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Development of a measure of collective efficacy within personal networks: A complement to self-efficacy in self-management support?

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ABSTRACT

Objective: To develop and evaluate the Collective Efficacy of Networks (CENS) questionnaire to measure perceived collective efficacy within personal social networks.
Methods: A mixed methods approach was used, guided by theory and with extensive input from adults with long-term conditions who completed the initial questionnaire (n = 78) with test-retest assessed at 2 weeks (n = 68). A second sample (n = 85) completed a postal questionnaire including CENS, theoretically linked constructs (self-efficacy, social support) and health outcomes (loneliness, mental and physical health).
Results: Principal components analysis demonstrated a two-factor structure with 12-items selected to represent Network responsiveness (8 items, Cronbach's alpha = 0.896) and Access to collective efficacy (4 items, Cronbach's alpha = .773). Good test-retest reliability was established for both subscales (r_{icc} = .793–.853). Network responsiveness was associated with self-efficacy (r = 342, p = . < 001) and social support (r = .407, p < .001) and predicted reduced loneliness. Access to collective efficacy significantly predicted better mental health; the predictive validity of the subscales improved when combined with self-efficacy.
Conclusion: The CENS is an acceptable and psychometrically robust measure of collective efficacy in personal social networks.
Practice implications: Measuring collective efficacy with self-efficacy will provide useful information for researchers and policymakers interested in capacity for self-management and social determinants of behaviour change.

1. Introduction

Social Cognitive Theory (SCT) acknowledges that both individual and environmental factors are important determinants of behaviour [1]. Bandura (1997) first defined the notion of collective efficacy (CE) as "*a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments*" [2]. It is positioned as an accompaniment to self-efficacy; both are hypothesized to be regulated through psychosocial processes, where collective efficacy may mediate and reinforce individual (self) efficacy beliefs about capacities and outcomes. While self-efficacy has been widely applied to health outcomes in behaviour change science [3–6], until recently the study of collective efficacy has mainly been limited to focussing on the properties of tight-knit communities (such as neighbourhoods or distinct social groups) [7]. As a result, collective efficacy has been conventionally measured through a hybrid of several related, but distinct, constructs such as social control, cohesion, support, and capital [7]. Consequently, collective efficacy has had limited applicability beyond organisations (e.g. schools) and communities with relatively well-defined boundaries (e.g. ethnic groups, distinctive neighbourhoods). Additionally, in pursuing a wider applicability to the concept it is also relevant to note the complexity of the constitution of groups within which collective efficacy might apply, where communities are seen as a set of "interlocking social networks of neighbourhood, kinship and friendship" [8]. Of relevance here is the idea of the 'personal community' as "the collection of 'important' personal ties in which people are embedded through which different patterns of commitment to friends and family can be empirically observed"

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[9]. Despite its potential to extend understanding beyond individual self-management efforts on the one hand and structural determinants on the other, to date, collective efficacy has not been applied specifically to personal communities in the context of managing health and well-being.

Personal communities have been recognised as important in the maintenance of well-being, reduction of isolation and for the mediation of accessing resources in the management of long-term conditions [10–16] and the provision of self-management support is linked to how networks are configured and work [17,18]. Network processes include negotiating the acceptability of using available support in relation to need, the capacity to reciprocate, and the preservation of individual autonomy [19,20]. Drawing on Bandura's original definition of collective efficacy as encompassing co-ordinated, interactive and shared beliefs, effort, influence, perseverance, and objectives in the pursuit of behavioural outcomes [21], the focus on collective efficacy suggested here requires in-depth attention to the details of how people relate to one another across multiple relationships and the various types of support operating within a network. We have suggested previously that high collective efficacy in personal communities is most likely to be achieved under conditions where low intensity, wide ranging, meaningful support opportunities are available over a long-term period [22].

Therefore, the aim of this paper therefore is to extend the previous work on collective efficacy to the development and evaluation of a collective efficacy measure in personal communities for managing a long-term condition. The development process of the measure and its psychometric properties are presented within this paper. The Collective Efficacy of Networks (CENS) measure focuses on giving prominence to the relational work that takes place within personal communities of support (for example negotiation, navigation, reciprocity). We expected that collective efficacy, as measured by the CENS, would be related to, but distinct from related constructs such as self-efficacy and social support. It was also predicted that this newly developed scale would predict important health outcomes, such as physical and mental health and loneliness above and beyond self-efficacy or social support.

2. Methods

2.1. Participants

A range of participants with long-term conditions were sought from community-based support groups or charity organisations supporting individuals with long-term conditions in the Wessex area for each of the phases and samples are outlined below. This was purposive to ensure there was breadth in terms of the type and nature of support that individuals might require from their personal networks in order to manage their day-to-day lives effectively. Ethical approval for the study was granted from the University of Southampton Ethics committee on 10 November 2015, submission number: 17564. All participants provided written informed consent for each part of the study.

2.1.1. Sample 1 (qualitative development phase)

A sample of 31 participants took part in focus groups (n = 8), with 17 people taking part in more than one focus group. Participant self-reported diagnoses included Arthritis; Chronic pain; Cancer; COPD; Diabetes; Heart disease; MS; Osteoporosis; Parkinson's and Stroke. No additional demographic information was collected.

2.1.2. Sample 2 (initial testing, and test-retest)

A sample of 75 participants completed an extended 62-item version of the CENS. Of these participants, 40 were women (53.3%), with most participants aged >66 years (n = 47, 62.7%), followed by 41–65 years (n = 23, 30.7%) and <40 years (n = 5, 6.6%). Participants most commonly reported diagnoses of Arthritis (n = 26, 34.7%), Cardiovascular problems (n = 24, 32.0%), and Type 2 diabetes (n = 18, 24%). After a two-week follow-up 68 complete test-retest questionnaires were returned (91%).

2.1.3. Sample 3 (validation sample)

A sample of 85 participants completed a battery of questionnaires including the CENS. These participants were between 34 and 86 years old (mean = 65.95; S.D. = 11). Of these participants, 50 were women (60%), 83 were white (97.6%) and 75 (88.2%) were not currently working.

2.2. Development of the CE measure

Several steps were undertaken in the development of the CENS measure: (1) initial item generation, (2) feedback from participants with long-term conditions (across several, iterative stages), (3) item refinement and modification and (4) item selection. At each stage, a mixed-methods approached was used. Fig. 1 provides an overview of this process.

2.2.1. Initial item generation

The theoretical literature [20] and previous research of the team [22] shaped the initial content of the focus groups. This first phase explored the concept of support networks, using concentric circle diagrams and introduced the initial theoretical domains of interest, with practical examples. Participants were asked to discuss examples from their own experiences to generate potential questions. The outcomes of Phase 1 generated a set of questions (n = 38) covering navigation, negotiation, collective efficacy, managing illness, and an emerging 'changing needs' domain. A second phase of qualitative developmental work was undertaken with further focus groups ($n = 2$) to explore the meaning and wording of items within each domain, to agree and refine question phrasing and reject items which participants did not like or understand. A total of 138 items were generated at this stage.

2.2.2. Item refinement and modification

Each of the 138 questions was coded for domain, subtheme, and grouped with other similar questions to remove duplicate items. Transcripts and field notes were used to identify preferred question stems. To ensure maximum comprehension and acceptability of items, various formulations were agreed for several key items. A further 21 items were generated by modifying items from validated self-efficacy questionnaires [23,24]; these were converted into items with a collective focus. For example, '*I know what things can trigger my health problems and make them worse*' [24] were converted in to items such as '*People around me know what things can trigger my health problems and make them worse*'. In total, a reduced set of 73 items (including the 21 items generated from modifying existing self-efficacy questions) were carried forward to the next stage.

2.2.3. Item feedback from participants

A third phase of focus groups elicited further detailed feedback from target users to explore the relevance of questions, including discussion around interpretation of questions. Participants answered each question, rated ease of understanding, and provided comments, amendments and potential re-formulations if they felt this would be useful. All 73 items were explored in this way across three focus groups (i.e. each focus group discussed different items).

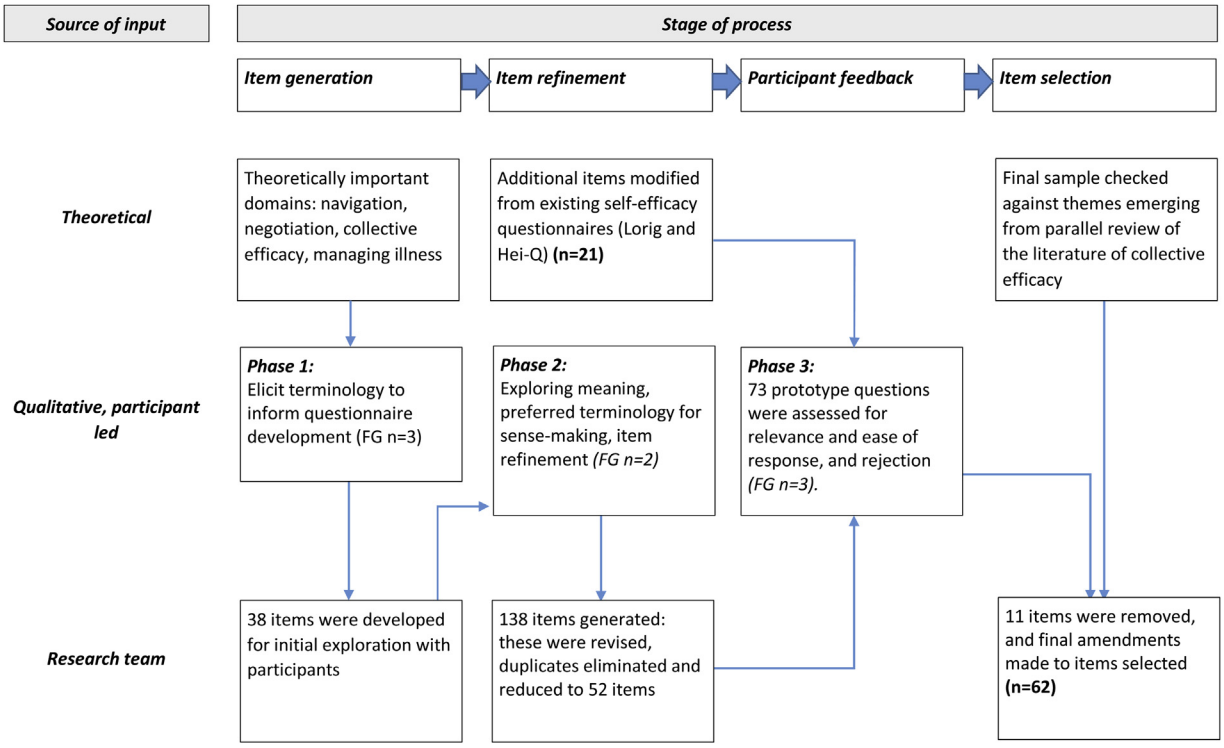

Fig. 1. Representation of the qualitative development process.

2.2.4. Item selection

Only items which all participants coded as being easy to understand and relevant were included in the questionnaire. This resulted in a final sample of 62-items to be responded to on a 5-point Likert-type scale ranging from Strongly disagree (1) to Strongly agree (5). The final items were checked against the themes arising from a meta-synthesis, conducted by the authors in parallel to the questionnaire development (exploring collective efficacy in relation to health outcomes [25]) to ensure no areas of key theoretical importance had been overlooked in the question selection. No further items were added at this stage.

2.3. Additional measures

The respondents in Sample 3 completed a paper based questionnaire that included a measure of Collective Efficacy of Networks (CENS) in addition to completing other validated measures. These included:

Self-Efficacy for Managing Chronic Disease 6-Item Scale [26]. Six items were used to assess participant self-efficacy for illness self-management at the time of completion. Items are rated from 1 to 10 and anchored with 'not at all confident' to 'totally confident'. Mean scores are calculated, with higher scores indicating greater self-efficacy.

Inventory of Socially Supportive Behaviors (ISSB) [27]. Social support received in the previous four weeks was assessed using the ISSB (Long-from). 40-items reflecting Guidance, Emotional Support, and Tangible Support are rated on a 5-point scale to indicate the frequency with which support has been received: these are rated as 1=not at all, 2=once or twice, 3=about once a week, 4=several times a week and 5=about every day. Mean levels of social support were calculated in the current sample. The ISSB has demonstrated good psychometric properties [27].

12-Item Short Form Survey (SF-12) [28]: Subjectively assessed mental and physical health were assessed using the SF-12 questionnaire. The questionnaire includes twelve items, which are used to generate eight domains (physical function, role physical, bodily pain, general health, vitality, social functioning, role emotional, mental health). Summary measures of mental and physical health were calculated following Ware et al [29].

De Jong Gierveld Loneliness scale [30]. Six items are used to assess social and emotional loneliness at the present time. Item responses are 'No', 'Yes' and 'More or less': on the negatively framed items (such as '*I often feel rejected*') a score of 1 is assigned to 'Yes' and 'More or less' and a score of 0 to 'No'. This is reversed for positively framed items (such as '*There are enough people I feel close to*'), where a 'No' response would receive a score of 1, and a 'yes' response a 0. A summary score was created, with a higher score indicating greater loneliness.

2.4. Statistical analysis

Descriptive statistics were generated for each item, to examine the mean, variability and distribution of responses. Principal components analysis was used to reduce the number of items, explore construct validity and identify subscales: for this reason, varimax rotation was selected. Factors with an eigenvalue greater than 1 were extracted and items with a factor loading of less than 0.5 were excluded throughout. A complementary pragmatic qualitative approach was embedded within each stage of the analysis process, this procedure was undertaken to ensure that factors were meaningful (i.e. in cases where two items were almost equivalent in terms of meaning, separate analyses were ran with each item included and the factor structure examined). For the final factor structure, descriptive statistics were generated for each subscale, and correlational analyses conducted. Cronbach's alpha

was calculated to assess internal consistency of subscales. Test-retest reliability was assessed by calculating ICC estimates and their 95% confidence intervals based on mean ratings using two-way mixed effect models with absolute agreement [31,32], between subscales at Time 1 and Time 2 for participants who completed the questionnaire on both occasions. A global score of collective efficacy was calculated within the current sample by calculating a mean across all items (where the 'Access to collective efficacy' items were reverse scored). In Sample 3, preliminary analyses examined the relationships between participant demographic variables, predictor variables and outcome variables using correlation for continuous variables (age) *t*-test for dichotomous variables (gender, marital status, ethnicity, employment status), and ANOVA for categorical variables with more than two levels (education, income). Linear regression analysis (ordinary least squares) was used to explore the predictive utility of CENS with addition to self-efficacy and social support in predicting health outcomes. Only variables that had statistically significant associations on the univariate level were included. In order to explore the combined effect of collective efficacy and self-efficacy we used a stepwise model where CENS and self-efficacy were introduced before the final model, with potentially confounding variables identified in the preliminary analyses. All analyses were conducted using SPSS (IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corporation).

3. Results

3.1. Factor structure

A PCA was conducted on the 62-items included in the CENS for Sample 2, to establish the optimum factor structure for the data. The exclusion of 50 items was an iterative process where factor structure, the loading of individual items, and decisions about removing and retaining them was mainly guided by the conceptualisation of collective efficacy and the interpretation of the sub themes and participant narratives developed during the qualitative phase. Other considerations included similarity of retained items and factor loadings <0.5. Each stage of this process was discussed and agreed within the research team and resulted in a final sample of 12 items. A 2-factor solution was obtained, accounting for 60.0% of the variance. A summary of the PCA conducted is provided in Table 1. Correlation coefficients revealed that the subscales were not significantly correlated (Table 1). Factor 1 named 'Network responsiveness' comprised 8 items, while Factor 2 was labelled as 'Access to collective efficacy' and comprised 4 items. Table 1 **also** provides the definition and interpretation of both subscales, the individual items and their factor loadings within each sample. The factor structure was retained in Sample 2 (Time 2 (T2)) and Sample 3 (with item loadings provided for each sample). All items loaded on to the individual factors at > 0.5, indicating the suitability of items for each subscale, and none of the items cross-loaded on to both factors in any of the samples. Scores on the 'Access to collective efficacy' subscale were reversed to facilitate interpretation (i.e. a higher score subsequently indicates being able to access collective efficacy from the network). The final version of the scale including instructions is located in Appendix A.

3.2. Reliability of the CENS

High levels of internal reliability (measured by Cronbach's α) were demonstrated for each subscale (Table 2). In addition, the alpha score was checked for improvement if each items was

Table 1
The final constructs and interpretation of the questionnaire with item factor loadings in each of the samples for the 12-item version of the CENS for the two subscale solution.

Scale definition and interpretation	Items in this subscale	Factor loading across each sample			Summary of PCA (S2 T1)		
		S2 T1	S2 T2	S3	Eigenvalues	% of variance	Correlation coefficients
Network responsiveness (n = 8) This subscale reflects a general perception of network efficacy available within the personal community. As such items reflect a sense that the network is responsive, trustworthy and there to be called upon when needed. **A higher score reflects higher perceived general network collective efficacy.**	In critical situations, I can rely on the people around me for help	.726	.728	.815	4.88	40.63	−.213*
	Most of the people around me are able to see when I need help	.853	.828	.852			
	People around me are able to adapt when my needs change	.829	.856	.774			
	People around me will work together if they think that I need help	.743	.862	.789			
	People around me help me to maintain a healthy lifestyle	.721	.801	.752			
	People around me try to find solutions to the problems I am facing	.750	.814	.836			
	There are people around me who fully understand what I can and cannot do	.704	.723	.828			
	With my health in mind, there are people around me who know how to support me	.751	.844	.874			
Access to collective efficacy (n = 4) This subscale reflects the perceived ability to access collective efficacy within the network, such as being able to ask for support or accept help. **When scored using the raw data, a higher score indicates lower perceived access to network support.** When reversed (as in the current dataset), a higher score indicates good perceived access to network support.	I do not ask for practical help from the people around me even when I need it	.815	.812	.710	2.32	19.33	
	I do not ask for emotional help from the people around me even when I need it	.820	.815	.649			
	I find it difficult to accept that I may need help from others	.743	.735	.747			
	I don't expect support from people around me because they have problems of their own	.727	.581	.834			

Table 2
Descriptive statistics for the CENS subscale scores for each sample.

Scale	Network responsiveness	Access to collective efficacy
No of items	8	4
Sample 2 Time 1		
Mean (sd)	3.51 (0.76)	2.61 (0.85)
Range	1.63-5	1.00-5.00
Cronbach's alpha	.896	.773
Sample 2 Time 2		
Mean (sd)	3.67 (.81)	2.71 (0.76)
Range	1.75-5.00	1.00-4.25
Cronbach's alpha	.923	.720
Sample 3		
Mean (sd)	3.69 (.90)	3.36 (.91)
Range	1.25-5.00	1.00-5.00
Cronbach's alpha	.929	.719

deleted from the subscale: all 12 items were retained in the final solution. Table 3 shows the ICC estimates calculated for each subscale between subscales at Time 1 (T1) and Time 2 (T2) in Sample 2: moderate-good test-retest reliability was established for all subscales, as evidenced by the ICC estimates.

3.3. Preliminary analysis for CENS validation

We found positive association between being married and network responsiveness ($t = 4.165$, $p < .001$), and social support ($t = 2.452$, $p = .016$). In addition, participant income was positively associated with self-efficacy ($F = 2.286$, $p = .030$), and participant age was positively correlated with self-efficacy ($r = .317$, $p = .003$), mental health ($r = .395$, $p < .001$) and negatively correlated with social support ($r = -0.274$, $p = .011$). All other relationships between potential confounding variables and patient outcome measures were non-significant: these were therefore excluded from subsequent analyses.

3.4. Content validity of the CENS

To assess content validity, the relationships between the CENS subscales, self-efficacy and social support were assessed. Self-efficacy and social support were not significantly correlated with one another ($r = -0.028$, $p = .794$). The 'Network responsiveness' subscale was moderately positively associated with self-efficacy, social support ($r = .342$ and 0.407 respectively) indicating that these variables are related, but distinct constructs (see Table 4). The 'Access to collective efficacy' subscale did not significantly correlate with either variables suggesting that this subscale does not reflect the amount of support available within the social network, nor does it reflect individual efficacy beliefs.

3.5. Incremental validity of the CENS

Preliminary analyses between the predictor variables (collective efficacy subscales, self-efficacy and social support) and outcome variables (physical health, mental health, loneliness) were explored. These analyses are presented in Table 5. Any predictor that was not found to significantly correlate with the outcome variables was not retained in the next stage of the analysis. Self-efficacy, social support and network responsiveness were significantly, negatively associated with loneliness. Social support did not significantly correlate with mental health ($r = -0.038$, $p = .747$). Physical health was not significantly correlated with any of the predictor variables; no further analyses with physical health are therefore presented here.

We assessed the incremental validity of the CENS subscales by examining the additional variance in the outcome variables explained in addition to, and beyond that, of the related predictor variables. A three-stage multi-level regression analysis was conducted with participants from Sample 3. In the initial models, the significant collective efficacy subscales were entered as the only predictors; step two included the other significant predictor variables within the model where appropriate (self-efficacy and social support), and finally any other potential covariates (age, marital status, income) were added into the model.

Higher levels of network responsiveness significantly predicted decreased reported loneliness (see Table 6). Once the other predictor variables were added to the model, network responsiveness and self-efficacy remained significant predictors of reduced loneliness in the final model. Regression analyses were repeated for mental health; when entered alone, increased network responsiveness and access to collective efficacy predicted better mental health outcomes. When self-efficacy was included in the model, the impact of network

Table 4
Correlations between the CENS scale and outcome measures (Sample 3).

CENS subscale	SE	ISSB	MCS	PSC	DJ
Network responsiveness	.342**	.407**	.290*	.052	−.531**
Access to collective efficacy	.133	−.081	.318**	.176	−.134

Note. SE = Self-efficacy (Lorig scale); ISSB = ISSB social support scale; MCS = SF-12 Mental Health composite scale score; PSC = SF-12 Physical Health composite scale score; DJ = De Jong loneliness scale.
* denotes significance of $p < .05$.
** denotes $p < 0.01$.

Table 5
Correlations between the predictor variables and outcome measures (Sample 3).

	Outcome variables		
Predictor variables	MCS	PSC	DJ
Self-efficacy (Lorig)	.566**	.176	−.516**
Social support (ISSB)	−.038	−0.27	−.275*
Network responsiveness (CENS)	.290*	.052	−.531**
Access to collective efficacy (CENS)	.318**	.176	−.134

Note. MCS = SF-12 Mental Health composite scale score; PSC = SF-12 Physical Health composite scale score; DJ = De Jong loneliness scale.
* denotes significance of $p < .05$.
** denotes $p < 0.01$.

Table 3
Reliability statistics (ICC) for the CENS subscales using a two-way mixed effects model with absolute agreement (single measurement presented) (Sample 2, T1 and T2).

		95% confidence interval		F Test with True value 0			
	ICC	Lower bound	Upper bound	Value	*df1*	*df2*	Sig
Network responsiveness	.853	.762	.910	13.115	58	58	<.001
Access to collective efficacy	.793	.676	.872	8.828	58	58	<.001

Table 6
Summary of Regression analysis for variables predicting participant outcome measures in Sample 3 (N = 85).

Variable	R^2	ΔR^2	Effect estimate	SE B	β	p	ΔF	Sig. ΔF
Outcome: De Jong Gierveld Loneliness scale								
Step 1								
Network responsiveness	.280	.280	−1.155	.207	−.529	<**.001**	31.114	<**.001**
Step 2								
Network responsiveness	.434	.144	−.758	.217	−.347	**.001**	19.960	<**.001**
Self-efficacy			−.413	.090	−.417	<**.001**		
Social support			−.325	.309	−.098	.296		
Step 3								
Network responsiveness	.445	.011	−.854	.238	−.391	**.001**	10.034	.878
Self-efficacy			−.403	.095	−.408	<**.001**		
Social support			−.334	.332	−.101	.318		
Age (years)			−.001	.018	−.006	.952		
Marital status (not married)			.419	.397	.103	.294		
Income			.000	.001	.039	.658		
Outcome: SF12 Mental health composite scale score								
Step 1								
Network responsiveness	.171	.171	3.293	1.295	.273	**.013**	7.425	**.001**
Access to collective efficacy			3.593	1.306	.296	**.008**		
Step 2								
Network responsiveness	.411	.240	1.345	1.158	.112	.249	16.483	<**.001**
Access to collective efficacy			2.860	1.118	.235	**.013**		
Self-efficacy			2.915	.543	.520	<**.001**		
Step 3								
Network responsiveness	.488	.077	.902	1.215	.07	.461	10.817	<**.001**
Access to collective efficacy			2.886	1.069	.237	**.009**		
Self-efficacy			2.447	.543	.442	<**.001**		
Age (years)			.296	.096	.290	**.003**		
Marital status (not married)			2.770	2.264	.121	.225		
Income			−.003	.004	−.079	.368		

$p < .05$ is in boldface.

responsiveness became non-significant. In the final model, self-efficacy, access to collective efficacy and older age were predictive of better mental health.

4. Discussion and conclusion

4.1. Discussion

The aim of the current study was to develop a quantitative measure to assess collective efficacy within the personal communities of individuals. The methods reported here outline the development and analysis of the CENS measure, in which a final structure comprising of two separate subscales was identified as most appropriate. These two subscales reflect distinct aspects of collective efficacy and were labelled as 'Network responsiveness', and 'Access to collective efficacy'. Good test-retest reliability was established over a two week period, during which it would be expected that personal communities would remain fairly stable. The development of these subscales therefore further conceptualise collective efficacy and contribute to understanding of social network processes in the context of managing health and wellbeing.

The Network responsiveness subscale assesses the individual perception that the network is able to understand and respond in a mutually acceptable manner when problems arise. We suggest therefore that this subscale reflects an individuals' general appraisal of the level of network collective efficacy within their personal community, which aligns most closely with the previous conceptualisations and applications of collective efficacy [2]. Theoretically, self-efficacy and collective efficacy are hypothesized to be moderately related, whereby judgements of self-efficacy are made and influenced by the wider group context [2]. The current study demonstrated that network collective efficacy, as measured by the CENS network responsiveness subscale is associated with, but distinct from self-efficacy. In addition, in our sample both network responsiveness and self-efficacy were unique predictors of loneliness: both factors appear to contribute a protective effect. By measuring efficacy beliefs at both levels (individual and collective) it may be possible to start to unpick the impact of individual, interactional, and contextual level processes on health-related outcomes. This is even more relevant for outcomes such as loneliness which are both individual and social in nature.

However, the 'Access to collective efficacy' subscale did not correlate with self-efficacy. This subscale is subtly different from both self-efficacy and the presence of collective efficacy, as it requires the individual to report on their own perceived abilities to access the collective efficacy within the network. It makes sense that these subscales do not necessarily correlate with one another; it is possible that collective efficacy is present but inaccessible and equally one might be able to access collective efficacy even when it's limited. We therefore propose that it is an appraisal of individual level collective efficacy, as it reflects the perception of the extent to which support can be negotiated and mobilised from the network. However, this perception regarding the presence of collective efficacy does not necessarily translate into social support, as reflected in the lack of association between these two variables. It is likely therefore, that this subscale captures individual level factors that may prevent or facilitate the utilisation of collective efficacy, which for example, may include personality traits: future research should seek to clarify the relationship between this subscale and both individual and network level traits.

Over 20 years ago, Bandura stated that "progress in the field of study [collective efficacy] requires the development of suitable tools for measuring groups' shared beliefs of efficacy to achieve varying levels of results" [2]. The current study therefore offers an important contribution to the literature by presenting the first reliable instrument to assess collective efficacy in social networks, with several theoretical and research utilities. Firstly, the development of the CENS measure will enable behavioural scientists to measure collective efficacy in addition to self-efficacy

with respect to both health and behavioural outcomes. Recent calls for greater clarification with respect to reporting behaviour change interventions [33,34] have included theoretical testing [35,36] and greater specification of proposed mechanisms of change, taking into account the social context within which complex interventions operate [37,38]. By assessing self- and collective efficacy together it may be possible to examine outcomes under conditions where, for example, self-efficacy is low but collective efficacy is high, compared with individuals who report high self-efficacy but limited collective efficacy. This may help researchers and policy-makers understand why some people are better able to self-manage than others. We therefore propose that the inclusion of the CENS measure will enhance specificity in process analysis reporting and behaviour change theory testing.

In addition, the CENS and its subscales attempt to go beyond viewing the social network simply as a form of capital to be accumulated or resource to be utilised, and attempt to capture the dynamics involved in identifying and negotiating acceptable support, particularly in the context of long-term condition management [19,20]. By attempting to characterise the properties of relationships within social networks and conceptualising relational work as key to understanding how, if and when people access support we anticipate that the CENS will also be a useful measure for social network researchers. Additionally, measuring both the amount and accessibility of collective efficacy may highlight cases where network level interventions may be appropriate in the first instance to utilise existing sources of support.

The limitations of the current study warrant discussion. Firstly, although our aim was to develop a scale which could be used to assess collective efficacy with respect to illness management, we must acknowledge that the items developed may have been influenced by including only individuals with a long-term condition in both the development and testing phases of the study. Future validation should include general population participants to ensure that the findings presented here do generalise beyond those who are actively managing their health, for example, for people who are isolated, lonely, or in points of transition, and a wider set of outcomes related to health status and behaviour change. We also acknowledge that these two subscales do not appear to represent a single factor, which may have been influenced by the negative phrasing of items on the access to collective efficacy scale. Future work may benefit from conducting a confirmatory factor analysis (CFA) both to assess the fit of the proposed structure.

4.2. Conclusions

This study demonstrated that the CENS is a reliable measure of collective efficacy in personal communities (support networks) for people with a long-term condition. The extensive user input and detailed development process have helped to ensure that the CENS is easy to understand and administer.

4.3. Practice implications

The development of such as measure is of importance theoretically, as well as having the potential to develop empirical research into this area focusing on the interaction of individual and network processes (i.e. self- and collective efficacy) in understanding behaviour in the context of health management.

Author's contribution

IV, AK and AR designed the study. RB, wrote the first and subsequent drafts of this manuscript, with input from IV, EJ and DC and later comments from the remaining authors. EJ led the qualitative aspects of the study and data collection with help from RB. Data analysis was conducted by RB, EJ, IV, DC and AK. All authors contributed to the interpretation of the data. BD provided the initial statistical advice and oversight; this was later provided by DC. All authors read and approved the final manuscript.

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Declaration of interest

None

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.pec.2019.02.026.

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