Addicted to socialising and still lonely: A comparative, corpus-driven analysis of problematic social networking site use

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FULL-LENGTH REPORT

ABSTRACT

Background and Aims: Problematic Social Networking Site Use (PSNSU) is not a formally recognised addiction, but it is increasingly discussed as such in academic research and online. Taking a quantitative, exploratory approach, this study aims to (1) determine whether PSNSU is presented like clinically defined addictions by the affected community and (2) address how well measurements of PSNSU fit with the thematic content found within the associated discourse. *Methods:* Four corpora were created for this study: a corpus concerning PSNSU and three control corpora concerning established addictions, including Alcohol Use Disorder, Tobacco Use Disorder and Gaming Disorder. Keywords were identified, collocates and concordances were explored, and shared themes were compared. *Results:* Findings show broad thematic similarities between PSNSU and the three control addictions as well as prominent interdiscursive references, which indicate possible confirmation bias among speakers. *Conclusions:* Scales based upon the components model of addiction are suggested as the most appropriate measure of this emerging disorder.

INTRODUCTION

Social Networking Sites (SNS) can be defined as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (Boyd, 2007). In recent years, these platforms have come to dominate how we spend our time online (Organisation for Economic Co-operation and Development, 2019), and for some users, it may be hard to disconnect. Between 2015 and 2020, the number of research articles concerning Problematic Social Networking Site Use (PSNSU) increased by over tenfold, with many demonstrating parallels between PSNSU and formally recognised addictions. Yet, this emerging disorder remains without clinical definition and does not benefit from formally recognised assessment tools (Brand et al., 2020).

Transdiagnostic models of addiction, such as the excessive appetite model (Orford, 2001), the syndrome model (Shaffer et al., 2004) and the components model (Griffiths, 2005), suggest that all addictive disorders share core similarities in their development, maintenance and consequences (Griffiths, 2005; Orford, 2001; Shaffer, 2004). Accordingly, it has been suggested that addiction may be conceptualised as an encompassing syndrome built upon universal features with distinctions found within aspects of the objects of addiction (Shaffer, 2004). Supporting this view of addiction, person-centered, qualitative studies have demonstrated consistency in perceived symptoms and aetiology between substance and behavioural addictions with some addiction-specific differences, e.g. the financial harms and

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underpinnings of gambling disorder (Coelho et al., 2022; Kim, Hodgins, Kim, & Wild, 2020). Yet, it remains that any diagnosis of addiction is object-specific (American Psychiatric Association, 2013; World Health Organization, 2019). So, when new potential objects of addiction emerge, associated research is accompanied by new measures of risk of addiction, which can have such variation between scales that there may emerge a lack of construct validity across research (Panova & Carbonell, 2018). These measures are often used with an a priori acceptance of addiction as an appropriate framing for problematic behaviours (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015).

When studied, PSNSU is commonly defined and measured based upon the components model of addiction (Andreassen, Torsheim, Brunborg, & Pallesen, 2012, 2014), which suggests that (substance and behavioural) addictions share six core symptoms: salience, mood modification, tolerance, withdrawal, conflict and relapse (Griffiths, 2005). However, reflecting the "underlying sense of conceptual chaos in the field" (Ryan, Chester, Reece, & Xenos, 2014; p.141; Shaffer, 1997), measures of PSNSU, which have primarily been developed by adapting existing measures of other addictions, do not consistently apply the symptoms set out in the components model proposed by Griffiths (2005) with many featuring similar or entirely different components. These include preoccupation, negative consequences, life problems, euphoria, loss of control, obsession, compulsion, preference for online social interaction, substitute satisfaction and deficits in self-regulation (Andreassen, 2015; Griffiths, Kuss, & Demetrovics, 2014; Hussain et al., 2018; Kuss, 2018; Ryan et al., 2014). Further complicating any measure of PSNSU, object-specific diagnostic criteria, e.g. preference for online social interaction, do not align with criteria identified for clinically recognised addictions in the DSM-5 (American Psychiatric Association, 2013) or ICD-11 (World Health Organization, 2019). Additionally, tolerance and withdrawal, which are diagnostic criteria typically identified for Substance Use Disorders are applied to some measures of PSNSU despite ongoing debate regarding the applicability of these symptoms to behavioural addictions (Daniel Kardefelt-Winther et al., 2017; Starcevic, 2016), and how well these components map onto PSNSU, in particular, remains unclear. Any measure of tolerance as a component of PSNSU would, of course, be complicated by society's ever-increasing use of SNS (and the internet in general) (Facebook, 2019, 2023; Pew Research Center, 2015, 2022), and empirical evidence of SNS withdrawal has been relatively limited (Radtke, Apel, Schenkel, Keller, & von Lindern, 2021). It is also notable that, although withdrawal is presented within diagnostic criteria for behavioural addictions in the DSM-5 (American Psychiatric Association, 2013), within the ICD-11, withdrawal is presented only as a (non-essential) clinical feature of gaming disorder and not presented as a feature of gambling disorder (World Health Organization, 2019). Such variation in and the debate around the assigned symptoms of and appropriate diagnostic criteria for PSNSU (and behavioural addictions in general) fundamentally limits research into this emerging disorder.

An attempt to work towards construct validity for Facebook addiction was made by Ryan, Chester, Reece, and Xenos (2016), who conducted a thematic analysis taken from interviews of excessive Facebook users. They found evidence of the following symptoms: negative consequences, loss of control, online social enhancement, preoccupation, mood alteration, withdrawal and excessive use. However, with data gathered using pre-determined questions aligning with these symptoms, it is unclear whether other symptoms are also part of Facebook addiction (Ryan et al., 2016). As such, Ryan et al. (2016) called for further research into PSNSU that may confirm relevant symptoms and explore unique symptoms.

In the absence of sufficient empirical evidence of construct validity, existing research concerning PSNSU has been criticised as being dominated by confirmatory studies, which leaves open the question as to whether or not PSNSU is even "real" (Casale, 2020, p. 2). Likewise, the behavioural addiction research field as a whole has been accused of "overpathologising everyday life" (Billieux et al., 2015, p.1). What defines and defies everyday life and all that is real within it is, however, inherently cultural and transitory. In any given period, dominant assessments of what is real and legitimate are cultural assessments democratically produced through discourse (Teubert, 2005).

The present study adopts the definition of discourse as a collection of testimonies born in social practice, which constructs meaning through patterns of linguistic choices (Teubert, 2005). Naturally-occurring discourse is a resource that provides empirical evidence of understandings and reported experiences. Through the data-driven detection of similarities, this study aims to uncover the shared (and distinct) micro-level linguistic patterns within discourses of addiction that may reflect macro-level, extra-linguistic phenomena (Koller & Mautner, 2004). In doing so, a transdiagnostic approach is taken, whereby it is considered (1) whether perceptions of the experience and symptoms of PSNSU are presented like those of other addictions by the affected discourse community and (2) how well existing assessments of PSNSU fit with the patterns found within its discourse.

METHODS

The methodology used in this study takes a multi-faceted, data-driven approach with keywords and their semantic categories providing an overarching view of datasets before carrying out a focussed analysis of specific lexical items.

Datasets

Focus corpora were compiled from publicly available, user-generated content presented in English on Reddit. Reddit is a popular online platform comprised of forums referred to as "subreddits", where users discuss specified topics. Although the demographics of users who produced the texts included in this study are uncertain, it seems likely, given the

language used on the website and the popularity of Reddit in English-speaking nations (Alexa Internet, 2021), that content creators may predominately be from Anglophone nations.

Established addiction corpora. Three control corpora of addictions listed by the World Health Organization (World Health Organization, 2019), Alcohol Use Disorder (AUD), Tobacco Use Disorder (TUD) and Gaming Disorder (GD), were generated by downloading the content of the most popular associated subreddits: r/stopdrinking, r/stopsmoking and r/stopgaming. In fitting with the year of the reference corpus, these corpora were compiled using Reddit posts from January 2015. Following the removal of text information such as "\n", the resulting AUD corpus contains 1,281,571 words from 28,025 comments; the TUD corpus contains 375,782 words from 8,882 comments; and the GD corpus contains 72,674 words from 1,167 comments. Reflecting the popularity of each individual subreddit, corpora are not of equal size. However, frequency information is not directly compared when conducting a keyword analysis.

PSNSU corpus. At the time of corpus creation, PSNSU was not the subject of any popularly used subreddit, so the PSNSU corpus was compiled by performing a Reddit search for relevant threads and collating that content. With only minimal content available from January 2015, any relevant threads posted before September 2020 (when corpora were compiled) were included in the PSNSU corpus. Based upon some of the most popular SNS platforms in the English-speaking nations (Ofcom, 2020; Pew Research Center, 2019), the following search terms were employed to identify relevant threads: 'Facebook addiction', 'Twitter addiction', 'Instagram addiction', 'Snapchat addiction', 'WhatsApp addiction', 'Tik Tok addiction', 'social networking use disorder', 'social media addiction' and 'social networking addiction'. The resulting corpus contains 144,407 words from 259 different threads containing, in total, 2,575 comments.

Reference corpus. The final corpus used in this study was the English Web Corpus (referred to as enTenTen2015), which contains 13,190,556,334 words taken from a wide range of online contexts and is part of a wider family of corpora of world languages (Jakubíček et al., 2013). Where the focus corpora compiled from Reddit content include language specific to addictions, this reference corpus represents more general uses of English online.

Data analysis

Data analysis was a multi-step, iterative process involving the generation and analysis of keywords, themes and repeated lexical patterns within those themes (see Fig. 1)

Identification of keywords. The first point of analysis in this study was the generation of keyword lists using Sketch Engine, a software developed for corpus analysis (Kilgarriff et al., 2004). Keywords are not words that occur with the highest frequency in a text; instead, they occur with "unusual frequency" (Scott, 1997, p. 236). Where frequency lists often reflect the general frequency of words in a language, keywords are said to be the "aboutness" words within a text (Scott, 1997, 2006). The extraction of keywords (with a minimum frequency of 10) was carried out with keyness scores calculated using Kilagarriff's (2009) effect-size metric. This method calculates keyness scores by dividing the normalised frequency of each word in a focus corpus ($fpm_{rmfocus}$) by that of the reference corpus (fpm_{rmref}). The default smoothing parameter (N) of 100 was added to both sections of the equation to ensure that the words generated are neither particularly rare nor particularly common (Kilagarriff, 2009, 2012):

$$\text{keyness score} = \frac{fpm_{rmfocus} + N}{fpm_{rmref} + N}$$

The resulting scores indicate how common a word is in the focus corpus over the reference corpus with greater keyness scores indicating greater typicality in the focus corpus. Only lexical items with a keyness score ≥2 were included in the analysis.

Generation of themes. Keyword lists were transformed into themes to provide a "bird's eye view" of discourse (Pijlaja, 2018). The first step of establishing shared themes was semantically tagging keywords. This was conducted using the UCREL Semantic Analysis System (Piao, Bianchi, Dayrell, D'Egidio, & Rayson, 2015), which categorises words using up to 232 labels. In cases where multiple semantic tags were suggested, only the first tag was included. Resultant semantic categories containing two or more keywords from
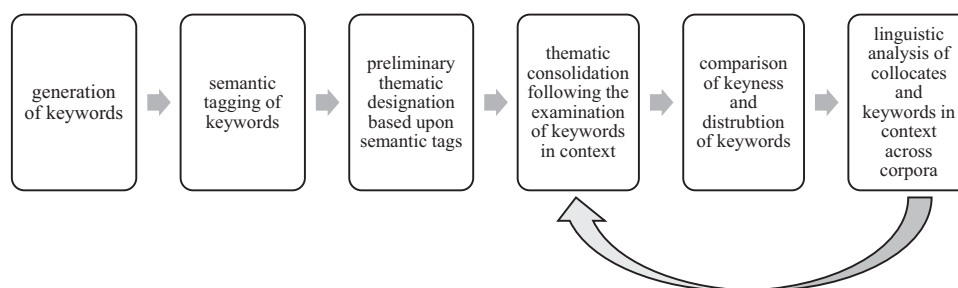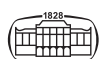

Fig. 1. Method of keywords analysis

each of the established addiction corpora were taken as the starting points for the thematic coding of data. Keywords tagged as including names, grammatical items, substances or paraphernalia, as well as categories indicative of internet forum use, were excluded from further analysis. Shared semantic categories were then consolidated into shared themes following the examination of keywords in their contexts. In establishing these shared thematic categories, original keyword lists were revisited to ensure that any item that may fit within these themes is included in the analysis. In fitting with Ryan et al.'s (2016) call for identifying any symptoms unique to PSNSU, any themes found to be unique to the PSNSU corpus were marked as salient themes.

Structural keyword analysis. In order to determine whether the PSNSU corpus was significantly different from the established addiction corpora, the distribution and weight of keywords across themes were analysed using the Chi-squared goodness of fit test and the Mann-Whitney U test. For both tests, the PSNSU corpus was compared to both the established addiction corpora as a whole and individually. Tests were analysed using Excel (Microsoft Corp, 2016) and SPSS-27 (IBM Corp, 2020).

Linguistic analysis. In describing shared thematic content, collocations and concordances for thematically categorised keywords were viewed using the Sketch Engine's Word Sketch and Keyword in Context (KWIC) functions. The Word Sketch function identifies word co-occurrences (collocations) through a *logDice* score, a measure of the typicality based on the frequencies (f) of (1) a target word (x), (2) its collocate (y) and (3) the co-occurring word and collocate combination:

$$logDice = 14 + log_2 \frac{2fxy}{fx + fy}$$

The greater the logDice score, the greater the strength of the relationship between lexical items (with a theoretical maximum of 14). Only collocations with a minimum frequency of five were considered in this analysis. KWIC information allowed for further analysis of keywords in their contexts through the use of concordance lines, which show keywords as they appeared in original texts. All illustrative examples were selected from concordance lines.

Ethics

Ethical approval from the Warwick Psychology Department was attained for this study. In abiding by ethical norms as well as the spirit of anonymity found on online forums and in order to maximise the linguistic validity of the corpus, meta-data, i.e. locational data and usernames, were not included in the datasets.

RESULTS AND PRELIMINARY DISCUSSION

Approximately 300 keywords were generated for each corpus (AUD: 265, TUD: 295, GD: 297, PSNSU: 300).

Semantic tagging

The following categories (and subcategories) identified by the UCREL Semantic Analysis System were found to be shared between the AUD, TUD and GD corpora: time (general, future, period, beginning and ending), social (people, relationships, helping/hindering), numbers (quantities), body (anatomy and physiology), emotion (happy/sad, worried/confident), psychological actions, states & processes (thought/belief, knowledge, wanting/planning/choosing and trying), evaluations (good/bad, easy/difficult, degree), cause and effect/connection, and comparing (similar/different). These semantic tags were also found in the keywords list taken from the PSNSU corpus.

Themes

Following the analysis of keywords in their contexts, the semantic groupings generated by the UCREL Semantic Analysis System were consolidated and developed into the following themes: (1) quitting, (2) body, mind and biological views of addiction, (3) measures of time and (4) relationships. These themes include 15.85% of all keywords from the AUD corpus, 17.63% from the TUD corpus, 13.47% from the GD corpus and 13.33% from the PSNSU corpus. An additional theme that emerged in the PSNSU corpus when keywords were examined in context and with their collocates was the theme of loneliness. (See Tables 1–5).

Thematic distribution and keyness

When the distribution of keywords allocated to each theme were compared, findings from the Chi-squared goodness of fit test showed that the distribution of keywords in the PSNSU corpus was not significantly different from that found in the established addiction corpora, X^2 (4) = 2.28, p = 0.69. When individual addiction corpora were compared to the PSNSU corpus, the distribution of keywords in the PSNSU corpus remained not significantly different from that of the AUD, X^2 (4) = 3.04, p = 0.55, TUD, X^2 (4) = 7.03, p = 0.13, or GD, X^2 (4) = 0.55, p = 0.97, corpora.

Next, a Mann-Whitney U Test was employed to measure differences in keyness scores between the established addiction corpora and the PSNSU corpus. Findings showed that, overall, the keyness of lexical items assigned to themes did not differ between the PSNSU corpus (Md = 2.75) and the corpora of established addictions (Md = 2.93) and, U = 2,306, z = −1.34, p = 0.18. When individual addiction corpora were compared to the PSNSU corpus, findings, again, showed that, overall, the keyness of lexical items did not differ between the PSNSU corpus (Md = 2.75) and the AUD corpus (Md = 2.87), U = 756, z = −0.96, p = 0.34; the TUD corpus (Md = 3.24), U = 869.5, z = −1.52, p = 0.13; and GD corpus (Md = 2.7), U = 741.5, z = −0.74, p = 0.46.

When keyness scores were compared for each theme, no significant differences were found between the established addiction corpora and the PSNSU corpus for theme 1 (Mdn

Table 1. Keywords (in descending order) for Theme 1: quitting

AUD Corpus		TUD Corpus		GD Corpus		PSNSU corpus	
Keyword	Keyness	Keyword	Keyness	Keyword	Keyness	Keyword	Keyness
sober	28.22	quit	49.18	quit	18.70	deleted	9.13
AA	13.68	quitting	18.78	quitting	7.03	delete	8.54
sobriety	13.56	easier	7.00	moderation	5.44	quit	5.42
quit	9.69	badge	6.96	stop	5.36	deleting	5.00
recovery	4.42	turkey	5.26	relapse	4.90	stop	4.20
stop	4.41	stop	4.91	CGAA	3.71	off	3.09
quitting	3.86	vaping	4.22	stopped	3.37	timer	2.86
badge	3.59	vape	4.22	rid	2.73	password	2.80
stopped	3.51	gum	4.10	meetings	2.57	rid	2.75
easier	3.32	helped	3.95	relapses	2.52	tried	2.54
helped	2.97	relapse	3.59	helped	2.42	log	2.45
steps	2.89	e-cig	3.26	moderate	2.26	quitting	2.34
sponsor	2.88	hardest	3.22	tried	2.24	helped	2.33
moderation	2.74	stopped	3.11	relapsed	2.17	disable	2.31
rehab	2.62	tried	3.05	stopping	2.15	deactivate	2.24
relapse	2.61	patches	2.82	uninstall	2.12	turkey	2.18
therapist	2.62	patch	2.62	limit	2.07	limit	2.13
doctor	2.58	stopping	2.19			stopped	2.07
stopping	2.29	resolve	2.17				
tried	2.26	ecig	2.05				
moderate	2.26	beat	2.04				
meeting	2.23	harder	2.03				
detox	2.10						

Table 2. Keywords (in descending order) for Theme 2: Body, Mind and Biological Views of Addiction

AUD Corpus		TUD Corpus		GD Corpus		PSNSU corpus	
Keywords	Keyness	Keywords	Keyness	Keywords	Keyness	Keywords	Keyness
anxiety	4.56	cravings	12.44	anxiety	4.94	dopamine	5.00
sleep	3.37	craving	9.52	bored	4.76	brain	3.47
cravings	2.97	withdrawal	5.32	depression	3.99	mental	3.00
brain	2.67	brain	4.78	sleep	3.89	anxiety	2.81
depression	2.40	lungs	4.70	brain	4.78	depression	2.75
withdrawal	2.39	smell	4.53	withdrawal	3.57	depressed	2.43
craving	2.08	stress	3.62	dopamine	3.43	attention	2.36
sick	2.06	sleep	3.39	compulsive	2.97	sleep	2.31
		anxiety	3.32	boredom	2.37	mindlessly	2.01
		urge	2.81	obsessive	2.14		
		trigger	2.50	anxious	2.03		
		triggers	2.42				
		coughing	2.31				
		breath	2.30				
		cough	2.28				
		crave	2.24				
		mental	2.19				
		breathing	2.07				
		mouth	2.05				

3.08 vs 2.65, $U = 476$, $z = -0.95$, $p = 0.35$), theme 2 (Mdn 2.97 vs. 2.75, $U = 150$, $z = -0.57$, $p = 0.57$), theme 3 (Mdn 2.85 vs. 2.27, $U = 69$, $z = -1.45$, $p = 0.15$) or theme 4 (Mdn 2.67 vs. 3.37, $U = 17$, $z = -0.65$, $p = 0.51$). Likewise, when addiction corpora were analysed individually, no significant differences were found for theme 1 between the PSNSU corpus (Md = 2.65) and the AUD corpus (Md = 2.89), $U = 165$, $z = -1.10$, $p = 0.27$; the TUD corpus, (Md = 3.43), $U = 156$, $z = -1.14$, $p = 0.25$; and GD corpus, (Md = 2.57), $U = 151$, $z = -0.07$, $p = 0.95$. No significant differences were found for theme 2 between the the PSNSU corpus (Md = 2.75) and the AUD corpus, (Md = 2.54), $U = 33$, $z = -0.29$, $p = 0.77$; the TUD corpus, (Md = 2.81) $U = 78$, $z = -0.37$, $p = 0.71$; and GD
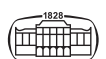
Table 3. Keywords (in descending order) for Theme 3: time

AUD Corpus		TUD Corpus		GD Corpus		PSNSU corpus	
Keywords	Keyness	Keywords	Keyness	Keywords	Keyness	Keywords	Keyness
days	5.36	days	7.51	hours	5.11	constantly	3.95
never	3.42	weeks	5.19	never	3.03	never	3.36
night	3.10	months	3.59	hour	2.51	time	3.33
months	2.85	tomorrow	3.52	eventually	2.44	hours	3.33
weeks	2.74	never	3.45	weekends	2.30	sometimes	2.27
morning	2.42	week	2.87	weeks	2.38	always	2.22
week	2.22	month	2.63	constantly	2.28	minutes	2.15
		long	2.31	months	2.24	days	2.11
						eventually	2.01

Table 4. Keywords (in descending order) for Theme 4: Relationships

AUD Corpus		TUD Corpus		GD Corpus		PSNSU corpus	
Keywords	Keyness	Keywords	Keyness	Keywords	Keyness	Keywords	Keyness
Friend	3.87	friend	2.74	friends	5.48	friends	7.46
friends	3.60	friends	2.29	friend	3.58	people	3.66
Wife	2.42	buddy	2.09	girlfriend	2.67	friend	3.08
people	2.08			people	2.51	connections	2.03

Table 5. Keywords (in descending order) for Salient Theme 1: Loneliness

AUD Corpus		TUD Corpus		GD Corpus		PSNSU corpus	
Keywords	Keyness	Keywords	Keyness	Keywords	Keyness	Keywords	Keyness
Alone	2.78	–	–	alone	2.42	loneliness	2.26
						validation	2.33
						interaction	2.28
						lonely	2.22

corpus, (Md = 3.57), $U = 33$, $z = -1.25$, $p = 0.21$. No significant differences were found for theme 3 between the the PSNSU corpus (Md = 2.27) and the AUD corpus, (Md = 2.85) $U = 24$, $z = -0.80$, $p = 0.43$; and the GD corpus, (Md = 2.41) $U = 30.0$ $z = -0.58$, $p = 0.56$. A significant difference was identified for theme 3 between the PSNSU corpus (Md = 2.27) and the the TUD corpus (Md = 3.48), $U = 15$, $z = -2.02$, $p = 0.043$. Finally, no significant differences were found for theme 4 between the PSNSU corpus (Md = 3.37) and the AUD corpus, (Md = 3.01) $U = 7.0$, $z = -0.29$, $p = 0.77$; the TUD corpus, (Md = 2.29), $U = 3$, $z = -1.06$, $p = 0.29$; and the GD corpus, (Md = 3.13) $U = 7.0$, $z = -0.29$, $p = 0.77$.

The significant difference identified between keyness scores in theme 3 between the PSNSU and TUD corpora may be taken as a reflection of object-specific differences with greater keyness scores for short time periods in the TUD corpus reflecting the great difficulty that people have when quitting smoking. With no other significant differences in the keyness of words within themes and without significant differences in the distribution of keywords across themes, data taken from the PSNSU corpus demonstrates a degree of structural similarity with the established addiction corpora.

Linguistic analysis

Theme 1- Quitting. Fundamental to addiction is quitting (Elster, 1999). Across all four corpora, keywords reflect the object-specific methods of quitting that are available socially and practically for each disorder. Similarities in the quitting process are found in a focus on an abstinence approach as expressed in the idiom "cold turkey" as well as in the keywords "stop" and "quit".

Although considered a core idiom, "cold turkey" (like many idioms) does not typically occur in great frequencies in collections of authentic uses of English (Grant, 2005). This idiom has a frequency of 0.23 per million in the reference corpus. Given its meaning, however, it is unsurprising that "cold turkey" appears much more often in the AUD, TUD, GD and PSNSU corpora with relative frequencies of 25.56, 610, 165.17 and 197.61 per million, respectively. The unusually high relative frequency of this idiom in the PSNSU corpus can be taken as an example of

interdiscursivity, whereby a recognisable language feature associated with addiction is appropriated by individuals discussing PSNSU.

Other constructions adopting the wider language around quitting are found where the keyword "just" modifies verbs of cessation. "Just quit" appears in the AUD (freq = 31, logDice score = 7.4), TUD (freq = 41, logDice score = 9.0) and GD (freq = 14, logDice score = 10.2) corpora but carries a logDice score of just 2.8 in the reference corpus. Likewise, "just stop" appears in the AUD (freq = 46, logDice score = 7.9), TUD (freq = 33, logDice score = 8.9), GD (freq = 6, logDice score = 9.0) and PSNSU (freq = 8, logDice score = 8.4) corpora but, again, is not as typical in the reference corpus (logDice score = 5.8). Also appearing in the PSNSU corpus is "just delete" (freq = 33, logDice score = 10.4). With the exception of the AUD corpus, where KWIC information reveals discussions of the medical dangers of abruptly quitting, collocations with "just" are often employed to positively present sudden, total cessation:

"This morning I woke up and decided to just stop." (TUD corpus)

"Just quitting makes everything better." (GD corpus)

"I would just delete the app/account and don't look back." (PSNSU corpus)

These constructions are reminiscent of the simplistic language that was found in the popular, morality-driven Just Say No campaign against drug use (Mackey-Kallis & Hahn, 1991) and the language that is popularly challenged when directed towards individuals facing addiction (Hartney, 2021; Herzanek, 2007; Khazan, 2017; Oh, 2014).

Also found to modify verbs of cessation are measures of totality that emphasise abstinence. "Completely" appears as a collocate of "quit" in the AUD (freq = 9, logDice score = 8.8), TUD (freq = 11, logDice score = 9.3) and GD (freq = 5, logDice score = 11.1) corpora but is less in typical in the reference corpus (logDice = 2.2). Likewise, "completely" is a collocate of "stop" in the AUD (freq = 16, logDice score = 9.4) and TUD (freq = 5, logDice score = 9.4) corpora but has a lesser logDice score (6.2) in the reference corpus. In the PSNSU corpus, "completely" appears as a collocate of "delete" (freq = 7, logDice score = 10.5), and synonymous adverbs are also found to modify "stop" and "quit" in the AUD and TUD corpora. When explored through KWIC information, these collocations are often found within texts debating abstinence over moderation:

"I'm now convinced that I have to stop completely." (AUD corpus)

"It's these little experiments that are likely to bring you on the path of quitting completely." (TUD corpus)

"Moderation is too hard, it's simpler and easier to quit completely." (GD corpus)

"I've tried to completely delete it, but life is now so intertwined with it that I keep having to go back to it." (PSNSU corpus)

As seen in the illustrative example above, in the case of the PSNSU corpus, texts highlight the unique role of SNS in everyday life, which makes any abstinence approach to quitting challenging and even undesirable.

Theme 2- Body, mind and biological views of addiction. Keywords related to the body and mind tell of known physical effects of addiction, shared comorbidities and a shared positioning of the brain/mind at the centre of a loss of control and agency.

Theme 2.1- Physical effects. Keywords related to the physical effects of addiction are, as to be expected, largely specific to each individual addiction. Across all corpora, however, there appear overlaps in discussions concerning sleep, although these discussions are varied. In the AUD and TUD corpora, many instances of "sleep" are featured in conversations concerning sleep quality following quitting. Those in GD and SNS corpora, on the other hand, are almost exclusively focused on how target activities may interrupt sleep:

"I was chronically sleep-deprived when gaming and sleep deprivation has very serious mental and physical effects." (GD corpus)

"My rock bottom was having a psychotic episode from lack of sleep." (PSNSU corpus)

This association between poor sleep and PSNSU as well as GD may be understood as an object-specific difference seen with internet-based addictions that has been previously identified in academic literature (Hawi, Samaha, & Griffiths, 2018; Wolniczak, 2013; Wong et al., 2020; Xanidis, 2016).

Theme 2.2- Comorbidities. "Anxiety" and (in all but the TUD corpus) "depression" appear as keywords across the corpora, reflecting known disorders that often present alongside the investigated disorders (Bonnaire & Baptista, 2019; Hobbs, Kushner, Lee, Reardon, & Maurer, 2011; Morrell & Cohen, 2006). Uniquely, in the PSNSU corpus, KWIC information reveals that users often attribute experiences of anxiety to the use of SNS platforms:

"I'm not sure Facebook will ever be able to provide anything but anxiety triggers for me." (PSNSU corpus)

Previous research has identified a positive relationship between the risk of PSNSU and social anxiety (Hussain & Griffiths, 2018), with some qualitative evidence suggesting that SNS may offer social enhancement for otherwise socially anxious individuals due to its ease of use and the social control it offers to users (Ryan et al., 2016). However, evidence from the PSNSU corpus indicates that, for some users, SNS may not offer an enhancing social environment but rather an anxiety-inducing one. This perspective identified within the corpus was also reflected in the recent work of Boursier, Gioia, Musetti, and Schimmenti (2020), who found that perceived loneliness predicted excessive SNS use, which, in turn, predicted higher levels of anxiety, indicating that SNS as a potential object of addiction for some users may carry adverse outcomes that may not manifest with more typical usage.

Theme 2.3- Loss of agency. Across corpora the brain is presented as an independent social actor controlling the

addiction, appearing in the subject position within statements so as to carry out actions that result in the engagement in addiction-related activities:

> "(…) those situations produced urges- or rather my alcoholic brain found in each of them a reason to drink and told me so." (AUD corpus)

> "(…) don't let your addict brain trick you into an unfulfilling relapse" (TUD corpus)

> "Your brain is currently crying out for electronic cocaine." (GD corpus)

> " I have a brain that convinces myself to go back over and over again." (PSNSU corpus)

Presenting the brain as a social actor may reflect the widespread popularity of the brain-disease model of addiction. This model has previously been found to be dominant in narratives of addiction as told by individuals with lived experiences (Hammer, Dingel, Ostergren, Nowakowski, & Koenig, 2012). However, just as this model of addiction has been criticised as one that "obscures the dimension of choice" (Satel & Lilienfeld, 2013, p. 1), this syntactic presentation of addiction in the corpora obscures agency.

The obscuring of agency is also found in texts from the PSNSU corpus that make use of the keyword "mindlessly" as found in the constructions "mindlessly scrolling" (freq = 7, logDice score = 11.9) and "mindlessly browsing" (freq = 3, logDice score = 11.5):

> "(…) mindlessly scroll through Facebook all numbed out and zombified." (PSNSU corpus)

In describing engagement in SNS use as "mindless", these texts present a loss of control.

This centring of agency on the brain and mind may also, in the cases of GD and PSNSU, serve to legitimise these relatively novel addictions. Although dopamine is also implicated in alcohol and tobacco addictions (Chiara, 2000; Herz, 1997), "dopamine" is only a keyword in the PSNSU and GD corpora, and examples suggest that, for those who self-identify as addicted to gaming or SNS, "dopamine" signifies substance:

> "I'm a complete dopamine addict." (GD corpus)

> " (…) in constant pursuit of little hits of dopamine, like a mouse drinking a bottle of cocaine laced water." (PSNSU corpus)

This presentation of technological addiction as a substance-based addiction is especially prevalent in the PSNSU corpus, where the language of substance abuse is adopted via collocations including "dopamine rush" (freq = 8, logDice score = 12.6) and "dopamine hit" (freq = 3, logDice score = 12.3). By employing collocations associated with substance abuse (Sturges, 1969; World Health Organization, 1994, p. 56, p. 174), PSNSU is constructed as a drug addiction.

Theme 3- *Time.* Time measurements make up keywords across all corpora, with texts often measuring both disengagement from and engagement in addictions.

Theme 3.1- *Measuring quitting.* Reflecting the abstinence approach to quitting presented in theme 1, disengagement from addiction activities is measured in "days" and "months" across corpora:

> "I was able to stop drinking for 6 months last year." (AUD corpus)

> "My day 1 began few minutes ago. Survived the first half hour." (TUD corpus)

> "Congrats on 57 days!" (GD corpus)

> " I did 2 months without it just to fall back again." (PSNSU corpus)

As seen in the illustrative examples above, KWIC information often depicts an experience of relapse or a sense of accomplishment in abstinence.

Theme 3.2- *Time lost in engagement.* Unlike the quitting process, time devoted to engagement in addiction activities is not presented as something countable. Speakers often lament how "much time" has been devoted to drinking (freq = 51, logDice = 9.2), gaming (freq = 15, logDice = 11.2) and SNS (freq = 42, logDice = 11.6), a collocation, which is relatively in common in general English (logDice = 8.5 in the reference corpus) but more typical in the addiction corpora. Texts also speak of how "time" is "wasted" on addiction in the AUD (freq = 25, logDice = 8.9), GD (freq = 13, logDice = 11.0) and PSNSU (freq = 33, logDice = 11.6) corpora. Comparatively, in the reference corpus, "time" is less likely to appear alongside "waste" (logDice = 8.5) than in these corpora, reflecting how time as a resource may be lost in both substance and behavioural addictions (American Psychiatric Association, 2013).

In the case of SNS use, time loss may be uniquely disruptive to daily activities, with usage often measured via the keyword "constantly" as seen in the collocation "constantly checking" (freq = 8, logDice = 11.1). Although "constantly" is also found in the GD corpus, its context is more diverse, with some examples including thoughts about gaming. Notably, such invasive thoughts about usage, which are typically considered evidence of salience (Griffiths, 2005), are not found in KWIC information for "constantly" in the PSNSU corpus. Rather, reflecting the ubiquity of smartphones and internet accessibility, texts speak of constant usage. While it is not uncommon for SNS users to use these platforms on a daily basis with many users logging on several times a day (Facebook, 2019; Pew Research Center, 2019), describing usage as "constantly checking" may reflect a number of proposed components of PSNSU, i.e. (behavioural) salience, preoccupation, obsession and compulsion.

Theme 3.3- *Time gained in quitting.* Time is also presented as something that is gained in quitting with additional "free time" presented as a positive effect of quitting in the AUD (freq = 32, logDice = 8.7), GD (freq = 10, logDice = 10.8) and PSNSU (freq = 14, logDice = 10.2) corpora, a relatively common construction but one carrying a lower typicality score in the reference corpus (logDice = 7.6). Yet, having additional free time following quitting is

not always presented without associated challenges. "Time" is something to "fill" following quitting in the GD (freq = 13, logDice = 11.1) and PSNSU (freq = 6, logDice = 9.2) corpora. Texts also employ the keywords "productive" (GD corpus: keyness = 2.78, PSNSU corpus: keyness = 3.18) and "hobbies" (GD corpus: keyness = 6.014, PSNSU corpus: keyness = 2.94) in the corpora of internet-based addictions to urge fellow users to busy themselves in order to quit:

> "(…) you have to keep yourself occupied with other hobbies." (GD corpus)

> "Trying to replace time spent on social media with productive activities or hobbies is a great way to decrease your usage of these apps." (PSNSU corpus)

This emphasis on "productive" activities presents gaming and SNS use as counterproductive, and a small number of examples in the GD and PSNSU corpora indicate that time lost to these activities may even be an antecedent of conflict:

> " You cannot advance in anything when wasting time on a useless activity that gives you zero to minus productivity." (GD corpus)

> "(…) all the wasted time I gave to those virtual platforms. Instead of taking care of my few friends and family, I was constantly updating my Instagram feed." (PSNSU corpus)

As seen in the examples above, time loss is presented as a cost of addiction with potentially negative impacts on other areas of life. However, as seen in theme 4, such experiences of loss in addiction and gain in quitting are not limited to time but are also found in relationships.

Theme 4- Relationships. Keywords related to relationships are found in all corpora with an emphasis on friendships. However, when examined in context, it is evident that friendship is often presented in a context of conflict.

Collocational data reveals that "friends"and "people" are often modified by their association with addiction. There are "drinking friends" (freq = 21, logDice score = 8.9) and "sober friends" (freq = 51, logDice score = 9.8), "drunk people (freq = 40, logDice score = 9.6) and "sober people" people (freq = 61, logDice score = 9.6) in the AUD corpus; "smoker friends" (freq = 17, logDice score = 11.6)/ "smoking friends" (freq = 7, logDice score = 9.3) and "non-smoker friends" (freq = 4, logDice score = 9.9)/"non-smoking friends" (freq = 5, logDice score = 10.4) in the TUD corpus; and "Facebook friends" (freq = 4, logDice score = 9.0)/"FB friends" (freq = 2, logDice score = 8.8) and "real friends" (freq = 11, logDice score = 10.5) in the PSNSU corpus. In comparison, modifiers of "friend" in the reference corpus that have similar logDice scores (>8.5) include "close" (logDice = 10.2), "dear" (logDice = 9.9), "family" (logDice = 9.1), "good" (logDice = 8.8) and "old" (logDice = 8.7). Although no collocate of "friend" in the GD corpus met the frequency threshold, examples found in KWIC information tell a similar story:

> "I had a couple of other sober friends who were supportive and that really helped." (AUD corpus)

> "I attempted to not smoke around my smoker friends, it failed every time." (TUD corpus)

> "Get rid of your gamer friends and fill the void." (GD corpus)

> "You find out who is REALLY a part of your life once you cut out the fb friends." (PSNSU corpus)

This dichotomous presentation of friends in relation to addiction reflects the interpersonal and intrapsychic conflict that may arise from addiction and quitting. Friends associated with addiction are often presented as less supportive and less "real" than other friends.

Such views of friendship may also have real world consequences as seen in discussions concerning social upheaval and forming new friendships. Texts from the AUD corpus speak of "losing friends" (freq = 34, logDice score = 9.9) and "making friends" (freq = 71, logDice score = 9.7) as a result of addiction and as a condition for sobriety. "Making friends" also appears in the GD (freq = 14, logDice score = 11.2) and PSNSU (freq = 15, logDice score = 10.6) corpora as a step in quitting. In the reference corpus, however, "make" and "lose" are less typical collocates of "friend" with logDice scores of 7.4 and 6.8, respectively. Uniquely, in the GD and PSNSU corpora, these collocations are often accompanied by admissions related to the social struggles often associated with internet-based addictions (Chen, 2018; Chou et al., 2017; Erdogan, 2023):

> "I'm stuck on how to make new friends though." (GD corpus)

> "I'm also not very good at making friends and socialising, and I wonder if SM has made that worse." (PSNSU corpus)

As reflected in the examples above and the higher keyness score for "friends" in the PSNSU and GD corpora, friendship appears as a potential preoccupation for internet-based addictions. Although texts encourage peers to "find people" as a step in addiction recovery in the AUD (freq = 45, logDice score = 9.4) and GD corpora (freq = 6, logDice score = 10.3), where texts from the AUD corpus celebrate how they may "meet people" (freq = 61, logDice score = 10.7) in contexts like AA meetings, "meet people" (freq = 12, logDice score = 12.2) often appears in the GD corpus within texts conveying individuals' challenges with the social skills involved with meeting new people. In the PSNSU corpus, on the other hand, the online world is, in some texts, presented as a space to "meet people" (freq = 12, logDice score = 10.7), while other texts encourage only "following people" (freq = 6, logDice score = 9.4) who are already known in the offline world. Texts from the PSNSU corpus also speak of having "few friends" (freq = 9, logDice score = 9.9) offline and present an overwhelming sense of loneliness, which is explored as a unique theme in the section below due to its object-specific expression.

Salient theme 1- Loneliness. Where the PSNSU corpus was found to differ from corpora of other addictions was in the use of keywords denoting experiences of loneliness.
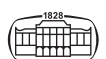
Although "alone" is a keyword in other corpora, instances largely speak of being "not alone" in the AUD (freq = 156, logDice = 7.4) and TUD (freq = 24, logDice = 6.4) corpora, which reflects the supportive nature of the forums. Such supportive messages are also found in the GD corpus, but more instances utilise the word "alone" to speak about the solitary (and lonely) aspect of gaming. In the PSNSU corpus, "alone" is just below the threshold of keyness at 1.98, and texts speak more often of "being alone" (freq = 18, logDice = 8.6, logDice = 6.4 in the reference corpus) than being "not alone" (freq = 6, logDice = 6.1, 4.8 in the reference corpus). When explored in context, KWIC information reveals that, unlike in the GD corpus, this experience of being alone does not reflect the act of using SNS. Rather, three subthemes identified in the PSNSU corpus present loneliness as (1) a driver of usage, (2) an effect of the platform, and (3) an effect of quitting.

Salient Theme 1.1- Loneliness as a driver of usage. Going online to meet social needs is presented, at times, as "seeking validation" (freq = 7, logDice = 12.8, logDice = 3.4 in the reference corpus), and the experience of loneliness is discussed as something that may prompt individuals to engage in SNS use as part of a process of mood modification:

> "(…) your boredom/fear/loneliness kicks in, you go on the internet." (PSNSU corpus)

Loneliness as a driver of usage has also been identified in extant studies (Boursier et al., 2020; Haifeng Xu, 2012), but how effective SNS may be in reducing loneliness is unclear (Ponnusamy, Iranmanesh, Foroughi, & Hyun, 2020; Teo & Lee, 2016). However, if, like other addictions, SNS is used for the purpose of self-medication, its effectiveness may not be relevant.

Salient Theme 1.2- Loneliness as an effect of the platform. When "loneliness" is directly defined in texts in the PSNSU corpus, statements attribute loneliness to social networking use:

> "Loneliness is the worst it's ever been in all of modern history because of our reliance to (sic) social media and a lack of in person connection." (PSNSU corpus)

Users distinguish between digital correspondence and more traditional "human" (freq = 7, logDice = 11.9, logDice = 7.0 in the reference corpus), or "face-to-face" (freq = 4, logDice = 11.6, logDice = 7.7 in the reference corpus) "interaction", and in doing so often express comparative dissatisfaction:

> "(…) it's a cheap facsimile of human interaction." (PSNSU corpus)

Although SNS may offer a number of features that may make socialising easier, users emphasise that it remains a unique mode of communication and present it as less valuable than offline interaction, and extant research supports this view. In a study comparing online interpersonal communication with face-to-face communication, Lee, Leung, Lo, Xiong, and Wu (2010) found online communication to have an insignificant or negative impact on quality of life. In contrast, face-to-face communication was found to have a positive impact. Likewise, Kim (2017) found face-to-face communication to have a positive effect on perceived social support, but lonely people report a greater reliance on smartphones for communication and a greater reluctancy to engage in face-to-face communication, leaving them more likely to develop smartphone dependency and experience decreased perceived social support.

Salient Theme 1.3 -Loneliness as an effect of quitting. When individuals quit using SNS, feelings of loneliness are again reported, and social networks are presented as being so popular that not using them could result in isolation:

> "Years ago deleted social accounts, now isolated and lonely after I lost my social net that has migrated to social platforms." (PSNSU corpus)

This presents another level of conflict for individuals who struggle to manage SNS usage. Unlike the peer pressure discussed as a factor influencing relapse in drug addiction (Barati et al., 2021), SNS users face societal norms where in many nations the majority of citizens are SNS users (Ofcom, 2020; Pew Research Center, 2021) and are using these platforms on a daily basis (Facebook, 2019; Pew Research Center, 2019, 2021), making socialising without SNS challenging and even lonely.

GENERAL DISCUSSION

Results from this study demonstrate that the discourse of PSNSU is broadly similar to that of clinically-defined addictions. Corpora were found to share a structural similarity of "aboutness", lexical patterns and themes with unique similarities identified between the two internet-based addictions included in this study, demonstrating support for transdiagnostic approaches to addiction. Shared content found in both the PSNSU and GD corpora included concerns over sleep deprivation and a perceived lack of social skills in regards to in-person relationships. In the PSNSU corpus, this concern over social lives was further expressed around discussions of loneliness with distinctions made between online and in-person socialisation and the overarching suggestion that, ironically, SNS may not be socially enhancing.

Perhaps surprisingly, the symptoms often used to delineate and measure addiction did not form themes in their own right in this study, but this is to be expected when using corpora of naturally occurring language. Yet, classic symptoms of addiction from Griffiths' (2005) components model did come across in the analysed discourse, with the components model of addiction largely represented in the PSNSU corpus. (Behavioural) salience (along with preoccupation, obsession and compulsion) was reflected in time measurements in the PSNSU corpus with users discussing the experience of "constantly checking". Mood modification was expressed in texts that suggested that SNS is often turned to in an attempt to alleviate loneliness. Conflict (as well as negative consequences and life problems) came

across within texts discussing relationships, and relapse was identified in texts that measured time away from SNS, with measures of abstinence often presented alongside admissions of reinstating platform use. Reflecting the debate concerning the relevance of tolerance and withdrawal for behavioural addictions (Daniel Kardefelt-Winther et al., 2017; Starcevic, 2016), these components were not directly reflected in texts from the PSNSU corpus. However, potentially indexical of tolerance, the amount of time devoted to SNS was presented as excessive in the corpus, and the term "withdrawal" was found to have a keyness score of 1.77, making the term more likely to appear in the PSNSU corpus than in general English (although this could be another example of interdiscursivity). Overall, textual evidence from this study suggests that these components of addiction may come together in a cycle of excessive usage centred around mood modification, with loneliness identified as both a driver and outcome of usage.

Strong evidence of social enhancement, substitute satisfaction or preference for online social interaction was not identified in discussions surrounding PSNSU in this study. When keywords related to relationships were explored, it was evident that virtual socialising was presented as convenient (to the extent that the convenience formed a barrier to quitting) but not enhancing or preferable. Moreover, like other addictions, distinctions were made by speakers between SNS-related friendships and "real" friendships. So, although people may use SNS to alleviate loneliness, it may not be particularly enhancing.

Other symptoms identified in the scales used to measure PSNSU were also identified in the discourse, but the prominence of interdiscursive references made it unclear as to whether or not these linguistic patterns are indicative of shared experiences with addiction or of shared experiences with language. Euphoria was identified in texts that spoke of experiencing a "dopamine rush" or "dopamine hit" when using SNS, reproducing popular language from the context of drug use. Loss of control and deficits in self-regulation were evident in statements that presented the brain as a social actor, reflecting a metaphorical understanding of the brain-disease model of addiction and the linguistic transfer of knowledge of addiction between discourse communities. These and other examples of discursive reproduction found in this study via well-known idioms, vocabulary items and syntactic constructions associated with drug addiction reflect pre-existing knowledge of the addiction-related language and the iterability of language in general, and in acknowledging this, we must also acknowledge the possibility that the same confirmation bias that plagues research (Billieux et al., 2015) may be present in the language choices employed by those who self-identify as struggling with PSNSU.

Based upon the above consideration of symptomatic components evident in the themes identified and taking into account the unreliable nature of some of the most clear examples of interdiscursivity, it is suggested that the most appropriate measures for PSNSU may be those that are based upon the components model of addiction, e.g. the Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2016) and the Social Networking Addiction Scale (SNAS) (Shahnawaz, Rehman, & Monacis, 2020). However, these should be understood as broadly fitting measures that may not perfectly reflect all individualised experiences of PSNSU. The use of scales that suggest that addicted individuals may experience social enhancement from SNS use, e.g. scales developed from Young's Internet Addiction Test, is not fully supported by the evidence taken from the discourse community.

Limitations to this study include aspects of the corpora themselves. Having been limited to data taken from Reddit forums, the sample is not representative. Furthermore, although it is apparent within the corpora that the majority of users are self-identifying as individuals facing addiction, it is not possible to formally identify which examples of language use come from individuals at greater or lesser risk of addiction. Despite these limitations, this study has demonstrated not only thematic and linguistic similarities between the discourses of established addictions and PSNSU but also how corpus linguistics may be applied to psychological research. Where emerging disorders form the subject of discussion, corpus research is able to be utilised to uncover the shared and salient linguistic features that tell of meaningful similarities and differences in the reporting of psychopathological experiences.

Building on this study, researchers may consider how interdiscursive references may be indexical of confirmation bias among speakers. Further, although the discourse of PSNSU was found to align with the discourses of established addictions in this study and, in doing so present PSNSU as a cultural reality, extradiscursive evidence is needed. Empirical linguistic evidence, such as that presented in this study, can offer a "bird's eye view" of perceptions of novel disorders without the constraints and biases of traditional qualitative interviews. However, it should be remembered that what is real in discourse is not necessarily real outside of discourse (Teubert, 2005), and any results from corpus-driven research should be used to inform additional empirical work concerning cognition and behaviours.

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