

Building addiction recovery capital through online participation in a recovery community

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Abstract

The study examines how online participation in a recovery community contributes to personal journeys to addiction recovery. We investigate whether recovery capital building - as indicated by increased levels and quality of online social interactions - and markers of positive identity development predict retention in a recovery program designed around fostering community involvement for early stage recovery addicts. We predicted that high levels and quality of online participation on the group's Facebook page and positive identity development predict retention in the program. To map how participants interact online we conducted social network analysis (SNA) based on naturally occurring online data on the Facebook page of a recovery community. We used computerised linguistic analysis to conduct a sentiment analysis of the textual data (capturing social identity markers). We used linear regression analysis to test whether our indicators of recovery capital predict program retention. To illustrate our findings in the context of the recovery community, we also present case studies of two key participants who moved from the periphery to the centre of the social network. By conducting in-depth interviews with these participants we were able to explore personal experiences of social media usage in the context of their recovery journeys for group members who have undergone some of the most significant changes since joining the community. We found that retention in the program was determined by a) the number of comment 'likes' and 'all likes' received on the Facebook page; b) position in the social network (degree of centrality); and c) linguistic content around group identity and achievement. In conclusion, positive online interactions between members of recovery communities support the recovery process through helping participants to develop recovery capital that binds them to groups supportive of positive change.

26 **Keywords**

27 online social interactions, recovery capital, social identity, recovery community

28

29 **Building addiction recovery capital through online participation in a recovery**
30 **community**

31
32 “...the longer people are on the Internet, the more likely they are to use the Internet to
33 engage in social-capital-building activities” (Kavanaugh and Patterson, 2001, p. 507)

34
35 **Introduction**

36 *Building recovery capital through social networks*

37 Traditional (offline) social networks are now recognised as helping make recovery more
38 sustainable (White and Kelly, 2010) by providing people with opportunities to develop their
39 recovery capital, i.e., "the sum total of one's resources that can be brought to bear on the
40 initiation and maintenance of substance misuse cessation” (Cloud and Granfield, 2009, p.
41 1972). Recovery capital can be developed through several avenues: a) building social capital
42 through developing and strengthening links with both group members (other people in
43 recovery), and outgroup members (reaching out to the broader community), referred to as
44 bonding and bridging capital respectively; and b) building community and cultural capital
45 (Best and Laudet, 2010; Groshkova et al., 2013). Based on the work of Robert Putnam (2001),
46 the concept of social capital has become a key theoretical framework around support and
47 resources and has been applied to addiction recovery populations (Cloud and Granfield,
48 2009). The accumulation of greater recovery capital is considered a marker of recovery
49 progress and a predictor of sustained recovery, therefore taking the form of a currency for
50 measurement in recovery research (Groshkova et al., 2013).

51 Being part of many supportive social networks of addiction recovery was shown to
52 have positive effects on wellbeing (Jetten et al., 2012; Litt et al., 2009; Longabaugh et al.,
53 1998; 2010). Here we aim to extend this evidence by examining the role of supportive *online*

54 *social networks* in helping people in recovery. We propose that online social networks can
55 assist recovery by helping build *recovery capital* at the same time supporting the
56 development of a positive identity. A positive identity can in turn further support efforts to
57 maintain a drug-free lifestyle.

58

59 *Social identity in recovery*

60 While we know that supportive social networks are beneficial for recovery and help the
61 development of recovery capital, to understand the underlying processes we turned to
62 theoretical resources from social psychology, specifically to Social Identity Theory (SIT,
63 Turner et al., 1987; Turner, 1982). Increased recognition of the importance of developing
64 positive social identities in the recovery process stems from the SIT proposition that group
65 membership is fundamental to understanding adherence to the norms, values and rules of
66 social groups, in particular, identification and engagement with valued groups that shape
67 individuals' behaviour, through a desire to be a part of the group and therefore aspiring
68 members will increasingly adhere to its norms and values. Applied to health, these ideas lead
69 to developing a 'social cure' approach (Jetten et al., 2012) in which group belonging is
70 beneficial not only because it can provide access to emotional support and practical
71 assistance from other group members, but also through a direct (positive) influence on
72 behaviour. The benefits of belonging to one or more groups are translated into positive
73 effects on health and wellbeing (Cruwys et al., 2013; 2014; Haslam et al., 2014).

74 This approach was applied to addiction recovery in the Social Identity Model of
75 Recovery (SIMOR, Best et al., 2016) which proposes that recovery is associated with
76 transitioning from the more excluded social group membership of 'using groups' to groups
77 that are supportive of recovery, and by doing so transitioning to more positive values, beliefs,
78 attitudes and ultimately to behaviours. In this model, the transition from active addiction to

79 recovery is a staged process that takes place over time, and through exposure to recovery
80 groups at a time of disenchantment with addiction lifestyles (with the ensuing dissonance
81 between addiction group membership and other valued life goals such as relationships and
82 parenting). Such dissonance experiences can loosen the bonds to groups involved in addictive
83 behaviours and support a gradual transition to engagement with recovery groups, and the
84 internalisation of their norms, values and rules. These ideas are consistent with findings from
85 the Alcoholics Anonymous (AA) literature where the importance of facilitating positive
86 changes in social networks through a move to health-promoting social networks have been
87 well-recognised (Kaskutas et al., 2002; Kelly et al., 2009; 2012).

88

89 *The role of online social interactions in recovery*

90 As new technologies enable a variety of ways of communication, the ways in which social
91 support in recovery is delivered and received has expanded to include online modes
92 (Moorhead et al., 2013; White and Dorman, 2001). From a social interaction point of view,
93 there are both advantages and limitations in using new technologies for communication. The
94 access to social support is facilitated through online communication which is particularly
95 useful in cases of social, geographical or mobility-related isolation (Rodham et al., 2009;
96 Savic et al., 2013). However, despite some evidence of similar outcomes (Shahab and
97 McEwen, 2009), it is still debated whether the quality of social support received online is
98 comparable with its face-to-face alternatives (Chung, 2013, Finfgeld, 2000). The ability to
99 interact online with people facing similar issues regardless of their physical proximity
100 promotes the creation of significantly broader, borderless 'online communities of support' that
101 can include not only those people recovering from addiction, but also their supporters and
102 advocates. Therefore, these communities have the potential not only to support individual
103 change, but also social change either as an alternative to or a supplement to face-to-face

104 support networks. As online social interactions become more common across all groups in
105 society, more evidence of significant health benefits linked to online engagement is emerging.
106 For example, recent research by Hobbs et al. (2016) based on a large US dataset (i.e., 12
107 million social media profiles) suggests that people who are well integrated in online social
108 networks such as Facebook are likely to have lower mortality rates.

109 As in many other areas of research, the use of technology in accessing support in
110 recovery has also opened new possibilities in terms of how we collect data in the field of
111 addiction recovery. The recognition that recovery is a dynamic and long-term process goes
112 hand in hand with more dynamic ways of approaching research which the use of new
113 technologies make possible. In agreement with Shneiderman's comments on 'Science 2.0',
114 that "traditional scientific methods need to be expanded to deal with complex issues that arise
115 as social systems meet technological innovation" (Shneiderman, 2008, p. 1349), here we
116 complement the use of more traditional scientific methods such as social network analysis
117 and the use of in-depth interviews, with approaches designed to capture the rich and dynamic
118 context of online interactions in the addiction recovery field (such as computerised linguistic
119 analysis that can be applied to large textual datasets). Conceptually, this allows us to test
120 Social Identity Theory and, in particular, the Social Identity Model of Recovery by mapping
121 changes in belonging and engagement in recovery-supportive groups as a consequence of
122 linguistic style and network location, and to map these predictors of social identity against a
123 recovery outcome, retention in a recovery community.

124

125 *Context of research*

126 We focus on a particular program in the UK, Jobs, Friends and Houses (JFH) - a recovery
127 initiative that incorporates social engagement and identity change supported by an
128 overarching process of building recovery capital. JFH is a social enterprise that engages

129 addicts in early recovery in apprenticeships in building professions while working on the
130 renovation and construction of recovery housing in the north of England town of Blackpool.
131 Participants in the program are actively involved in employment and training, are provided
132 with recovery housing and many of them also attend recovery mutual aid meetings together
133 as a part of a lifestyle change program. The program illustrates particularly well some key
134 SIT principles, as social identity change is enabled by providing participants with a highly
135 visible and attractive ‘ready-made’ positive social identity (a previous publication has
136 outlined how the model of JFH incorporates SIT principles, Best et al., 2016). This positive
137 social identity is constructed around work and the re-invigoration of a deprived community
138 that has resulted in a strong sense of engagement and bonding among program participants
139 and staff members (Best, 2016). Individuals who engage with JFH are able to challenge their
140 own and others' negative perceptions and prejudices through the adoption of a uniform of
141 work and through engagement in activities in a group that contributes to and is positively
142 valued in the local community. A further research paper has shown how the actions of JFH
143 staff prevented a serious assault in the town and describes the impact on bonding capital
144 within the group and bridging capital to the wider community (Best, 2016).

145 As part of the building of the recovery community, JFH has set up a Facebook page to
146 perform two primary functions: to create a recovery-supportive online community for
147 participants; and to allow the outside world (including a range of community stakeholders) to
148 engage with JFH. The community together with its online platform provides an excellent
149 opportunity to examine the role of online social interactions in supporting recovery capital
150 development and the transitioning to a successful recovery identity, which in turn should
151 predict positive outcomes in terms of retention in the program.

152

153

154 *Rationale and approach*To examine the role of supportive online interactions in recovery, we
155 focus on understanding the intragroup and intergroup dynamics as a whole (looking at the
156 structure of the online social network), as well as changes in the ‘agents’ of the network
157 (looking at changes within individuals in the group). As such, the study necessitates a mixed-
158 methods approach. At the same time, the increased widespread use of technologies for online
159 communication enabled us to gain access to more data sources in more varied formats. We
160 make use of these affordances by using social network and textual data extracted from the
161 Facebook’s group page that is complemented by qualitative data from in-depth interviews
162 with key agents in the network, and quantitative retention data. By using a diverse and
163 complementary range of data sources and a mixed methods approach (Denscombe, 2008) we
164 seek to be able to capture the complex and dynamic processes that underpin a successful
165 recovery journey – while the quantitative components of our study will provide structural
166 data and aggregated linguistic information regarding the online social interaction in the
167 recovery community, the qualitative data will give us an insight into the subjective
168 experience of positive change.

169 As a first measure of online engagement in the community of support we look at the
170 growth in the online activity as captured by the number of posts and comments on the
171 Facebook page. To examine how recovery capital is developed in the online community we
172 identity specific markers of recovery capital development by charting the first eight months
173 of activity in the JFH Facebook page in terms of its growth and change over this eight months.
174 We do so by examining the online community of support as made up of three primary groups
175 of members and the interactions between them: a) JFH program participants; b) JFH staff,
176 and c) external individuals (broader community members).
177 By examining the connections between the members of the online community and how they
178 change in the eight months of our investigation we are able to identify variations in the

179 dynamics of the group at an internal level (intragroup). Social network analysis (SNA)
180 represents a comprehensive approach to understanding relational features in groups (i.e.,
181 contacts, ties, connections, group attachments and encounters that relate one group member
182 to another) so it provides an ideal tool to capture intragroup and inter-group dynamics and
183 communication in our online community (Scott, 2012). Theoretically, SNA can be seen as
184 derived from a form of social exchange theory (Emerson, 1976) and more recently it has been
185 linked to Putman’s social capital theory (where social networks are seen as a specific form of
186 social capital). However, “SNA provides a vocabulary and set of measures for relational
187 analysis but it does not imply the acceptance of one particular theory (...)” (Scott, 2012, p.8).
188 For instance, the centrality of a group member in the network would denote increased
189 communications with the other group members – in SNA the more linkages an ‘agent’ has
190 the more central its position in the network would be. This means that we can use centrality
191 coefficients derived from SNA as measures of the *quality of online engagement*. Centrality
192 coefficients can also be used to capture prototypicality (i.e., how representative a group
193 member is for the whole group), and influence within the group. Thus, SNA allows us to
194 identify those group members who have undergone the most change in their location in the
195 social network, reflected by movement from the periphery to the centre of the social network,
196 as shown in SNA maps. As a result, we were then able to validate and further examine how
197 recovery capital is developed by conducting in-depth interviews with two of the most
198 representative members of the group (identified as the most central agents in the online social
199 network towards the end of the eight months period from among the JFH participant cohort)
200 who were then identified and participated in in-depth interviews described below.

201 Changes in the social identity of the group members are captured through conducting
202 a computerised analysis of the language used by participants in their contributions to the
203 Facebook page. By using the computerised language analysis software LIWC (Linguistic

204 Inquiry and Word Count) we can identify the levels (and changes in these) of identification
205 with the recovery group (Pennebaker, 2011), emotions (Chung and Pennebaker, 2014; Gill et
206 al., 2008), and social and cognitive processes of the participants (Pennebaker et al., 2007;
207 2015).

208 Indicators of recovery capital and identity change are used to examine whether they
209 are predictive of retention in the program - retention data being accessed from the JFH
210 administrative team in the form of joining and departing dates for each member of the JFH
211 housing and employment program. As a positive outcome of recovery, we used program
212 retention as *duration of staying in the recovery program* because this has previously been
213 found to be associated to long-term positive recovery outcomes (Zhang et al., 2003). Across a
214 range of treatment outcome studies (e.g., the Drug Abuse Reduction Programme; Simpson
215 and Sells, 1990 in the US, and the National Treatment Outcome Research Study, Gossop et
216 al., 2001, in the UK), there is a strong evidence base that longer retention in specialist
217 treatment services is associated with better outcomes across a range of outcome indicators.
218 Similarly, for recovery-oriented mutual aid groups, Kelly (2016) has reported on the
219 importance of both the intensity and the extensity of meeting attendance on reductions in
220 substance use and improvements in psychological health.

221 Our approach can be divided into two parts: a) examining how recovery capital is
222 built through online interactions, at the same time investigating changes in social identity;
223 and b) testing whether online social engagement and the indicators of recovery capital and
224 social identity change predict retention outcomes.

225 **Methods**

226 *Study participants*

227 The study population (total $N = 609$) consists of all participants in the online JFH Facebook
228 community and includes JFH program participants ($N = 23$), JFH staff ($N = 5$), and

229 community members ($N = 581$) who contributed to the online discussions over a period of
230 eight months since the establishment of the JFH Facebook page. Of the JFH program
231 participants, 91% were male and their ages ranged from 19 to 60 ($M = 34.57$, $SD = 10.86$);
232 32% left school with no qualifications, 26% had a high-school certificate, 16% A Level
233 (Advanced) Education Certificate, and 26% had other types of educational qualifications.
234 Regarding their employment status, 15% of the participants were never employed, 25% were
235 previously employed but no longer working, 45% employed for periods of time with breaks
236 in between, and 5% were in continuous employment.

237

238 *Outcome and predictor variables*

239 We seek to examine the effects of online engagement with a recovery community on
240 retention in a recovery program. Specifically, as predictors of retention, we examine the
241 following indicators:

- 242 - Overall levels of participation in the online community - captured by levels of
243 online activity on the group's Facebook page (i.e., number of posts and comments
244 made);
- 245 - Quality of participation in the online community - captured by centrality network
246 coefficients derived from conducting social network analysis (SNA) by mapping
247 the linkages between members of the online network through their online
248 interactions (the underlying assumption is that, being a result of number and type
249 of connections in the network, centrality coefficients capture the quality of online
250 interactions); and
- 251 - Social identity markers - captured through word usage during the online
252 interactions.

253

254 *Analytic strategy*

255 *1. Social network analysis (SNA)* – SNA is based on a conceptualisation of social structures
256 as a network with ties connecting members and channelling resources (Wetherell et al., 1994).
257 Therefore, we used the network coefficients of ‘degree’ centrality (i.e., the total number of
258 connections connecting a node, Scott, 2012) and ‘betweenness’ centrality (i.e., how much a
259 specific node can act as an intermediary between two other nodes, Scott, 2012) as indicators
260 of quality of online interaction. This choice of coefficients is based on the assumption that in
261 a social network, betweenness and degree centrality are the most relevant indicators of a
262 person’s influence in the communication within the group (for example, the person with the
263 highest betweenness centrality will be the most influential communicator in the network).
264 SNA enabled us to identify those members of the online network that are the most influential
265 agents in the group (through their position in the network). The centrality coefficients were
266 calculated using the software R using the ‘SNA’ package, and were based on the online
267 activity and interactions on the group’s Facebook page in the first eight months since its
268 creation. All interactions between two members within the Facebook group (i.e., commenting
269 on posts, liking posts, and liking comments) were classified as links (edges). The analysis
270 was divided by months (from month 1 to month 8) and includes all contributions during this
271 timeframe (i.e., posts, comments to posts, and likes of posts and comments). SNA maps were
272 also created using the R software using the igraph package.

273 *2. Computerised linguistic analysis* - Linguistic Inquiry Word Count (LIWC) software was
274 used for sentiment analysis of the online communications between the group members
275 (including staff members and broader community members). Online communication data in
276 the form of text was extracted from the group’s Facebook page (all online text exchanges
277 between participants). LIWC is a linguistic analysis software package designed by social
278 psychologists James Pennebaker and colleagues (2015) to capture a number of linguistic and

279 psychological categories underpinning language. These categories include: use of various
280 function words, cognitive mechanisms, social processes, emotions, etc. The software was
281 used and validated in a range of health related contexts including alcohol consumption (Lowe
282 et al., 2013), depression (Baddeley et al., 2013; Rude et al., 2004), and suicide (Stirman et al.,
283 2001). The software's dictionary includes over 80 categories, but the most relevant in this
284 context are: achievement (given the core purpose of the group – to support members to
285 achieve sustainable behavioural change), collective (or social) identity (use of first-person
286 plural pronouns as opposed to first-person singular pronouns), as well as emotions such as
287 affect and positive emotions (as further indicators of the quality of the online engagement).

288 *3. Correlation and linear regression analyses* – in a first stage we conducted correlational
289 analysis on all key variables, followed by linear regression analysis with the following
290 variables entered as predictors:

- 291 - Network centrality coefficients (betweenness centrality and degree centrality);
- 292 - Number of posts and comments;
- 293 - Number of post likes given and received;
- 294 - Number of comment likes given and received;
- 295 - Number of all likes given and received;
- 296 - Client-Client comments received, given and total;
- 297 - Client-Staff comments received, given and total;
- 298 - Total usage of LIWC categories in posts;
- 299 - Total usage of LIWC categories in comments;
- 300 - Total usage of LIWC categories in both posts and comments.

301 *4. Qualitative analysis* – the qualitative data obtained through the in-depth interviews with
302 the two group members selected on the basis of being the most prototypical/influential group
303 members in the social network (as indicated by SNA). The individuals who were identified as

304 central by the end of the study window who had been peripheral at the start were approached
305 to participate in an in-depth interview. We used a deductive approach broadly derived from
306 thematic analysis (Braun and Clarke, 2006), and framework approaches as described by Pope
307 et al. (2000). More specifically, we first familiarised ourselves with the data by independently
308 reading and re-reading the transcripts of the in-depth interview several times. To analyse the
309 data we used a thematic framework (i.e., comprising of the key concepts and themes by
310 which the data can be examined) a-priori drawn from our research questions. The outcome of
311 next step of the analysis was the classification of qualitative data into the relevant categories
312 and themes around the research question about how recovery capital is developed in the
313 program through experiences of both online and face-to-face interactions which were shared,
314 agreed upon and further refined collectively. The final themes were labelled, and the most
315 illustrative quotes for each theme were identified.

316 **Results**

317 *Descriptive statistics*

318 Overall online engagement was captured by computing the number of posts, comments and
319 likes made by staff, clients and community members. Table 1 illustrates a breakdown by type
320 of contribution made by each category of participant across our timeframe of eight months.
321 The counts indicate that the participants from the broader community are particularly active
322 in terms of comments and likes to the posts – which are mostly contributed by staff and
323 clients.

324
325 *Insert Table 1 about here*

326
327 General levels of activity on the Facebook group are shown in Table 2.

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Insert Table 2 about here

Determinants of retention in the program

We expected that retention would be associated with the indicators of recovery capital development (quantity and quality of online interaction), and indicators of a positive recovery identity development. In quantitative terms, online interaction was captured through the number of: a) posts made; b) comments made; c) post likes received; d) comment likes received; and e) all likes received. The quality of online interaction was captured by network structure, that is, degree and betweenness coefficients, and linguistic indicators of positive affect. In addition, different types of recovery capital were captured by: a) number of connections (posts and comments) between members/clients (bonding capital); b) number of connections between members and staff (internal level of support - bonding capital), and c) number of connections between members and broader community/others (bridging capital). The development of a positive social identity (identification with the recovery community) was captured through the use of the pronoun ‘we’ and achievement words. Retention in the program was coded in terms of total number of days in the program (range of 464 to 86 days).

Among indicators of online interaction, in-group validation as captured by the number of likes received (for both posts and comments) is the strongest determinant of retention (see Table 3). The position occupied in the social network by participants (the centrality in the network) is also a good indicator of program retention. In particular, degree centrality is significantly associated with retention. Regarding the content of communication, the computerised linguistic analysis revealed that collective identity markers such as the use of

354 the pronoun 'we' in posts as well as achievement words (used in both posts and comments)
355 are the best determinants of retention in the program (see Table 3). Other marginally
356 significant predictors include affect and positive emotions words.

357

358 *Insert Table 3 about here*

359

360 We expected that these findings will be consistent with data collected through in-
361 depth interviews. The participants in the interviews were selected based on the SNA based on
362 the online interaction between group members on the JFH's Facebook page. The two
363 interviewees have been identified as the most prototypical members of the community based
364 on their central position in the online network, and their transition from the periphery to the
365 centre of the network over the course of the eight months of the study. Figure 1 illustrates
366 configurations of the social networks for each of the eight months of our analysis. The
367 different types of network members are color-coded, so we can observe the dynamic
368 evolution of the network in our set timeframe – i.e., the movement of the 'clients' from the
369 periphery to the centre of the network, and in particular the movement of the two selected
370 participants (identified as 614 and 93 in Figure 1). We were able to identify the individuals
371 and ask them to participate in an interview about their social networks with both agreeing to
372 take part.

373 Both our participants were male, aged 30 and 45. Participant 1 started with JFH in
374 mid-January 2015, and in his own words, before joining the community, he was addicted and
375 homeless, living in a shelter. Participant 2 joined JFH from the start of the community
376 (01/11/2014), and before that he was "on the sick [Disability Living Allowance] and working
377 part-time - abstinent about one year - living in a recovery house - not a lot of support in the

378 house - working in services taking clients on prescriptions to the gym, 16 hours a week”

379 (Extract 1)

380

381 *Insert Figure 1 about here*

382

383

384 *Qualitative data findings – Bonding capital: reaching to the other group members*

385 Bonding recovery capital refers to resources which are made available through linkages

386 between group members. In this context (of online social interaction), we found that our

387 interviewees value the availability of online means of communication with other group

388 members (*‘live social connectivity’*) and they see it an asset that supports their recovery:

389 Extract 2: “It’s good, sometimes you get notifications like 'has anyone seen T?' - and

390 you get five phone calls. It is a really good support network (...) it’s visible ... it

391 reminds me that you are part of something” (P1)

392 Another aspect of online communication that is seen as supporting bonding recovery capital

393 development is the capacity of not only enabling live group interaction, but also continuous

394 access to relevant (potentially ‘life saving’) information and instant access to a supportive

395 network:

396 Extract 3: “JFH is not just 9-5; it continues - you get on with each other and you do

397 the messaging to support – it’s about looking after each other whether you are in work

398 or not...(I) use it 24/7 - even during the day, it’s like information at your finger-tips”

399 (P2)

400 Extract 4: “(...) It is a support page but it also puts information out there. It is a

401 support network - I am friends with everyone in JFH who has a Facebook account

402 (...) You get a lot of support - people recognise if you are not on, it is good because
403 you can interact with a lot of people quicker.”(P2)

404

405 *Qualitative data findings – Bridging capital: reaching to the wider community*

406 Bridging capital in the context of recovery refers to those resources that are built based on
407 linkages with outgroup members, or the wider community in our case. Based on our
408 interview data, being part of an online recovery community helps build bridging recovery
409 capital through being able to *access wider support* which in turn further helps group members
410 to create a sense of hope in their recovery success:

411 Extract 5: “(...) what excites me more is when other people comment. It just gives me
412 a really good feeling. (...) It shows the support from the people who are out there.
413 (...) It’s like the ripple effect - instead of parents writing off their children, they are
414 starting to have some sense of hope” (P1)

415 The opportunity to reach to the wider community as a key resource to support recovery is
416 also mentioned:

417 Extract 6: “It’s like the wider community coming in. (...) It’s about the recovery
418 community getting in touch with the wider community - and it’s important that it is
419 about the wider community and them understanding - like that incident with the
420 woman” (reference to an incident when several members of the groups intervened and
421 saved a woman in a domestic incident)

422

423 *Qualitative data findings - Recovery social identity*

424 According to theories of addiction that draw on social identity theory (SIMOR and SIMCM),
425 developing a strong recovery identity is likely to enable a sustainable, long-term recovery
426 journey. Therefore, we looked for themes around identity development through the interview

427 data, and found that the importance of visibility of identity change as a way of helping others
428 in their recovery was highlighted:

429 Extract 7: “You will go out your way if you need to bring other people on board (...)
430 a lot of guys, it has given them hope. A lot of people are touched through addiction,
431 and now they can see that there is hope. They are looking at them differently and they
432 can see that there is hope. (...) Really important (to be seen as successful); we are
433 visible - we can recover and we can deal with everyday stuff - without individuals to
434 show that it does work, it wouldn't seem the same... Where you are now and where
435 you were two years ago...” (P1)

436 The visibility of being part of JFH (a positively valued social identity) comes with a sense of
437 pride in this identity – that further helps development and maintenance of the recovery
438 identity:

439 Extract 8: “Positive things - there was not one bad thing - we are trying to do our best
440 - public see it as a really good thing, Withnell Road - built up relationships - turned
441 people around (...) 261 properties coming on from the 14th of December”(P2).

442 **Discussion and Conclusions**

443 The study contributes to our understanding of group processes in addiction recovery by using
444 naturally occurring online data and subjecting this to SNA, standard statistical analyses, and
445 computerised linguistic analysis. These online data are supplemented by two case studies
446 where qualitative data from face-to-face in-depth key informant interviews are used to bridge
447 the gap between online activity and personal report and reflection on social networks. This
448 mixed methods approach has allowed unique insights into how online social networking and
449 social identity processes can affect retention in a recovery program. Our findings support the
450 proposition that program retention is significantly predicted by SNA centrality coefficients
451 such as degree (the more central people are in the online network, the longer they stay in the

452 program), indicating the importance of prototypicality in group engagement, and the dynamic
453 processes through which centrality and prototypicality are achieved.

454 Using computerised linguistic analysis, we found that retention in the group was not
455 only significantly predicted by the pronoun “we” use (a social identity marker – the more
456 they talk about ‘we’ the longer they stayed in the program), but also by the extent of
457 affirmation or ingroup validation – reflected in the number of comments and post 'likes'
458 received (i.e., other people liked their post), comment 'likes' received, and all 'likes' received.

459 The focus on retention as the dependent variable in this study is based on evidence
460 suggesting that not only recovery maintenance but also thriving is predicted by retention in
461 recovery groups (Zhang et al., 2003). The design has provided us with a new method of
462 measuring how group processes can impact upon retention with four aspects of network
463 location and social interaction predictive – being active in the network, being central in the
464 network, being positive about belonging to the network, and being endorsed by others for
465 contributions to the network, as well as dynamic changes in these things. These findings are
466 entirely consistent with the two social identity models of recovery. SIMOR (Best et al., 2016)
467 would suggest that the active participation and increased sense of belonging to recovery
468 groups is protective against involvement with using groups (and so relapse). Similarly, the
469 SIMCM (Frings and Albery, 2015), which focuses specifically on group processes and social
470 identification in therapeutic settings and in the wider community (including mutual aid
471 groups), have argued that active identification with the group (as indicated in our study by the
472 use of ‘we’ language) binds people to the group and to the resultant recovery values. It is
473 important to note that while collective personal pronoun use (‘we’) is predictive of retention,
474 individual personal pronoun (‘I’) was not. What this implies is that the salience of the group
475 and the individual’s commitment and belonging are associated with greater endorsement by
476 the group and longer engagement in it. Our findings support the argument that developing a

477 sense of collective selfhood (a positive recovery identity) helps the recovery process. Our
478 findings provide some support for the SIMOR model in that linguistic analysis markers of
479 group belonging (use of we language) and SNA indicators of group centrality were predictive
480 of retention, suggesting that greater active identification with a recovery group and greater
481 prototypicality with a recovery group is associated with longer retention in that group. These
482 findings were also supported (as a form of triangulation) by the two in-depth interviews. The
483 design has allowed us to map the underlying processes of group immersion and how it is
484 experienced and why it was valued by our interview participants.

485 By using a staged mixed-method approach, we found that retention outcomes can be
486 understood as a process of fostering social identity change that is also supportive of recovery
487 capital development. While indicators of specific types of capital (bonding and bridging)
488 were only marginally significant, we found that both the specific model of recovery
489 community (build around participation and social engagement) and the use of technology
490 enhanced positive recovery outcomes. Our findings explain how these two elements effected
491 psychological change in the JFH participants as also evidenced in the qualitative reports of
492 the two individuals who were interviewed following their identification as having
493 transitioned from the periphery to the centre of the group. Thus, there is a clear sense that the
494 adoption of the values of the group, identifying oneself strongly with it and being endorsed
495 widely for one's contributions has a positive impact on centrality (and so influence over the
496 group) and on the likelihood of enduring involvement with the group. These findings were
497 also present in the narratives described in the case studies. For instance, these narratives
498 highlight the importance of establishing positive identities and making the achievements
499 associated with these identities visible in the broader community – that in turn supports
500 recovery through creating a sense of pride and hope, and that may challenge exclusionary and
501 stigmatising attitudes and beliefs.

502 This has important implications for recovery group participation, both face-to-face
503 and online. To encourage new group members to engage effectively in recovery groups, it is
504 critical that they are endorsed and supported to feel that they are part of the group and that
505 their contributions to the group are acknowledged and valued. It would also imply that those
506 whose views are not endorsed and supported by other group members are more likely to
507 become peripheral and as a result to drop out of the recovery group. What is clear from the
508 findings is that this transition from the periphery to the centre of a social network (and the
509 reverse) is a gradual process and that there may be opportunities for group coordinators to
510 identify and prevent drop-out from groups through endorsement and support for group
511 identification, and including and assertively engaging new members of the network.

512 *Limitations of the research*

513 Our findings are based on an in-depth case-study of intragroup dynamics in a specific
514 recovery community, therefore they are not meant to be extrapolated to other groups and
515 populations and no inferences can be drawn about the prevalence of the relationships
516 observed beyond JFH. Further research should be conducted to replicate the methodology
517 and approach in other recovery communities, and assess outcomes of different approaches
518 based on comparisons between different communities (based on different approaches to
519 recovery). While retention is recognised in specialist addiction treatment services as a proxy
520 indicator of outcomes, it is an assumption of the paper that the same is true of online recovery
521 groups, and the impact will need further testing with prospective outcome analysis including
522 a more diverse range of indicators (e.g., levels of recent substance use/abstinence, well-being
523 measures, etc.). We describe two case studies that include findings derived from in-depth
524 interviews conducted with only two group members selected because they undertook
525 significant changes in their position in the online social network - reflecting a positive
526 recovery journey. A broader and more diverse sample would have been ideal but including

527 participants with less positive trajectories would have raised ethical issues around the use of
528 data from open social media sites and the linking of these online data to personal data.
529 Further examination of other individuals who moved from the centre to the periphery of the
530 online network (in other online communities) represents another research option that needs to
531 be explored in future studies.

532 *Recommendations for future research*

533 This study has used a mixed methods approach to study in real time the changes that take
534 place in a recovery community that are underpinned by processes of social networking, social
535 identity and recovery capital development. We have established that online engagement
536 represents an effective way of supporting the process of recovery. More research is needed,
537 however, to identify the socio-economic and individual factors that facilitate or hinder the
538 engagement with online forums in the first place. We have determined that there are three key
539 factors that determine retention in the recovery group that relate to centrality and
540 commitment to the group and to endorsement by other members of the group. These findings
541 provide a basis for further research to examine group dynamics using online naturally
542 occurring data to assess a combination of 'fit' with the values of the group and the resulting
543 affirmation by fellow group members for the possibility of interventions to prevent drop-out
544 by peripheral members of recovery communities and groups.

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689 **Table 1**

690 Descriptive statistics of JFH Facebook page activity across the eight time periods, cumulative
 691 numbers in parenthesis

		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8
All	Posts and		388	579	369	530	581	796	674
	comments	382	(770)	(1349)	(1718)	(2248)	(2829)	(3625)	(4299)
	Post likes		878	1856	1440	1880	1756	2667	1857
	give	1167	(2045)	(3901)	(5341)	(7221)	(8977)	(11644)	(13501)
	Comment								
	likes		970	825	171	634	970	825	171
	given	784	(1604)	(2429)	(2600)	(3234)	(4204)	(5029)	(5200)
Staff	Posts and		106	170		185	176	227	316
	comments	129	(235)	(405)	96 (501)	(686)	(862)	(1089)	(1405)
	Post likes	188	147	302	209	385	372	567	511
	give		(335)	(637)	(846)	(1231)	(1603)	(2170)	(2681)
	Comment	168	303	237	69	168	303	237	69
	likes		(471)	(708)	(777)	(945)	(1248)	(1485)	(1554)
	given								
Clients	Posts and		155	214	132	208	286	419	253
	comments	145	(300)	(514)	(646)	(854)	(1140)	(1559)	(1812)
	Post likes	365	252	415	303	549	529	898	576
	give								(3887)
			(617)	(1032)	(1335)	(1884)	(2413)	(3311)	
	Comment	143	318	235	33	143	318	235	33
	likes		(461)	(696)	(729)	(872)	(1190)	(1425)	(1458)
	given								
Other	Posts and		127	195	141	137	119		105
	comments	108	(235)	(430)	(571)	(708)	(827)	150 (977)	(1082)

Post likes	614	479	1139	928	946	855	1202	770
give		(1093)	(2232)	(3160)	(4106)	(4961)	(6163)	(6933)
Comment	473	349	353	69	323	349	353	69
likes		(672)	(1025)	(1094)	(1417)	(1766)	(2119)	(2188)
given								

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694 **Table 2**

695 Connections made in JFH Facebook page broken down by type (bonding vs. bridging),

696 cumulative numbers in parenthesis

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8
All	834	581	809	469	597	577	617	419
connections		(1415)	(2224)	(2693)	(3290)	(3867)	(4484)	(4903)
Connection:	140	126	139	105	136	120	186	108
post-comments		(266)	(405)	(510)	(646)	(766)	(952)	(1060)
Client-to-client		54	40	106	192	200	465	192
(bonding)	93	(147)	(187)	(293)	(485)	(685)	(1150)	(1342)
Staff-to-client			36	74	128	126	279	176
(bonding)	48	40 (88)	(124)	(198)	(326)	(452)	(731)	(907)
Other-to-client		96	118	282	250	240	615	275
(bridging)	115	(211)	(329)	(611)	(861)	(1101)	(1716)	(1991)
Connection:	528	429	590	328	461	398	567	295
post-likes		(957)	(1547)	(1875)	(2336)	(2734)	(3301)	(3596)
Client-to-client				38	41	109	198	
	23	40 (63)	20 (83)	(121)	(162)	(271)	(469)	87 (556)
Staff-to-client						50	67	
	7	9 (16)	2 (18)	13 (31)	31 (62)	(112)	(179)	59 (238)
Other-to-client						29	63	
	14	11 (25)	9 (34)	30 (64)	25 (89)	(118)	(181)	19 (200)
Connection:	385	256	1029	1223	1458	1746	1973	2193
comment-likes		(641)						
Client-to-client		82	108	61	127	151	172	
	115	(197)	(305)	(366)	(493)	(644)	(816)	78 (894)

Staff-to-client	113	119	44	89	140	114	107
	123	(236)	(355)	(399)	(488)	(628)	(849)
Other-to-client	109	109	52	61	68	68	
	52	(161)	(270)	(322)	(383)	(451)	(519) 25 (544)

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699 **Table 3**

700 Retention time as predicted by Facebook page activity, network statistics, and LIWC

701 categories

Variable	<i>B</i>	<i>SE</i>	β	R^2
Comment likes received	.43	.18	.47*	.22
Likes received (all)	.08	.03	.43*	.18
Comment-like difference	1.09	.50	.43*	.19
Network degree	.01	.001	.43*	.18
LIWC We (Post)	3.89	1.76	.43*	.19
LIWC Achievement (Post)	.56	.26	.43*	.18
LIWC Achievement (All)	.14	.07	.42*	.17

702 * $p < .05$

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