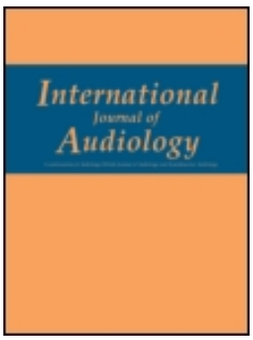

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Original Article

Measuring motivation using the transtheoretical (stages of change) model: A follow-up study of people who failed an online hearing screening

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Abstract

Objective: Acceptance and readiness to seek professional help have shown to be important factors for favourable audiological rehabilitation outcomes. Theories from health psychology such as the transtheoretical (stages-of-change) model could help understand behavioural change in people with hearing impairment. In recent studies, the University of Rhode Island change assessment (URICA) has been found to have good predictive validity. *Design*: In a previous study, 224 Swedish adults who had failed an online hearing screening completed URICA and two other measures of stages of change. This follow-up aimed to: (1) determine prevalence of help-seeking at a hearing clinic and hearing aid uptake, and (2) explore the predictive validity of the stages of change measures by a follow-up on the 224 participants who had failed a hearing screening 18 months previously. *Study sample*: A total of 122 people (54%) completed the follow-up online questionnaire, including the three measures and questions regarding experience with hearing help-seeking and hearing aid uptake. *Results*: Since failing the online hearing screening, 61% of participants had sought help. A good predictive validity for a one-item measure of stages of change was reported. *Conclusions*: The Staging algorithm was the stages of change measure with the best ability to predict help-seeking 18 months later.

Key Words: Hearing screening; motivation; stages of change; behavioural change; hearing help-seeking; hearing aid uptake

After being aware of having hearing problems it takes on average 10 years for adults to seek professional help for their perceived problems (Davis et al, 2007). Hearing screening, including remote forms such as telephone and web-based, has been suggested to improve public awareness regarding hearing health care (Swanepoel & Hall, 2010), as well as to improve help-seeking (Arlinger, 2003). Previous studies have reported mixed findings on the usefulness of hearing screening on help-seeking, hearing aid uptake, and lasting successful rehabilitation.

Yueh et al (2003) reviewed the scientific evidence on screening and management of hearing impairment in older adults in the primary care setting. At the time, no randomized clinical trial had evaluated the value of routine screening for improving patient outcomes. A large randomized clinical trial on 2305 older veterans (Yueh et al, 2010) showed that screening for hearing impairment (by either tone-emitting otoscope, questionnaire, or combined testing) led to significantly increased hearing-aid use than in a control group. Out of the 1772 participants (76.9%) who participated in a one-year follow-up, hearing aid uptake rates were the following: 6.3% in participants screened with tone-emitting otoscope, 4.1% in those screened with a questionnaire, 7.4% in those screened with combined testing, and 3.3% in the control group. The conclusion was that for this group of older veterans, hearing screening led to significantly more obtained hearing aids. A recent review reported strong evidence for the accuracy of common hearing screening tests as well as for their ability to identify patients at higher risk for hearing impairment (Chou et al, 2011). However, evidence on the efficacy of treatments for screening-detected hearing impairment was stated as limited. Similar results have been obtained in older and institutionalized

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Abbreviations

SHS	Stage with highest score, method for calculating URICA scores used in the present paper
SNR	Signal to noise ratio
SRT	Speech reception threshold
URICA	University of Rhode Island change assessment

populations as well, where programs of screening and follow-up services only slightly improved hearing aid uptake (Gussekloo et al, 2003; Linssen et al, 2013).

In 2011, Meyer and colleagues followed up 193 participants who had failed a telephone-based hearing screening test. Telephone interviews four-five months after the screening revealed that 36% had sought help. Participants who had considered hearing aids prior to the screening were significantly more likely to have sought help. In total, eight participants (4%) acquired hearing aids, of which six participants (3%) reported a successful rehabilitation outcome of hearing-aid use >1 hour/day (Meyer et al, 2011). The Dutch national hearing test, based on digit triplets and available by telephone and internet, had shown similar results (Smits et al, 2004, 2006). Over 50% of the 881 participants who failed the screening and answered a five-month follow-up stated having sought help for their hearing problems (Smits et al, 2006). In summary, even though failing an online hearing screening may increase help seeking, rates of hearing aid uptake as well as successful rehabilitation are low. However, a more extensive understanding of a participant's motivation levels at the time of a hearing screening may create a more realistic predictor of outcome.

Theories of health psychology describing behaviour change can help understand barriers and facilitators that people experience when seeking help for a health condition. Help-seeking and uptake of rehabilitation can be seen as a change in the behaviour of adults with hearing impairment. Therefore these theories have been increasingly applied to audiology populations (e.g. van den Brink et al, 1996; Milstein & Weinstein, 2002; Gilliver & Hickson, 2011; Laplante-Lévesque et al, 2013, 2015; Saunders et al, 2012). One of these theories is the stages of change model, part of the transtheoretical model of health behaviour change, originally developed through participant experiences with the process of quitting smoking. This model describes the process towards health behaviour change in separate stages: precontemplation, contemplation, action, and finally, maintenance, for people facing behaviour changes (Prochaska & DiClemente, 1983). A later publication also recognizes a fifth stage: preparation, between the contemplation and the action stages (Prochaska et al, 1992). Recent studies have argued for incorporating the preparation stage when using the stages of change model with audiology populations (Laplante-Lévesque et al, 2013; 2015). Within an audiological context, the stages of change model has been used for explaining the process of health behaviour change of seeking help and/or taking up hearing aids (Babeu et al, 2004).

Several tools to measure stages of change are available and three of them have been used for the present study. The University of Rhode Island change assessment (URICA) is a 32-item questionnaire (McConnaughy et al, 1983). In recent studies, the URICA has been found to have good concurrent and predictive validity when measuring stages of change in people with hearing impairment (Laplante-Lévesque et al, 2013, 2015). For example, the URICA showed that a sample of 224 Swedish adults who had failed an online hearing screening were mostly in the contemplation and preparation stages of change (Laplante-Lévesque et al, 2015). This study sample also completed the Staging algorithm (Milstein & Weinstein, 2002), a one-item measure for assessing stages of change, and the Line (Rollnick et al, 1999), an unmarked visual analogue scale for assessing readiness for help-seeking. The URICA correlated with both single-item measures, suggesting initial support for assessing stages of change using the Staging algorithm or the Line instead of the longer URICA. In addition, the Staging algorithm and the Line correlated with a moderate strength (Ingo et al, submitted). The objective of the present study was to: (1) determine prevalence of help-seeking at a hearing clinic and hearing aid uptake, and (2) explore the predictive validity of the stages of change measures, by a follow-up on the 224 participants who had failed a hearing screening 18 months previously.

Methods

The present follow-up study was part of a two-step study protocol. Participants were recruited for the initial study during the period December 2012 to February 2013. Inclusion criteria were the following: years of age ≥18, Swedish as first language, and no previous hearing aid fitting. An 18-month follow-up was conducted in June 2015.

Initial study protocol

Potential participants for the initial study were recruited via a free of charge online hearing screening developed by the research institute Hearing Bridge and governed by the Swedish Association of People with Hearing Loss (http://www.horseltest.se). The hearing screening consisted of a close-set of 10 words (Hagerman, 1982) presented in background noise and with matching icons on the screen. Participants were encouraged to use earphones during testing. First, participants were asked to adjust the speech to a comfortable level. Participants were then instructed to click on the icon representing the word presented. If a correct answer was given, the background noise increased (SNR decreases), and vice versa. This adaptive procedure used 2-dB steps for a total of 20 words presented in a random order. For each participant, the resulting speech-in-noise recognition threshold (expressed as a signal-to-noise ratio, SNR) at which 50% intelligibility was achieved was calculated from the 10 last words presented. A −3.4 dB SNR as cut-off corresponds to a true-positive rate of 79% and a false-positive rate of 24%, given a pure-tone average threshold of 35 dB HL (Molander et al, 2013).

All 365 participants who failed the online hearing screening during the period December 2012 to February 2013 and met the inclusion criteria were invited to participate in the study. Participants consented by sharing their email address and completing an online questionnaire sent to them. The online questionnaire consisted of the three stages of change measures (URICA, the Staging algorithm, and the Line) and demographics: age, gender, living conditions, level of education, amount of years with perceived hearing problems, and the question; Can you imagine yourself using hearing aids, if you were recommended? All three stages of change measures were originally developed for diverse populations and have subsequently been adapted for people with hearing impairment. In total, 224 individuals (61%) completed the initial study. This study received approval from the regional ethics committee (dnr 2011/453-31).

Follow-up study protocol

In June 2014 (18 months after conducting the online hearing screening and participating in the initial study) the 224 participants were invited to complete a second online questionnaire. The online questionnaire consisted of the three measures of stages of change (same as used for baseline): the URICA, the Staging algorithm, and the Line.

Further, participants' experiences with hearing help-seeking and hearing aid uptake were assessed with up to three items. First, they were asked if they had taken action to have their hearing tested (*yes/no*). Those who answered yes to the first item were referred to the second item: *Did you choose to receive hearing aids?* (*yes/no / I was told that my hearing is normal / I was not entitled to receive subsidized hearing aids*, or *Other option)*. Those who answered yes to the second item were asked to estimate how many hours per day, during the last two weeks, they had used their hearing aids (*not at all, less than 1 hour/day, 1–4 hours/day, 4–8 hours per day, more than 8 hours/day*). All participants who reported not having sought help were asked to choose one of four alternatives that best represented their situation: (1) *At present, I do not feel any need for getting hearing aids*; (2) *I feel unsure in my decision [not to seek help], and considering getting hearing aids*; (3) *I think that I need hearing aids, but I don't want to*; and (4) *Other option*.

Measures

The original URICA is a neutral questionnaire consisting of eight statements for each of the precontemplation, contemplation, action, and maintenance stages of change model, e.g. the precontemplation statement: *As far as I'm concerned, I don't have any problems that need changing* (McConnaughy et al, 1983). The word *problems* may then be specified to *hearing problems*. Participants express their agreement to each statement by choosing one of five possible answers; *Strongly disagree, Disagree, Undecided, Agree, and Strongly agree.* The Swedish translation of the URICA was used (Farbring, 2010) and items relating to the maintenance stage were removed as they were not relevant for this population, reducing the total amount of statements to 24. The present study used the URICA factor structure published by Laplante-Lévesque et al (2013), which recognizes the additional preparation stage, and distributes the 24 items accordingly; eight for precontemplation, four for contemplation, five for preparation, and seven for action. URICA scores can be summarized in different ways. In the present study, the stage with the highest score (SHS), based on the highest mean value, was used. In the case of identical mean values on two, or more, of the stages, the more advanced (higher) stage is considered the SHS. The SHS thereby classify each participant as belonging to the specific stage of change for which their URICA scores are highest (for further information see Laplante-Lévesque et al, 2013).

The Staging algorithm is a one-item questionnaire assessing stages of change. Milstein and Weinstein (2002) developed the Staging algorithm as a first attempt to assess stages of change in people attending a hearing screening. The Staging algorithm consists of a single question: *Which of the following statements best describes your view of your current hearing status?* The question has four possible answers, each corresponding with a stage of change: (1) *I do not think I have a hearing problem, and therefore nothing should be done about it*. (precontemplation); (2) *I think I have a hearing problem. However, I am not yet ready to take any action to solve the problem, but I might do so in the future*. (contemplation); (3) *I know I have a hearing problem, and I intend to take action to solve it soon.* (preparation), and (4) *I know I have a hearing problem, and I am here to take action to solve it now* (action).

The Line is a one-item measure of readiness for hearing help-seeking and consists of the question: *How important is it for you to improve your hearing right now?* (Rollnick et al, 1999; Tønnesen, 2012). In the original format, the instruction is to answer on an unmarked visual analogue scale. In the present online questionnaire, a discrete 11-point scale from 0 (not important at all) to 10 (highly important).

Data analysis

Statistical analyses were conducted using SPSS version 23. Independent *t*-tests and chi-square tests were conducted to investigate group differences in baseline data for participants from the initial study who did not participate in the follow-up ($n = 102$) and participants who completed the follow-up ($n = 122$). Independent *t*-tests were used for the continuous variables: age, SNR, and amount of years with perceived hearing problems, and categorical variables were the SHS, the Staging algorithm, the Line, gender, living conditions, level of education, and the question; Can you imagine yourself using hearing aids, if you were recommended? The same tests were conducted to identify any group differences between participants who reported at follow-up having sought help for their hearing problems, and those who reported not having sought help. Chi-square tests were conducted to investigate differences in scores for the SHS, the Staging algorithm, the Line between baseline and follow-up for the participants who completed the follow-up. In this case, with categorical dependent variables, corrected with McNemar-Bowker test. Chi-square tests (corrected with Fisher's exact test due to few observations) conducted with baseline scores of the SHS, the Staging algorithm, and the Line were used to investigate predictive validity for the three measures. Baseline scores of the SHS, the Staging algorithm, and the Line was also dichotomized to investigate if scoring in the lower half versus scoring in the higher half of these three measures was associated with help-seeking at follow-up. For URICA scores, participants in the precontemplation or the contemplation stages were considered to be in the lower half, and participants in the preparation or action in the higher half. The same procedure was used for the Staging algorithm. For the Line, the lower half consisted of participants scoring 0 through 5, and the higher of participants scoring 6 through 10.

Results

Differences between initial and follow-up samples

The 18-month follow-up had a response rate of 54%: 122 of the 224 invited people completed the follow-up. Table 1 shows baseline data for the 122 participants who completed the follow-up and for the 102 participants who did not complete the follow-up. No statistically significant difference was found in terms of age, SNR, amount of years with perceived hearing problems, gender, living situation, education, the SHS, the Staging algorithm, the Line, and the question: Can you imagine yourself using hearing aids, if you were recommended? (all p values $>.05$).

Stages of change at baseline and follow-up

Table 2 show baseline and follow-up scores on the SHS, the Staging algorithm, and the Line for the group of participants who completed the follow-up. There were significant changes in baseline and

Table 1. Summary of descriptive data and data for the three measurements at baseline for the study sample who did not participate in the follow-up ($n = 102$), and the study sample that did participate in the follow-up ($n = 122$).

	No follow-up (n = 102)	*Follow-up (n = 122)*	*Significance*
Gender n (%)			$\chi^2(1) = 0.12$, $p = 0.733$
Male	60 (58.8)	69 (56.6)	
Female	42 (41.2)	53 (43.4)	
Age, in years Mean ± SD	67.25 (8.8)	68.95 (8.8)	$t(222) = 1.44$, $p = 0.152$
Speech and noise recognition threshold expressed as a signal-to-noise ratio, in dB Mean ± SD	−0.29 (2.5)	−0.57 (2.2)	$t(222) = -0.88$, $p = 0.378$
Education *n* (%)			$\chi^2(3) = 1.22$, $p = 0.748$
Elementary school	19 (18.6)	23 (18.9)	
Middle school	9 (8.8)	16 (13.1)	
High school	28 (27.5)	29 (23.8)	
College/university/graduate school	46 (45.1)	54 (44.2)	
Living situation *n* (%)			$\chi^2(1) = 0.51$, $p = 0.477$
Alone	21 (20.6)	30 (22.8)	
With others	81 (79.4)	92 (77.2)	
Amount of years with perceived hearing problems Mean ± SD	10.9 (10.3)	10.3 (10.3)	$t(220) = -0.44$, $p = 0.659$
Can you imagine yourself using hearing aids, if you were recommended? *n* (%)			$\chi^2(1) = 1.27$, $p = 0.260$
Yes	84 (82.4)	107 (87.7)	
No	18 (17.6)	15 (12.3)	
URICA Stage with highest score *n* (%)			$\chi^2(3) = 6.42$, $p = 0.093$
Precontemplation	14 (13.7)	7 (5.7)	
Contemplation	42 (41.2)	43 (35.2)	
Preparation	44 (43.1)	68 (55.7)	
Action	2 (2.0)	4 (3.3)	
Staging algorithm *n* (%)			$\chi^2(3) = 0.23$, $p = 0.973$
Precontemplation	3 (2.9)	3 (2.5)	
Contemplation	45 (44.1)	55 (45.1)	
Preparation	47 (46.1)	54 (44.3)	
Action	7 (6.9)	10 (8.2)	
The Line mean (SD)	6.11 (3.1)	6.17 (2.7)	$\chi^2(10) = 12.98$, $p = 0.225$

Table 2. Summary of results on self-assessment measures: URICA (SHS), Staging algorithm, and the Line (rage of response options: 0–10). Baseline and follow-up data for the study sample who completed the follow-up ($N = 122$).

	Baseline data (122)	*Follow-up data (122)*	*Significance*
URICA stage with highest score *n* (%)			$\chi^2(5) = 122$, $p = 0.018$*
Precontemplation	7 (5.7)	10 (8.2)	
Contemplation	43 (35.2)	48 (39.3)	
Preparation	68 (55.7)	50 (41.0)	
Action	4 (3.3)	14 (11.5)	
Staging algorithm *n* (%)			$\chi^2(4) = 122$, $p = 0.004$*
Precontemplation	3 (2.5)	3 (2.5)	
Contemplation	55 (45.1)	48 (39.3)	
Preparation	54 (44.3)	42 (34.4)	
Action	10 (8.2)	29 (23.8)	
The Line mean (SD)	6.17 (2.7)	6.16 (2.8)	$\chi^2(33) = 122$, $p = 0.42$*

*Corrected with McNemar-Bowker test.

follow-up scores according to URICA (SHS) and the Staging algorithm. The mean on the Line slightly decreased but this change was not significant.

Prevalence of help-seeking at a hearing clinic and hearing aid uptake at follow-up

Out of the 122 participants, 74 (60.8%) reported that they had sought help at a hearing clinic at follow-up. In total, ten participants (8.2% of those who sought help) reported their hearing assessment to reveal normal results, which is in line with the sensitivity of the online hearing screening test (Molander et al, 2013). After seeking help at a hearing clinic, 31 (25.4% of the total sample) obtained hearing aids: ten (32%) used them more than 8 hours/day, seven (23%) used them 4–8 hours/day, five (16%) used them 1–4 hours/day, three (10%) less than 1 hour/day, and six (19%) reported not using them at all.

Table 3. Associations between descriptive and stages-of-change data at baseline, and whether participants had sought help at 18-months follow-up.

	Sought help (n = 74)	*Not sought help (n = 48)*	*Significance*
Gender *n* (%)			$\chi^2(1) = 0.18$, $p = 0.404$*
Male	43 (58.8)	26 (54.2)	
Female	31 (41.9)	22 (45.8)	
Age, in years, mean ± SD	69.28 (9.2)	68.44 (8.2)	$t(120) = 0.513$, $p = 0.609$
Speech and noise recognition threshold expressed as a signal-to-noise ratio, in dB Mean ± SD	−0.66 (2.2)	−0.43 (2.2)	$t(120) = -0.544$, $p = 0.587$
Education *n* (%)			
Elementary school	10 (13.5)	13 (27.1)	$\chi^2(3) = 5.26$, $p = 0.154$
Middle school	8 (10.8)	8 (16.7)	
High school	20 (27.0)	9 (18.8)	
College/university/graduate school	36 (48.6)	18 (37.5)	
Living situation *n* (%)			
Alone	15 (20.3)	15 (31.3)	$\chi^2(1) = 1.89$, $p = 0.123$*
With others	59 (79.7)	33 (68.8)	
Amount of years with perceived hearing problems Mean ± SD	11.6 (11.3)	8.3 (8.4)	$t(119) = 1.72$, $p = 0.088$
Can you imagine yourself using hearing aids, if you were recommended? *n* (%)			
Yes	65 (87.8)	42 (87.5)	$\chi^2(1) = 0.003$, $p = 0.583$*
No	9 (12.2)	6 (12.5)	
URICA Stage with highest score *n* (%)			$\chi^2(3) = 1.69$, $p = 0.638$
Precontemplation	5 (6.8)	2 (4.2)	
Contemplation	28 (37.8)	15 (31.3)	
Preparation	38 (51.4)	30 (62.5)	
Action	3 (4.1)	1 (2.1)	
Staging algorithm *n* (%)			$\chi^2(3) = 7.554$, $p = 0.043$*
Precontemplation	1 (1.4)	2 (4.2)	
Contemplation	28 (37.8)	27 (56.3)	
Preparation	36 (48.6)	18 (37.5)	
Action	9 (12.2)	1 (2.1)	
The Line mean (SD)	6.51 (2.6)	5.65 (2.8)	$\chi^2(10) = 13.1$, $p = 0.217$

*Corrected with Fisher's exact test.

Predictive validity

Whether participants had sought help at a hearing clinic at follow-up or not was used to determine predictive validity (see Table 3). No significant differences were found in terms of age, SNR, or amount of years with perceived hearing problems, gender, living situation, education, the SHS, the Line, and the question: Can you imagine yourself using hearing aids, if you were recommended? between those who sought help and those who did not. There was however a significant association between scores on the Staging algorithm and whether the participants had sought help or not. In this study, the Staging algorithm was the only baseline measure predictive of whether the participants sought help at a hearing clinic within 18 months. When dichotomizing baseline URICA, the Staging algorithm and the Line scores, as presented in the method section, there were no significant association between URICA or the Line and help-seeking (both p values $>.35$). However, the association between the dichotomized Staging algorithm and whether participants had sought help was still significant (X^2 (1) = 5.260, p =0 .027), with an odds ratio of 0.42.

Discussion

The first aim of this follow-up study was to determine the prevalence of help-seeking at a hearing clinic and hearing aid uptake 18 months after failing an online hearing screening. Among the 122 participants who completed the follow-up, 61% sought help at a hearing clinic. This rate compares advantageously to those previously presented by Smits et al (2006) with over 50%, and by Meyer et al (2011) with 36%. However, the rate of hearing aid uptake (25% in the present study) and that of hearing-aid use (71% of those who obtained reported using their hearing aids >1 hour/day) was considerably higher reported by Meyer et al (2011). Audiological rehabilitation, including hearing aids, is relatively easy to access and is subsidized to a high degree in Sweden (Brännström et al, 2013). Given that barriers and facilitators to hearing services vary across countries, comparing help-seeking rates across studies should be made with caution.

The second aim of this follow-up study was to explore the predictive validity of the three stages of change measures. No association was found between either the URICA or the Line, and whether participants had sought help or not. However, participants who were in the preparation and action stages at baseline according to the Staging algorithm had an odds ratio of .42 to have sought help 18 months later. Our results show that the staging algorithm had the best ability to predict help-seeking. In a previous study, the URICA showed to have good predictive validity for hearing aid uptake and outcomes (Laplante-Lévesque et al, 2013). In the present study, the URICA did not show predictive validity. The two studies had

differences which could have affected the ability of the URICA's predictive validity. Firstly, the Laplante-Lévesque et al study and the present study addressed different populations (people seeking help for the first time versus people failing an online hearing screening). Secondly, participants in the Laplante-Lévesque study were mainly in the action stage, whilst most participants in the present study were in the contemplation or preparation stages. Thirdly, Laplante-Lévesque et al used an oral administration within a clinical setting, whilst the present study used a self-administered online format. Adults with hearing impairment report more hearing problems in online questionnaires than in questionnaires administered in a paper and pen format, showing that administration format can affect results (Thorén et al, 2012). Fourthly, Laplante-Lévesque et al used the English version of the URICA whilst the present study used the Swedish translation. Even though the Swedish translation of the original version of the URICA has been validated (Farbring, 2010), it has not been specifically validated for audiological purposes. These results show that the URICA has not the same predictive validity in all populations of adults with hearing impairment.

Study limitations

The accuracy and the usefulness of the transtheoretical model of health behaviour change, and more specifically the stages of change part, has been questioned within health psychology research (Armitage, 2009). Several studies from other disciplines have investigated the use of the model. However, limits in terms of study design, with most previous studies using a cross-sectional design, make it difficult to verify the predictive validity of concepts within the model (Sutton, 2000). Longitudinal designs, like in the present study, as well as investigating components other than the stages of change construct are therefore needed to qualify the usefulness of the transtheoretical model (Armitage, 2009). Research within audiology has focused on the stages of change but should be extended to other components of the transtheoretical model.

A response rate of 54% was achieved: 122 of the 224 invited people completed the follow-up. No significant differences were found between the two groups. All participants received instant feedback after failing the online hearing screening, with a recommendation to seek help at a hearing clinic along with the invitation to the initial study. This recommendation may have influenced help seeking and hearing aid uptake. However, participants' reports of their experiences with hearing help-seeking and hearing aid uptake were not cross-checked against clinical records. False reports on experience with hearing help-seeking and hearing aid uptake may have occurred.

Implications for further research

Of the three measures of stages of change used, the Staging algorithm has the best predictive validity in identifying people who seek help 18 months later. This is encouraging for short measures of stages of change which could be used in the clinic. Further research should investigate the predictive validity of short measures of stages of change. Increasing motivation and help-seeking in adults who have failed an online hearing screening is also important.

Conclusions

Eighteen months after having failed a free of charge online hearing screening, 61% of the participants who completed the follow-up reported having sought help. In this population, the Staging algorithm was the stages of change measure with the best ability to predict help-seeking 18 months later.

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