may not be as straightforward as has been implied by the literature (e.g. Lowenthal & Dunlap, 2018). The existence of individual differences in perceptions of social presence should be kept in mind when attempting to improve the socio-emotional design for students that are invariably diverse in terms of their personality. Of course, it is hardly realistic to assess students comprehensively before a course in order to tailor the course experience to them. More realistically, practitioners should simply keep this potentially consequential individual difference in mind, when designing and assessing learning experiences with large amounts of social interaction, for example computer-supported collaborative learning. Given the centrality of successful interaction in these learning scenarios, differences in perceptions of social presence may be particularly important here and even minute differences between students could be compounded to affect the learning experience.

8 Limitations

Upon interpreting these findings, some limitations should be kept in mind. Firstly, all measures in this study were based on self-report, such that certain response biases like social desirability cannot be ruled out. Additionally, although our sample size of 201 students should be considered adequate for typical analyses like linear regression, the most interesting findings of this study hinge on the results of our cluster analysis. A three-cluster solution essentially divided the total sample into three cells with sizes between 59 and 77, which were then used to assess our effect of interest, thus effectively limiting our sample size. However, a sensitivity analysis of ANOVA, fixed effects, omnibus, one-ways, with $\alpha = .05$, $1\text{-}ß = .8$ using G*Power (Faul et al., 2007) yields a minimum detectable effect size f of .22. As this is lower than our detected effect of 3.71, we can conclude that our study was sufficiently powered above the 80% level. Another limitation may be found in our assessment of the Big Five personality inventory, for which we chose the BFI-25 as a compromise between test duration and validity. Still, this compromise may affect the validity of our findings as each sub-facet making up a personality dimension could not be assessed with a sufficient number of items (Messick, 1996). However, the results regarding factor structure and internal consistency of scales support the assumption that basic measurement requirements have indeed been met. Therefore, to ensure robustness, this effect should be replicated in future studies before being extended conceptually.

9 Conclusion

This study aimed to address a significant gap in our understanding of what determines perceptions of social presence in online distance learning environments. Toward this goal, the value of a trait-level view of social presence was investigated by assessing personality as a potential determinant. Results suggested no straightforward relationships between single personality dimensions

and social presence. However, drawing on a cluster-based segmentation of our sample, we could identify three central personality configurations. Using these to compare social presence experiences, one personality configuration emerges as critical. Students characterized by high agreeableness, high conscientiousness, high neuroticism, and low extraversion (e.g., 'overcontrolled' personality prototype) reported significantly higher degrees of social presence than their peers with different personality configurations. These results point to the value of considering personality in our attempts to model the phenomenon of social presence and, possibly, limit the efficacy of our efforts of enhancing social presence in online distance learning through interventions.

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