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# **Health Confidence Score (HCS) – Development and Validation**

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## Abstract

### Background

Self-care depends on people feeling confident to take control of aspects of their own health. We need a way to measure people's health confidence for use clinically, and for quality improvement, evaluation and accountability.

### Methods

We set out to develop and validate a short generic survey instrument to measure of patient's confidence in looking after their own health, as part of the R-Outcomes family of short generic patient-reported outcome measures. The Health Confidence Score (HCS) was developed through multiple iterations in two main stages over three years.

We report the results of three studies; two of the general public (n=1031, n=378) and one of users of social prescribing services, composed of older people (n=1325).

### Results

The Health Confidence Score (HCS) has a broad scope, including aspects of health literacy, self-efficacy, access and shared decision-making. The measure has four items, covering people's confidence in their knowledge of their health, their capability to self-manage, to obtain the help they need, and be involved in decision-making. It uses a four-point response scale with options: strongly agree, agree, neutral and disagree, scored 3, 2, 1 and 0 respectively. Items may be reported individually and as a summary score (the sum of the item scores).

The Health Confidence Score is short (50 words) with a reading age of 8 years.

The distribution of responses is broad (mean HCS summary score on 0-100 scale was 76.7 (SD 20.4) in study 2 and 70.4 (SD 20.7) in study 3. Cronbach's  $\alpha$  was 0.82 in study 2 and 0.90 in study 3.

Correlation of the HCS summary score with the single item My Health Confidence rating scale is high ( $r=0.76$ , study 2).

As expected, people who feel happy and healthy report higher health confidence. The HCS summary score is positively correlated with the Personal Wellbeing Score ( $r=0.60$ ) and the *howRu* health status measure ( $r=0.51$ ) (study 3).

HCS summary score correlates negatively with the number of medications taken (study 2  $r=-0.29$ , study 3  $r=-0.07$ ) and with age in study 2,  $r=-0.22$ , but positively in study 3 ( $r=0.09$ ), where the average age was over 80. HCS was not significantly associated with ethnicity, having children or education level (study 2).

### Conclusions

The Health Confidence Score is short, quick and easy to use measure, with good psychometric properties and construct validity.

### Keywords

Health Confidence, Patient-Centered Care, Patient Participation, Patient Activation, Shared Decision-Making, Health Literacy, Self-Efficacy.

## Introduction

Health care policies are expecting people to do more to manage their own health and care,<sup>1</sup> because evidence shows that those who are more involved and engaged in their own health report better outcomes<sup>2</sup> and cost less.<sup>3</sup> Most people want to be involved in decisions about their own health and care, but may lack the skills and confidence required.<sup>4</sup> We need tools to measure how well patients can look after their own health and collaborate with their service providers.<sup>5</sup> Such measures may be useful, both at the individual level for clinical care and at the aggregate level for evaluation and as a key performance indicator (KPI).

People need the knowledge, skills and confidence to manage and make informed decisions about their own health and care.<sup>6</sup> New approaches often seek to help patients modify their behaviour, recognizing that behaviour change is related to people's capability, opportunity and motivation to change.<sup>7</sup>

Patient-centred care is a broad subject,<sup>8</sup> which includes patient-centred leadership,<sup>9</sup> self-management education,<sup>10</sup> personalised care planning<sup>11</sup> and interactive health communication.<sup>12</sup>

A review of measures used for patient-centred care identified 160 measures covering (in alphabetical order): activation, choice, compassion, continuity, control, dignity, empathy, empowerment, health literacy, holism, independence, individuality, integration, involvement, partnership, privacy, respect, rights and trust.<sup>13</sup> Most existing measures address only one aspect of this broad domain. Some focus on patients' perceptions, others on what professionals and providers do and think.<sup>14,15,16</sup>

We identified a need for a short broad generic measure of patients' own perception of their confidence to look after their own health. The purpose of this paper is to describe the development of the Health Confidence Score (HCS) and its validation in a series of trials.

## Methods

### *Development of the Measure*

Development of the HCS questionnaire followed a similar process to that used to develop other measures in the R-Outcomes family of short generic outcome measures. We wanted a measure that would be useful, both at the individual (clinical) level to increase awareness of gaps in an individual's confidence, and at the aggregate level for evaluation, audit, quality improvement, management and accountability.

A literature review was combined with informal work with patients, experts and focus groups. The literature review was informed by published reviews.<sup>4,5,13,17</sup> We reviewed leading measures used to measure patient's perceptions of their self-efficacy, health literacy, activation, engagement and capability.

- Self-efficacy is the belief in one's ability to succeed in specific situations or accomplish a task.<sup>18,19</sup>
- Health literacy is about people having enough knowledge, understanding, skills and confidence to use health information, to be active partners in their care, and to navigate health and social care systems.<sup>20</sup> The Health Literacy Tool Shed describes 129 measures of health literacy.<sup>21</sup>
- Patient activation is a measure of a person's skills, confidence and knowledge to manage their own health.<sup>22</sup>
- Patient engagement and shared decision-making (SDM) cover the extent to which a patient is actively involved in their own care.<sup>23,24</sup>

- Capability refers to things of value that a person is able to do.<sup>25</sup>

We held informal focus groups and discussions with patients, clinicians and researchers from hospitals, general practice, community services and social care over a period of two or three years. We did not start with a long list of statements, but set out to synthesise the core domains of interest and refine and test statements to capture these in a generic way. This process continued through more than 60 iterations.

The proposed measure also needed to be suitable for use in combination with other R-Outcomes measures. Over the past decade, R-Outcomes Ltd has developed a family of short generic patient-reported outcome measures covering health status (*howRu*),<sup>26</sup> patient experience (*howRwe*)<sup>27</sup> and personal well-being.<sup>28</sup> These measures share a strong family resemblance. All are short, with a low reading age, and generic, applicable to people with any condition. Each measure has four response options, which are labelled, color-coded and use smiley pictographs, with the best option on the left and the least desirable on the right. Most measures have four questions items, although exceptions are allowed.

Other design criteria were to be clear, brief, suitable for frequent use, multi-modal (suitable for use with multiple data collection modalities including smart-phones), responsive, show good psychometric properties and generate easily understood scores. Scores generated should be easy to understand, interpret and action by all stakeholders, and be comparable for benchmarking. These criteria are common to all patient-reported outcome measures intended for routine clinical use.<sup>29,30</sup>

### *Length and Readability*

Response rates and data quality are influenced by questionnaire length and complexity.<sup>31</sup> We counted the number of items and words in the HCS and other instruments that measure broadly similar constructs, including:

- My Health Confidence<sup>32</sup>
- Patient Health Engagement Scale (PHE-s)<sup>33</sup>
- Stanford self-efficacy for managing chronic disease 6-item scale<sup>34</sup>
- Patient Activation Measure (PAM-13)<sup>35</sup>
- ICECAP-A<sup>36</sup>
- Health Literacy Questionnaire.<sup>37</sup>

The texts analysed are those reported by the original authors.

For each questionnaire, we counted the number of items and words. Reading age was assessed using the Flesch-Kincaid Readability Grade (FKG) provided as part of Microsoft Word. It has been suggested that patients should not be asked to complete questionnaires with a reading age of more than ten, which corresponds roughly to readability grade FKG=5.<sup>38</sup>

## Validation Studies

Three studies are reported here.

### Study 1

Study 1 was conducted in March 2015 through YouGov using a nationally representative online sample in the UK, as part of a study on online cancer information.<sup>39</sup> This used the Stage 1 questionnaire. Panel members were paid a small fee for surveys completed. The four HCS questions were presented on screen (without graphics) early in the survey.

### Study 2

In Study 2, an interviewer approached a convenience sample of members of the public in and around Newbury, an English market town, and asked them to complete a short anonymous survey, presented on a two-sided laminated sheet. The purpose was to test the Stage 2 questionnaire. The interviewer entered responses into a web-based survey app using a smart-phone.

In addition to the HCS, each respondent also completed the howRu health status measure<sup>17</sup> and the My Health Confidence (MHC) questionnaire.<sup>32</sup>

- HowRu has four items: (1) Pain or discomfort, (2) Feeling low or worried, (3) Limited in what you can do, and (4) Require help from others; each item has four responses: None, A little, Quite a lot, and Extreme.
- MHC has two questions: (1) how confident are you that you can control and manage most of your health problems, and (2) how understandable and useful is the information your doctors and nurses have given you about your health problems or concerns. Both MHC questions use an eleven-point (0-10) thermometer scale. We expected HCS to correlate more strongly with the MHC confidence scale, than with the MHC information scale.

We also recorded each respondent's sex, age in decades, ethnicity (White British or other), if they had children (yes or no), took regular medication (none, 1 or 2, 3 or more medications each day), age at which they completed education (under 17, 17-19, over 19) and the English region where they lived.

### Study 3

The Study 3 data set came from secondary analysis of data collected as part of the evaluation of five social prescribing and proactive care services in Hampshire, the Isle of Wight and Surrey during 2016 and early 2017. The choice of measures and data collection methods were discussed and agreed with each local project team in advance.

For this analysis, the data from several projects was pooled. The interventions were similar, focusing on helping older people to adapt to their conditions and connect with local voluntary and other services that could help them cope. However, there were some differences between services in terms of case mix, support skills and service availability during each week. The models of care also differed, in that some services discharged people and others did not.

Data was collected from people when they were referred to each service over a four-week period (on referral). A member of the project team visited the participant in their own home, where the on referral survey was collected.

The same data set was also collected from current and previous patients (after referral). The interval between referral and after referral ratings was not recorded, but was usually between 4 and 10 weeks.

Identical surveys were used on referral and after referral. Some after referral surveys were collected by telephone, but we did not record the mode of data collection at the time. All data were anonymous. No identifiable data were collected. There was no linkage between responses on referral and after referral. They represent separate cohorts.

The project worker usually recorded responses on a paper copy of the survey. Later they, or another member of the project, entered the data onto the R-Outcomes server. In some cases, it was not practical to ask the patient to complete the survey, but we do not have a record of these cases. In a few cases, a carer or other proxy completed the survey.

In Study 3 people were asked to complete the HCS, the *howRu* health status measure<sup>26</sup>, the *howRwe* patient experience measure<sup>27</sup>, the Personal Wellbeing Score (PWS)<sup>28</sup>. Gender (male or female), age group in decades, and number of medications being taken (none, 1 or 2, 3 to 5, 6 to 9, 10 or more) were also recorded. All items were optional.

### *Expected Results*

*Distribution:* In Study 2 and Study 3, we hoped to find a broader distribution of responses than in Study 1, as measured by the standard deviation, interquartile range, skew and kurtosis. We expected a ceiling effect, where health confidence is already high and the instrument is not able to detect further improvement. Despite having no *strongly disagree* response option, we did not anticipate a floor effect, where the health confidence is so low that the measure cannot detect further deterioration.

*Internal consistency:* We investigated the correlations between the four items. We expected these to be in the range  $r = 0.4$  to  $0.6$  and for Cronbach's  $\alpha$  to be in the range  $0.7$  to  $0.9$ , which would support the use of a summary score.<sup>40</sup>

*Concurrent validity* was assessed by examining the correlation between the HCS scores and the My Health Confidence score in Study 2, which sets out to measure the same thing as HCS.

*Construct validity* was assessed by examining whether the measure was sensitive to a clinical intervention, such as the provision of a social prescribing service, in Study 3. We hypothesised that:

- Health confidence would be lower *on referral* than *after referral*.
- Health confidence would be lower for people with lower health status than for those with higher health status, as measured by *howRu*.
- There would be little difference in health confidence between men and women.
- For people with similar case mix, such as those using these social prescribing and proactive care services, health confidence might be slightly higher in older people, who have adapted better, than in younger people.
- For people using these services, health confidence would be lower with a higher number of medications taken.

Regression analysis was performed to help understand the relationship between the HCS summary scores and health status (*howRu*), personal well-being (PWS), age and number of medications taken.

We applied a factor analysis (using an oblique rotation, Promax, as we expect constructs to be correlated) on the individual questions in *howRu*, PWS, HCS, *howRwe* and the two additional experience questions asked. All Study 3 data were included, on referral and or post-referral.



## *Ethics Statement*

Study 1 and Study 2 used data collected anonymously from members of the public who consented freely to complete the task. Study 3 used secondary analysis of existing anonymous data, which had been collected as part of the service evaluation of new models of care. This did not require ethics approval because data collection was undertaken anonymously to evaluate operational services without randomisation. No data was collected until patients had consented and there was no risk of substantial damage or distress to individual participants.<sup>41</sup> Consent in study 1 was recorded electronically. In studies 2 and 3, data was not collected until participants had consented.

## **Results**

The development of the measure took place in two main stages. We report three separate studies, one for Stage 1, two for Stage 2.

### *The HCS Measure*

Our focus was on each individual's own perception of their confidence to manage their own health. This led to the name *Health Confidence Score*. We identified four domains:

- *Knowledge* – how much you understand about your health, conditions, medication, investigations and treatment; this covers many aspects of health literacy.
- *Self-management* – perceived ability to manage your own health, treatment and lifestyle. This covers perceived self-efficacy, motivation (reflective and autonomic), activation, enablement and capability.
- *Access to help* – this covers your social proficiency to navigate the system and obtain the health and care services most relevant to your needs.
- *Shared decision-making* – this covers the level of your participation in clinical decisions and how well staff understand your wishes, fears and beliefs.

The first two domains address personal capability, while the second pair are influenced by service availability and approach. All four domains can be impacted by the actions and initiatives of health care providers and public health agencies.

### *Stage 1 Development*

The Stage 1 questionnaire was the result of more than 30 distinct iterations over several months, with small-scale testing and refinement. Initially, we proposed to use the question *how confident do you feel?* with four response options: *very confident, quite confident, not very confident, and not at all confident*.

However, in testing, we found that the distribution of scores in Study 1 was narrower than we had hoped or expected.

### *Stage 2 Development*

#### *Items and Options*

Consequently, we recast the questionnaire into an agree-disagree format and the wording evolved through 30 further iterations. The four items are:

- I know enough about my health (knowledge)
- I can look after my health (self-management)
- I can get the right help if I need it (access)

- I am involved in decisions about me (shared decision-making)

Recognizing the skewed nature of the distribution, we used four response options: *Strongly agree*, *Agree*, *Neutral* (in early versions of we used *neither agree nor disagree*), and *Disagree*. All responses are optional, so there is not a *Don't know* category. The combination of four items and four options each creates a 4×4 matrix with 256 combinations.

The final questionnaire is shown in Figure 1:

<b>Health Confidence</b>				
How do you feel about caring for your health?				
How much do you agree?				
	Strongly agree	Agree	Neutral	Disagree
I know enough about my health				
I can look after my health				
I can get the right help if I need it				
I am involved in decisions about me				

Figure 1 Health Confidence Score (HCS)

### Scoring

For analysis and reporting, each option is allocated a score on a 0 to 3 scale, where: *Strongly agree* = 3, *Agree* = 2, *Neutral* = 1, and *Disagree* = 0. Higher is better. A summary score (the Health Confidence Score) is calculated by adding the scores for each item, giving a 13-point scale with a range from 0 (4 × *disagree*) to 12 (4 × *strongly agree*).

When reporting group results, the mean score is transformed linearly to a scale from 0 to 100, where 0 indicates that all respondents chose the lowest score and 100 that all chose the highest. A common 0-100 scale is familiar to most people and lets item and summary mean scores be compared on the same scale.

### Clinical Codes

The UK Terminology Centre has issued SNOMED CT and Read Codes for the HCS so that the information can be recorded in the patient's electronic health record (EHR).<sup>42</sup>

## Length and Readability

The number of items (questions), words, FKG and reading age for the final HCS and other instruments are shown in Table 2. The HCS has the lowest word count and reading age.

Table 1: Number of items, words, Flesch-Kincaid Grade (FKG) and reading age of questionnaires

Instrument	No of items	Word count	FKG	Reading age
Health Confidence Score (HCS)	4	50	2.8	8
My Health Confidence (MHC)	2	83	4.8	10
Patient Health Engagement Scale (PHE-s)	5	144	5.1	10
Stanford self-efficacy for managing chronic disease 6-item scale	6	212	8.5	14
ICECAP-A	5	281	5.2	10
Patient Activation Measure (PAM-13)	13	299	8.2	13
Health Literacy Questionnaire (HLQ)	44	1,001	7.2	12

## Study 1 Distribution

Study 1 (using the Stage 1 questionnaire) had 1,031 responses. The distribution of scores was narrower (higher kurtosis and lower inter-quartile range), than hoped for, with more than half (62%) of the sample choosing the same response (*quite confident*) across all items. This led to revision of the instrument (Stage 2).

## Study 2 Results

Study 2 used the revised Stage 2 questionnaire. The frequency distribution of each item is shown in Table 4. The range of response rates varies from 1% (*disagree that I can get the right help if I need it*) to 53% (*strongly agree that I am involved in decisions about me*). The mean score for each item on a 0-100 scale is also shown.

Table 2: Frequency distributions for the questionnaire items in Study 2 (n=378)

HCS Item (Stage 2)	Strongly agree	Agree	Neither agree nor disagree	Disagree	Mean score (95% CI)
I know enough about my health	163 (43%)	171 (45%)	38 (10%)	6 (2%)	76.6 (74.2–79.0)
I can look after my health	154 (41%)	147 (39%)	65 (17%)	13 (3%)	72.4 (69.4–75.0)
I can get the right help if I need it	192 (51%)	151 (40%)	29 (8%)	4 (1%)	79.9 (78.1–82.7)
I am involved in decisions about me	199 (53%)	121 (32%)	44 (12%)	14 (4%)	78.0 (75.1–80.6)

The distribution of the HCS summary scores is shown in Table 5. The mean HCS summary score is 9.2 on the 0-12 scale, with standard deviation 2.4, interquartile range 8 to 11, negative skew -0.9 and kurtosis 0.4.

Table 3: Frequency distribution of HCS summary scores (Study 2)

HCS score	Equivalent on 0-100 scale	n (%)
12	100	85 (23%)
11	92	49 (13%)
10	83	59 (16%)
9	75	50 (13%)
8	67	44 (11%)
7	58	35 (9%)
6	50	24 (6%)
5	42	10 (3%)
4	33	8 (2%)
3	25	3 (1%)
2	17	6 (2%)
1	8	0 (0%)
0	0	1 (< 1%)

The ceiling state (*strongly agree* on all four items) accounted for 23% of ratings; the floor state (*disagree* on all four items) occurred once.

When transposed to a 0-100 scale the mean HCS score is 76.7 (95% CI 74.6 to 78.8, SD=20.4). The 0-100 scale is easier to understand and allows comparison of the mean scores for each item and the summary score.

The internal structure was explored by examining the correlations between each pair of items (Table 6). All correlations are in the range 0.41 to 0.59, implying that they are measuring related but different things. Cronbach's  $\alpha = 0.82$  is in the middle of the desired range.

Table 4 HCS Inter-item Spearman correlation matrix (95% confidence intervals) all  $p_s < 0.001$  (Study 2)

	I can look after my health	I can get the right help if I need it	I am involved in decisions about me
I know enough about my health	0.57 (0.50 to 0.64)	0.53 (0.45 to 0.60)	0.41 (0.32 to 0.49)
I can look after my health		0.59 (0.53 to 0.66)	0.44 (0.36 to 0.52)
I can get the right help if I need it			0.51 (0.43 to 0.60)

The frequency distribution, mean HCS scores (0-100 scale) and confidence intervals for demographic and independent variables are shown in

Table 5.

The HCS scores for men were lower (74.9) than for women (78.0), but not statistically significantly different ( $t(371) = 1.4, p = 0.20$ ). HCS was flat between the ages of 30 and 60 but falls with age (Spearman's correlation,  $r = -0.22, p < 0.0001$ ). Those over 60 had lower HCS scores than those under 60, with a further drop over 80.

Those taking three or more medicines also had lower HCS (Spearman's correlation,  $r = -0.29, p < 0.0001$ ), a result that is confounded with age. HCS was moderately correlated with health status (howRu), but less so at higher levels of health confidence (HCS = 10, 11 or 12) (Spearman's correlation,  $r = 0.49, p < 0.0001$ ),

There were no significant differences in HCS scores according to ethnicity ( $t(370) = 0.8, p = 0.4$ ), having children ( $t(369) = 0.5, p = 0.7$ ) or education level (Spearman's correlation,  $r = -0.10, p = 0.059$ ).

Table 5: Independent variables frequency distribution, mean HCS score (0-100 scale) and confidence limits (Study 2).

Variable	n	%	Mean HCS score (0-100 scale)	95% confidence interval
<b>Overall</b>	378	100%	76.7	74.6 to 78.8
<b>Sex</b>				
Female	219	58%	78.0	75.3 to 80.7
Male	156	41%	74.9	71.7 to 78.1
<b>Age Group</b>				
20-29	67	18%	75.0	70.1 to 79.9
30-39	101	27%	82.3	78.3 to 86.3
40-49	86	23%	81.2	76.9 to 85.5
50-59	62	16%	81.0	75.9 to 86.1
60-69	27	7%	59.6	51.9 to 67.3
70-79	25	7%	66.3	58.3 to 74.4
80-89	10	3%	37.5	24.8 to 50.2
<b>Medication</b>				
None	126	33%	82.1	78.6 to 85.7
1 or 2 items	171	45%	78.0	74.9 to 81.0
3 or more items	80	21%	64.7	60.3 to 69.2
<b>Ethnicity</b>				
White British	284	75%	76.3	74.0 to 78.7
Any other	93	25%	78.3	74.1 to 82.4
<b>Has children</b>				
No	176	47%	77.2	74.2 to 80.3
Yes	200	53%	76.3	73.4 to 79.1
<b>Age FT education ended</b>				
16 or under	186	49%	78.7	75.7 to 81.6
17-19	163	43%	75.0	71.9 to 78.1
20 or over	29	8%	73.2	65.8 to 80.7
<b>howRu (health status) score</b>				
0	1	0%	50.0	10.2 to 89.8
1	6	2%	43.1	26.8 to 59.3
2	6	2%	41.7	25.4 to 57.9
3	2	1%	37.5	9.3 to 65.7
4	8	2%	60.4	46.3 to 74.5
5	14	4%	57.7	47.0 to 68.3
6	19	5%	69.7	60.6 to 78.9

Variable	n	%	Mean HCS score (0-100 scale)	95% confidence interval
7	11	3%	65.9	53.9 to 77.9
8	21	6%	68.7	60.0 to 77.3
9	39	10%	74.1	67.8 to 80.5
10	61	16%	76.6	71.5 to 81.7
11	56	15%	79.5	74.1 to 84.8
12	131	35%	87.1	83.6 to 90.6
<b>MHC Confidence</b>				
0	1	0%	16.7	-23.2 to 56.5
1	0	-	-	-
2	1	0%	16.7	-23.2 to 56.5
3	2	1%	8.3	-19.8 to 36.5
4	2	1%	33.3	5.2 to 61.5
5	1	0%	91.7	51.8 to 100
6	6	2%	58.3	42.1 to 74.6
7	67	18%	52.4	47.5 to 57.3
8	111	29%	73.0	69.2 to 76.8
9	119	31%	86.6	82.9 to 90.2
10	69	18%	95.6	90.8 to 100
<b>MHC Information</b>				
0	1	0%	66.7	26.8 to 100
1	1	0%	100.0	60.2 to 100
2	1	0%	16.7	0 to 56.5
3	0	-	-	-
4	4	1%	64.6	44.7 to 84.5
5	7	2%	67.9	52.8 to 82.9
6	3	1%	66.7	43.7 to 89.7
7	85	22%	73.5	69.2 to 77.8
8	110	29%	78.3	74.5 to 82.1
9	89	24%	78.1	73.9 to 82.3
10	78	21%	78.8	74.3 to 83.3

The MHC confidence rating has a mean of 8.4 on the 0-10 scale. The MHC scale has a narrower dispersion than HCS (Brown-Forsythe test,  $F(1, 751) = 141, p < 0.00001$ ).<sup>43</sup> The MHC standard deviation is 1.3, range 0 to 10, interquartile range 8 to 9, negative skew -1.6 and kurtosis 6.9.

Correlation between the HCS score and the MHC 'confidence' question is high (Spearman's correlation,  $r = 0.76, p < 0.0001$ ). The mean MHC score for each actual HCS score is shown in Figure 2, showing a linear relationship.

The correlation between HCS score and the MHC 'information' question is not significant (Spearman's correlation,  $r = 0.08, p = 0.1$ ).

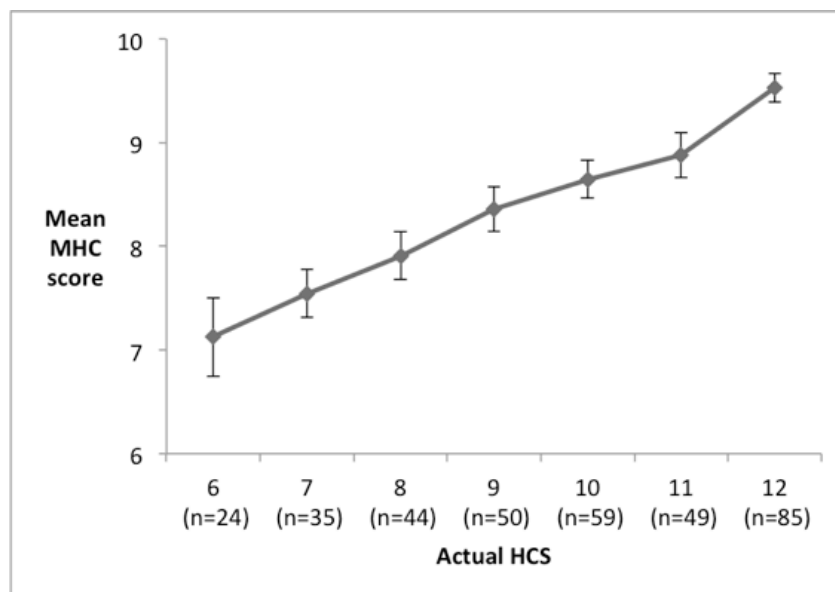


Figure 2: Mean My Health Confidence (MHC) score for each Health Confidence Score (HCS)

### Study 3 Results

The distribution of HCS item responses in Study 3 is shown in Table 6, with the mean scores (0-100 scale) and 95% confidence intervals.

The mean HCS summary score on 0-12 scale for all participants in Study 3 is 8.47, SD 2.49, interquartile range 7 to 10, skewness -0.315, kurtosis -0.255.

Table 6: Frequency distributions for the Study 3 questionnaire items

HCS Item (Study 3)	n	Strongly agree	Agree	Neutral	Disagree	Mean score (0-100 scale)	95% CI
I know enough about my health	1317	406 (30.8%)	680 (51.6%)	189 (14.4%)	42 (3.2%)	70.0	68.7–71.4
I can look after my health	1314	327 (24.9%)	651 (49.5%)	270 (20.5%)	66 (5.0%)	64.8	63.3–66.2
I can get the right help if I need it	1313	459 (35.0%)	595 (45.3%)	231 (17.6%)	28 (2.1%)	71.0	69.6–72.4
I am involved in decisions about me	1317	576 (43.7%)	588 (44.6%)	133 (10.1%)	20 (1.5%)	76.9	75.6–78.1

Table 7 shows the mean for each HCS item and for the HCS summary score, for all participants in Study 3, on referral and after referral. As expected, scores after the intervention are better than on referral. The largest difference is for *I can get the right help if I need it*.

Table 7 Mean scores on 0-100 scale for each HCS item and summary score, for all participants, on referral and after referral (Study 3)

Item	All participants (n=1309)	On referral (n=639)	After referral (n=670)	Difference
I know enough about my health	70.0	66.9	73.0	6.1
I can look after my health	64.8	61.7	67.7	6.0
I can get the right help if I need it	71.0	64.7	77.0	12.3
I am involved in decisions about me	76.9	73.6	80.0	6.4
HCS Summary Score	70.6	66.7	74.4	7.7

Figure 2 shows the mean scores from Study 2 (convenience sample of the general public) and Study 3 (social prescribing on referral and after referral). The lowest scores for all groups are for *I can look after my health*. The highest scores for Study 2 was for *I can get the right help if I need it*, and for Study 3 *I am involved in decisions about me*.

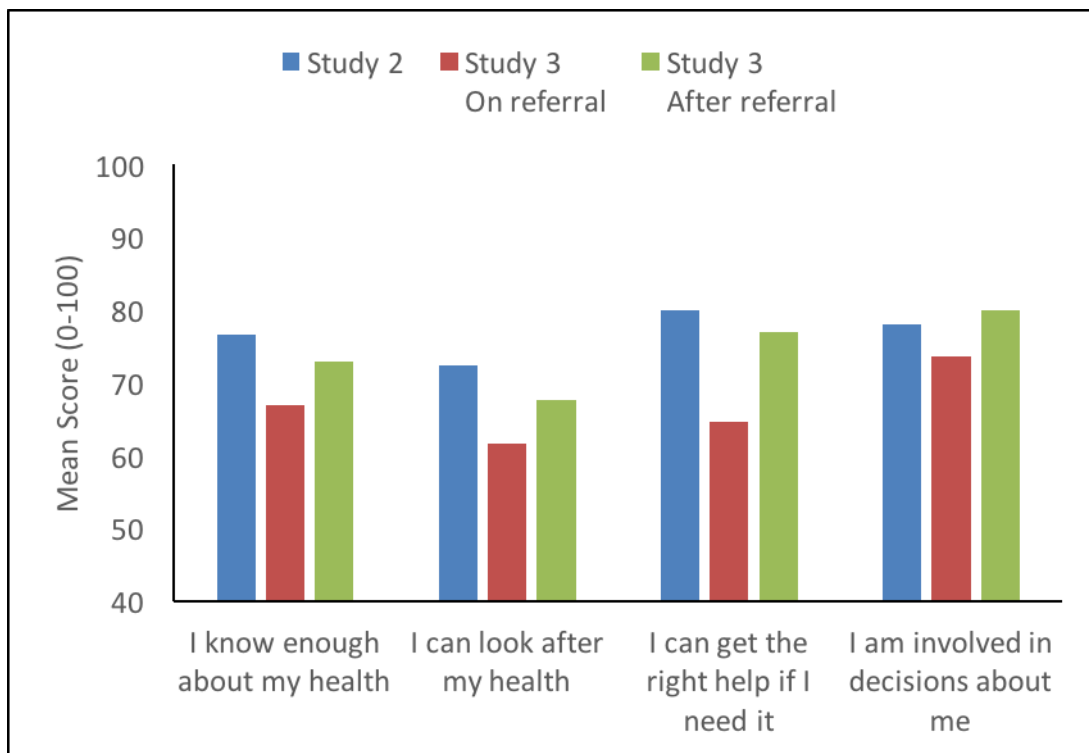


Figure 2. Mean scores for each HCS item on 0-100 scale for Study 2 (general population) and Study 3 (Social prescribing) on referral and after referral.

Cronbach's alpha in the Study 3 population is 0.904, at the top end of the expected range. This implies that it is appropriate to use a single summary score for this instrument, in addition to individual dimension scores.

The inter-item correlations (Table 8) are all in the range  $r=0.50$  to  $r=0.64$  with the highest correlations between *I can get the right help if I need it* and *I am involved in decisions about me*, which are most influenced by local provider policies. The second highest correlation is between *I know enough about my health* and *I can look after my health*, which are most patient focused.



Table 8: HCS Inter-item correlation matrix (all  $p < 0.0001$ ).

Pearson correlation	I know enough about my health	I can look after my health	I can get the right help if I need it	I am involved in decisions about me
I know enough about my health	1.0			
I can look after my health	0.60	1.0		
I can get the right help if I need it	0.50	0.55	1.0	
I am involved in decisions about me	0.53	0.50	0.64	1.0
HCS Summary Score	0.81	0.82	0.83	0.81

Table 9 shows the correlation between HCS items and summary score and summary scores for health status, measured using howRu, personal wellbeing, measured using PWS, and patient experience, measured using howRwe. The highest correlation is between *I can look after my health* and personal wellbeing ( $r=0.54$ ); the lowest is between *I can look after my health* and patient experience ( $r=0.26$ ).

Table 9 Pearson correlation between HCS items and summary score and health status, personal wellbeing and experience measures (Study 3). All correlations are significant ( $p < 0.001$ ).

Item	Health status (howRu)	Personal Wellbeing (PWS)	Experience (howRwe)
I know enough about my health	0.38	0.43	0.31
I can look after my health	0.52	0.54	0.26
I can get the right help if I need it	0.40	0.52	0.33
I am involved in decisions about me	0.33	0.45	0.34
HCS Summary Score	0.51	0.60	0.37

Regression analysis was performed on 1223 records with complete data for health confidence score (HCS) with health status (howRu) summary score, personal wellbeing (PWS) summary score, age decade (Age) and rank order of number of medications taken (Meds). This gives the following regression equation:

$$\text{HCS} = 0.375 * \text{PWS} + 0.233 * \text{howRu} - 0.154 * \text{Age} + 0.038 * \text{Meds} + 4.978$$

Coefficients for PWS and howRu are significant ( $p < 0.00001$ ), coefficient for Age is also significant ( $p = 0.0014$ ); coefficient for Meds is not significant ( $p = 0.557$ ).  $R^2 = 0.389$ .

Table 10 shows the correlations between HCS items and summary score and patient's age in decades and rank order of the number of medications taken. *I can get the right help if I need it* and *I am involved in decisions about me* and the summary HCS score are positively correlated with age in the

Study 3 population. This differs from Study 2, where the correlation with age is negative, and is likely to be related to differences in case mix between the populations.

*Table 10 Pearson correlation for each HCS item and summary score with age in decades and no of medications rank.*

Item	Age in decades		No of medications rank	
	r	p	r	p
I know enough about my health	0.039	0.156	-0.036	0.190
I can look after my health	0.024	0.383	-0.125	<0.001
I can get the right help if I need it	0.114	<0.001	-0.041	0.136
I am involved in decisions about me	0.117	<0.001	-0.025	0.363
HCS Summary Score	0.088	0.001	-0.071	0.010

In both populations, the HCS summary score is negatively correlated with number of medications, with the strongest association for *I can look after my health*. The distributions are shown in Table 11.

*Table 11 Counts, Mean HCS and standard deviations for all participants with complete HCS scores, on referral and after referral by sex, age group and number of medications taken*

Variable	All participants		On referral (A)		After referral (B)		HCS Difference (B-A)
	Count	Mean HCS	Count	Mean HCS	Count	Mean HCS	
<b>Overall (all items complete)</b>	1,309	70.6	639	66.7	670	74.4	7.74
<b>Sex</b>							
Female	789	71.4	370	67.3	419	75.0	7.64
Male	508	69.4	263	65.7	245	73.3	7.59
<b>Age Group</b>							
20 to 29	11	62.1	7	58.3	4	68.8	10.4
30 to 39	15	65.0	8	59.4	7	71.4	12.1
40 to 49	7	69.0	6	68.1	1	75.0	6.9
50 to 59	36	66.2	28	61.9	8	81.3	19.3
60 to 69	79	65.5	37	62.6	42	68.1	5.4
70 to 79	253	68.3	127	62.6	126	74.1	11.5
80 to 89	647	72.7	302	69.9	345	75.2	5.3
90 or over	228	70.6	99	66.6	129	73.8	7.2
<b>Medications</b>							
None	26	71.8	13	73.1	13	70.5	-2.56
1 or 2	121	68.5	72	66.4	49	71.6	5.16
3 to 5	534	73.4	279	69.8	255	77.3	7.42
6 to 9	412	69.5	162	62.8	250	73.9	11.18
10 or more	182	66.7	87	64.4	95	68.9	4.49

Table 12 shows the distribution of HCS summary scores for all participants, on referral and after referral. In this population 3 out of 1,309 (0.2%) were at the floor (chose worst option for all four items) and 236 (18.0%) were at the ceiling (scored best for all four items). This does not suggest either a problematic floor or ceiling effect, in whereby a measure is not able to detect whether participants become worse or better because they are already in an extreme class.

*Table 12 Distribution of HCS summary scores, for all participants, on referral and after referral.*

HCS score	All responses		On referral		After referral	
	n	%	n	%	n	%
<b>0</b>	3	0.2%	2	0.3%	1	0.1%
<b>1</b>	3	0.5%	3	0.8%		0.1%
<b>2</b>	13	1.5%	12	2.7%	1	0.3%
<b>3</b>	16	2.7%	11	4.4%	5	1.0%
<b>4</b>	46	6.2%	35	9.9%	11	2.7%
<b>5</b>	74	11.8%	50	17.7%	24	6.3%
<b>6</b>	106	19.9%	63	27.5%	43	12.7%
<b>7</b>	143	30.9%	75	39.3%	68	22.8%
<b>8</b>	330	56.1%	148	62.4%	182	50.0%
<b>9</b>	127	65.8%	61	72.0%	66	59.9%
<b>10</b>	123	75.2%	49	79.7%	74	70.9%
<b>11</b>	89	82.0%	25	83.6%	64	80.4%
<b>12</b>	236	100.0%	105	100.0%	131	100.0%
<b>Total</b>	1,309		639		670	

Figure 3 shows the distribution of HCS summary scores (0-12 axis), grouped into very low (0-3), low (4-6), medium (7-9) and high (10-12) groups, for Study 2 and Study 3 on referral and after referral cohorts. Each cohort has a distinctly different distribution.

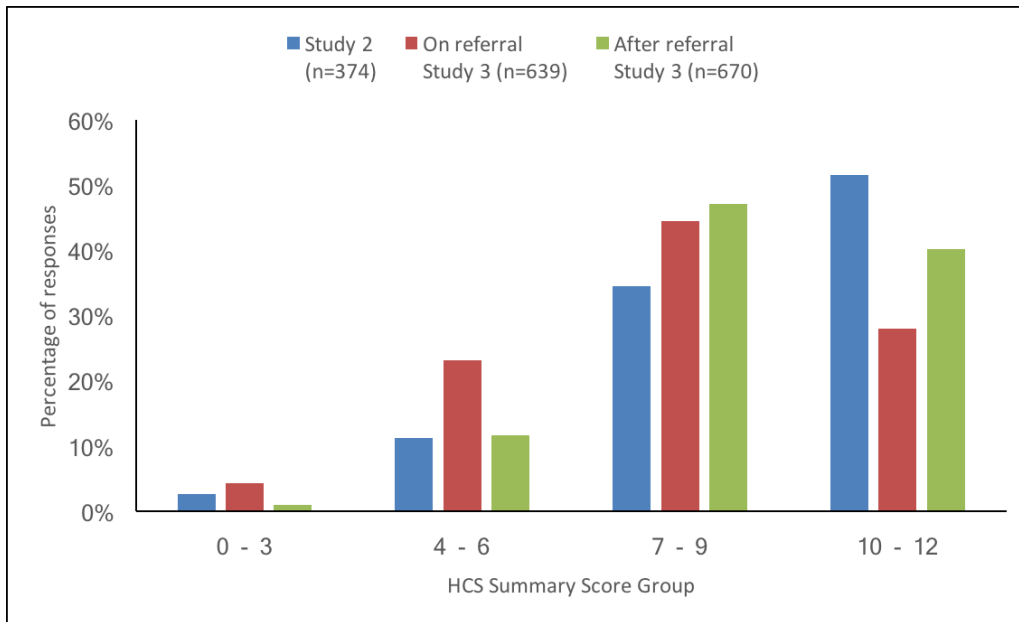


Figure 3 Distribution of HCS summary scores groups for Study 2, Study 3 On referral and Study 3 After referral cohorts.

The results of factor analysis are shown in Table 13. A scree plot implies four or six factors, while Kaiser’s criterion implies four. This supports the design of the 4 scales as measuring distinct constructs, although in this population it sub-divides howRu into ‘symptoms’ and ‘functionality’. A factor analysis of just the 4 HCS questions shows little indication of internal structure. Results were broadly the same when repeated on just the on referral or post-referral data.

Table 13 Factor analysis results, using oblique rotation, Promax. Only weights over 0.3 are shown.

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
howRu 1				0.51		
howRu 2				0.51		
howRu 3					0.77	
howRu 4					0.82	
PWS 1			0.69			
PWS 2			0.67			
PWS 3			0.87			
PWS 4			0.82			
HCS 1		0.61				
HCS 2		0.46				
HCS 3		0.71				
HCS 4		0.71				
howRwe 1	0.85					
howRwe 2	0.91					
howRwe 3	0.88					
howRwe 4	0.91					
Services talk to each other	0.36					0.42
No need to repeat story	0.61					0.39

## Discussion

This is the first published account of the Health Confidence Score (HCS), which is a new short generic person-reported questionnaire for measuring a person's perceived confidence to participate in their own health and care. It is readily usable on smartphones and tablets. It is designed for use across all health and social care sectors, and in combination with other modules within the R-Outcomes family of measures. HCS is shorter, with a lower reading age than other measures (Table 2) and has good psychometric properties and construct validity. This paper shows results for members of the public and for an older population of people who have been referred to social prescribing services.

Health confidence is a broad concept, which is related to self-efficacy,<sup>23</sup> patient activation,<sup>44</sup> health literacy,<sup>45</sup> self-management,<sup>46</sup> shared decision-making<sup>47</sup> and empowerment.<sup>48</sup> The focus of HCS is on the individual's perception, not on what they do (activity), nor on what clinicians or providers do or provide. This concept is not specific to one encounter or decision,<sup>49</sup> nor does it relate directly to how providers engage with patients or the public.

The Health Foundation is undertaking independent quantitative and qualitative evaluations of the feasibility of using the PAM-13 in the NHS in England.<sup>50</sup> The PAM is longer than HCS (299 vs 50 words) with a higher reading age (13 vs 8 years). PAM provides a single score in the range 0-100 and classifies patients into four levels. HCS provides a summary score plus scores for each of the four items.

The HCS summary score has a broad distribution of responses on a 13-point scale, with standard deviation 2.45 and kurtosis 0.4 (Study 2). This compares favorably with the leptokurtic distribution of the MHC confidence rating, which has standard deviation 1.28 and kurtosis 6.9 on an 11-point scale.

For HCS, the inter-item correlations and Cronbach's  $\alpha$  are within the desired range and suggest that, while each item in the questionnaire measures a different aspect and is useful on its own, the summary score is a meaningful and useful summary measure.

The relationships between HCS scores and independent variables were as expected. Regression analysis shows that HCS scores are strongly related to personal wellbeing ( $r=0.60$ ) and health status ( $r=0.51$ ) and slightly with age ( $r=0.088$ ) (Study 3).

There was a strong correlation between HCS and the MHC confidence score but not with individuals' perceptions of the value of the information provided to them. Study 2 did not find any significant relationship with sex, ethnicity, education or region. We did not ask whether people lived alone.

The HCS is not a conventional outcome measure, which should always be maximized. Health confidence, like patient activation, is sensitive to each person's existing health problems.<sup>51</sup> For example, other things being equal, an individual with no health problems is likely to score higher than one with multiple long-term conditions. Case mix, health status and context must always be considered.

The concepts of health confidence and activation can help us understand whether proposed interventions are reaching and helping their target participants, or whether only those who are already health literate are being reached and benefit.<sup>52</sup>

The HCS results can be provided as feedback for people and carers, clinicians, managers and commissioners for each item individually and/or as an overall summary score. The results may be incorporated as patient-reported history into EHRs for use in clinical management.<sup>53,54</sup>

The HCS meets the need for a short easy to use measure of health confidence. It can be used on smartphones and other devices that people already use as part of their daily life. The HCS is usually

used as one part of a longer questionnaire that includes other R-Outcomes' measures such as *howRu* and *howRwe*.<sup>55</sup>

The proposed form has some flexibility. It may include a text box to allow respondents to clarify or expand on their answers. The questionnaire has also been adapted to ask staff about their job confidence, known as the Job Confidence Score (JCS) and for use by carers to assess their confidence levels. For the JCS, the first item was modified to *I know enough about my work* and so on.

## Limitations

The second validation study (Study2) was undertaken among a convenience sample of the public. These results are not a representative sample of the general population, and was undertaken for the purpose of tool validation. Using a single interviewer to collect the data may have created some bias, but this is unknown.

Study 3 used secondary analysis of data collected from populations of older frail individuals living in their own homes, who are in receipt of social prescribing support services. This data did not contain a some data elements that could have been of interest, such as the number of people who declined to participate, the method of data collection, the time between referral and after referral rating, case-mix data, and whether respondents lived alone.

## Conclusions

The Health Confidence Score (HCS) is a new short generic measure of an individual's confidence to participate in and look after his or her own health. It has been shown to be easy to use with vulnerable older people, as well as with the general public, and is responsive to social prescribing interventions. It is shorter and has a lower reading age than other widely used instruments. In evaluation studies, it had few missing values, good psychometric results with good correlation with concurrent measures of health status and health confidence, and construct validity.

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## Declaration of conflicting interests

TB and AL are directors of R-Outcomes Ltd, which owns the copyright of the Health Confidence Score and provides quality improvement and evaluation services using it.

HP has done consultancy work for Crystallise Ltd, unrelated to the work reported herein. The authors declare that they have no other conflicting interests.

## Authors' contributions

TB designed the questionnaire with CB, and wrote the first draft of the paper. HWWP designed the surveys with TB. HWWP and TB performed the analyses. JS and AL were actively involved in the data collection and analysis of Study 3. All authors contributed to the final text, read and approved the final manuscript.

## Authors' information

The Health Confidence Score is copyright of R-Outcomes Ltd. Those wishing to use the Health Confidence Score should contact R-Outcomes Ltd (<http://r-outcomes.com>, [info@r-outcomes.com](mailto:info@r-outcomes.com)).

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### List of abbreviations

FKG: Flesch Kincaid Readability Grade  
HCS: Health Confidence Score  
HLQ: Health Literacy Questionnaire  
JCS: Job Confidence Score  
MHC: My Health Confidence  
NHS: National Health Service  
PAM: Patient Activation Measure  
PHE-s: Patient Health Engagement Scale  
PWS: Personal Wellbeing Score

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