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Review

Application of Transtheoretical (Stages of Change) Model in Studying Attitudes and Behaviors of Adults with Hearing Loss: A Descriptive Review

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Abstract

Background: Health Behavior Change (HBC) refers to facilitating changes to habits and/or behaviors related to health. There are a number of models/theories of HBC, which provide a structured framework to better understand the HBCs of individuals. The Transtheoretical Model (TTM, aka "the Stages of Change" model) is an integrative model used to conceptualize the process of intentional behavior change and is applied to a variety of behaviors, populations, and settings. In the last few years, use of TTM by the profession of audiology has been increasing.

Purpose: This descriptive literature review was aimed at identifying and presenting a summary of research studies, which use TTM to study the attitudes and behaviors of adults with hearing loss.

Research Design: A literature review was conducted.

Study Sample: This review included 13 empirical studies.

Data Collection and Analysis: A literature review was conducted using the EBSCO*host* and included the databases Cumulative Index to Nursing and Allied Health, MEDLINE, and PsycINFO.

Results: The review suggests TTM is useful in studying the attitudes and behaviors of adults with hearing loss. There are positive associations between stages of change and help-seeking, intervention uptake, and hearing rehabilitation outcome (i.e., benefit and satisfaction). However, associations with intervention decisions and intervention use were not evident. It appears help-seeking, intervention uptake, and successful outcomes are usually displayed in people in the later stages of change as those with greater hearing loss are often in the later stages of change.

Conclusions: Understanding the readiness toward help-seeking and uptake of intervention in people with hearing loss based on TTM may help clinicians develop more focused management strategies. However, additional longitudinal and interventional studies are needed to further test the predictive validity of the stages of change model.

Key Words: attitudes, belief, health behavior, hearing loss, help-seeking, outcome, rehabilitation, stages of change, transtheoretical model.

Abbreviations: HBC = Health Behavior Change; HBM = Health Belief Model; TC = The Circle; TL = The Line; TTM = Transtheoretical Model; URICA = University of Rhode Island Change Assessment; VAS = visual analog scale

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INTRODUCTION

Health behavior change (HBC) refers to facilitating change to habits and/or behavior related to health. There are number of models/theories of health behavior change which provide a structured framework to better understand the health behavior of individuals. Some of these models include Transtheoretical Model (TTM; Prochaska and DiClemente, 1983), Health Belief Model (HBM; Janz and Becker, 1984), Protection Motivation Theory (Rogers, 1975), Theory of Reasoned Actions (Fishbein and Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1991), Self-Determination Theory (Ryan and Deci, 2000), and Social Cognitive Theory (Bandura, 1986). Of these, the TTM and HBM are occasionally applied to audiology (Laplante-Lévesque et al, 2013; Manchaiah et al, 2015; Ferguson et al, 2016a; 2016b; Saunders et al, 2016a; 2016b).

The TTM (also called "the Stages of Change" model) is an integrative biopsychosocial model used to conceptualize the process of intentional behavior change and is applied to a variety of behaviors, populations, and settings. TTM is classified as an individual or intrapersonal theory, which incorporates knowledge, attitudes, beliefs, and behaviors (Hernandez, 2011). TTM focuses on a person's readiness to change, with regard to adopting and maintaining healthy behavior(s). TTM was originally developed by Prochaska and DiClemente (1983) to examine the process of smoking cessation. Further research led to modifications in the model (Prochaska et al, 1992). Although the original focus was on addictive behaviors, application of TTM to different populations has been embraced because of its logical, common sense approach. Other applications include diet, exercise, depression and anxiety, HIV prevention, sun exposure, medication compliance, and drug and alcohol problems (Hall and Rossi, 2008; Prochaska et al, 2009). Concepts encompassed in TTM include the following: process of change, decisional balance, stages of change, self-efficacy, and temptation (Prochaska et al, 2009). However, this review will be focused on the stages of change aspect of TTM.

There are variations of the stages of change model with the number of stages varying between four and seven. The most widely used model has five stages (McConnaughy et al, 1983): (1) precontemplation, (2) contemplation, (3) preparation, (4) action, and (5) maintenance (Prochaska et al, 1992). This approach helps tailor interventions based on a person's stage of readiness and their willingness to change. This approach explains how a person progresses from "no change" to "incorporating change" (Hernandez, 2011). Another stage, the "relapse" stage was added in 1983 when the approach was used with addictive behaviors. The relapse stage is witnessed when the person returns to their previously identified negative behavior (Prochaska and DiClemente, 1983). A final stage, "termination," was added in 1997 (Prochaska and Velicer, 1997) and is witnessed when the behavior change appears to be permanently embedded, and it appears unlikely the person will regress to their previously identified negative behavior (Hernandez, 2011).

The precontemplation stage is when someone is not ready to take action, the contemplation stage is when a person begins to recognize problem behavior(s) and gets ready for change, the preparation stage is when the person intends to take action and begins steps to achieve change, the action stage is when someone makes modifications in their behavior(s) to include healthy behaviors, and the maintenance stage is when a person sustains the action stage (Prochaska et al, 1992). Of note, although relapse and termination stages are seen in the related literature, they do not often apply to audiology.

Researchers have identified the need and relevance of applications of health behavior theories in audiological rehabilitation research (Noh et al, 1994; Manchaiah, 2012). More specifically, Babeu et al (2004) presented theoretical ideas on how TTM is adopted to the delivery of audiological services. More recently, the Ida Institute used TTM while developing a motivational tool for adults with hearing loss (Clark, 2010; Ida Institute, 2009). Since then, multiple researchers have used TTM as a theoretical basis for research in audiology. This includes studies related to hearing loss (Laplante-Lévesque et al, 2013; Manchaiah et al, 2015; Ferguson et al, 2016a), tinnitus (Kaldo et al, 2006), and hearing conservation (Raymond and Lusk, 2006; Hong et al, 2012).

The current literature review presents a summary of research studies which used TTM in studying the attitudes and behaviors of adults with hearing loss.

METHOD

A literature search was conducted during May–June 2016 through EBSCO*host*, which offers customizable basic and advanced searching supported by Boolean logic, natural language, enhanced subject indexing, and journal searching. This database includes various other databases. However, our search was limited to three databases: Cumulative Index to Nursing and Allied Health, MEDLINE, and PsycINFO. EBSCO*host* removes multiple instances of the same record (i.e., duplicates) from different databases before displaying search results. Two researchers conducted the search independently to assure existing literature had not been missed.

The search was conducted with the Boolean/phrase "stages of change" OR "transtheoretical model" AND "hearing loss" OR "hearing impairment." We applied advanced filter options to limit the search to English language and peer-reviewed publications. The database search resulted in a total of 1,584 records of articles. An

additional 17 articles were identified through manual journal searches and through the reference lists of key articles. Abstracts of all 1,601 records were assessed for eligibility, and after that, 53 full articles were screened. Owing to limited numbers of studies in this area, all studies meeting the inclusion criteria and published in peer-reviewed journals were included regardless of their study design.

Inclusion criteria were as follows: (1) studies related to condition (e.g., acquired hearing loss), (2) any stage in hearing loss rehabilitation, (3) text not indicative of a hearing conservation program, (4) adult population (i.e., ≥18 yr of age), and (5) published in English.

After applying the inclusion criteria, 13 studies were included in the current review.

Figure 1 shows the process followed in study identification, eligibility screening, and inclusion of articles.

RESULTS

Summary of Studies

Table 1 provides a summary of the 13 studies included in this review on attitudes and behaviors with hearing loss using TTM.

Within the audiological literature, Milstein and Weinstein (2002) were the earliest to conduct an empirical study using TTM on adults with hearing loss. Their study was aimed at determining whether hearing screening with and without "information sharing" would result in greater compliance with recommendations for follow-up. They included 147 community-based older adults (>65 yr of age) who completed surveys on health status, hearing disability, and readiness for change. The Readiness for Change Questionnaire (also known as Hearing Status Questionnaire) was developed based on a staging algorithm associated with their screening process (Prochaska et al, 1992). Each participant underwent pure-tone audiometric hearing screening. The population was subdivided into two groups. The experimental group reviewed videotapes regarding hearing loss and hearing aids. The control group did not receive videotape (or other) information. Before screening, the majority of participants (i.e., 76%) were in precontemplation and contemplation stages. Of note, the informative approach experienced by the experimental group did not lead to greater compliance. The authors suggest this may be a result of minimal hearing disability experienced by the participants.

Laplante-Lévesque et al (2011) investigated the predictors of rehabilitation intervention of hearing-impaired older adults (age >50 yrs) seeking help for the first time (with respect to their hearing loss) who had never worn hearing aids. The authors collected data using the University of Rhode Island Change Assessment (URICA; McConnaughy et al, 1983) scale and several other measures. URICA questionnaire consists of 32 items with eight questions each for four stages (i.e., precontemplation, contemplation, action, and maintenance). However, as the study participants were seeking help for the first time, the eight items relevant to the maintenance stage were not applicable and were excluded while using the URICA in this study. Participants were offered three intervention options using shared decision-making: hearing aid, communication programs, and no intervention. Of the 139 participants,

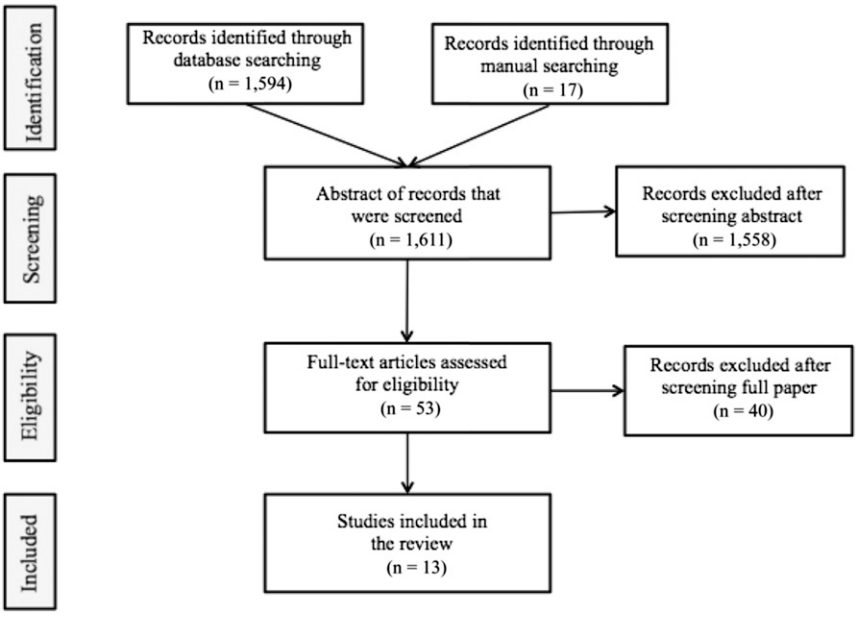

Figure 1. Flow diagram of the study identification, eligibility search, and inclusion process.

Table 1. Summary of Studies on Attitudes and Behaviors of Adults with Hearing Loss Using the Transtheoretical (Stages of Change) Model

Study	Country	Population	Sample Characteristics	Study Design	Main Findings Related to Stages of Change
Milstein and Weinstein (2002)	United States	Older adults (≥65 yr) from the community	N = 147	Prospective	76% of participants were in the precontemplation or contemplation stages
			Mean age = 75 yrs	Nonrandomized interventional	No differences were found between the experimental group and control group as a result of information counseling
			Gender (F) ≈75%		
Laplante-Lévesque et al (2011)	Australia	Adults with acquired HL seeking help for the first time	N = 139	Prospective	60% of participants were in contemplation stage
			Mean age = 70 yrs	Cross sectional	No significant association were found between SoC and intervention decision after adjusting for covariates
			Gender (F) = 30%		
Laplante-Lévesque et al (2012)	Australia	Adults with acquired HL seeking help for the first time	N = 153	Prospective	SoC and self-reported hearing disability were the two most robust predictors of hearing rehabilitation intervention uptake and successful outcome
			Mean age = 70 yrs	Nonrandomized interventional	
			Gender (F) = 31%		
Laplante-Lévesque et al (2013)	Australia	Adults with acquired HL seeking help for the first time	N = 153	Prospective	80% of participants were in action stage, whereas 2%, 10%, and 8% were in precontemplation, contemplations, and preparation stages, respectively
			Mean age = 70 yrs	Nonrandomized interventional	Construct, concurrent, and predictive validities of the URICA scale (and SoC model) were good
			Gender (F) = 31%		
Laplante-Lévesque et al (2015)	Sweden	Adults who failed online hearing screening	N = 224	Prospective	9%, 38%, 50%, and 3% of the participants were in precontemplation, contemplation, preparation and action stages respectively
			Mean age = 68 yrs	Cross sectional	Participants who reported a more advanced SoC had significantly greater self-reported hearing disability but did not have worse speech-in-noise recognition or reported HL for longer
			Gender (F) = 42%		
Manchaiah et al (2015)	United Kingdom	Adults with hearing difficulties but not using HAs	N = 90	Prospective	45%, 48%, and 7% of the participants were in contemplation, preparation and action stages, respectively
			Mean age = 63 yrs	Cross sectional	Participants fell into expected stages supporting the SoC model
			Gender (F) = 50%		

Table 1. Continued

Study	Country	Population	Sample Characteristics	Study Design	Main Findings Related to Stages of Change
Saunders et al (2016a)	United States	Adults with acquired HL seeking help for the first time and never used HAs and normal-hearing individuals	N = 182	Prospective	4%, 16%, and 78% of participants were in precontemplation, contemplation, and action stages, respectively
			Mean age = 70 yrs	Cohort observational	Individuals with more HL were at more advanced SoC
			Gender (F) = 6%		Main predictors of SoC in first-time help seekers were reported participation restrictions and duration of HL
Saunders et al (2016b)	United States	Adults with acquired HL seeking help for the first time and never used HAs	N = 167	Prospective	<15% of participants in precontemplation stage had acquired HAs by follow-up after six months, as compared with almost 80% of those in the action stage
			Mean age = 69 yrs	Cohort observational	Attitudes and beliefs changed after behavior change
			Gender (F) = 5%		Attitudes and beliefs after behavior change are better predictors of HA outcome than are attitudes and belief at the time of initial consulting
Ekberg et al (2016)	Australia	Adults with acquired HL seeking help for the first time	N = 62	Prospective	Clients' readiness for change could be observed through their interaction with audiologist
			Mean age = 72 yrs	Qualitative	Clients identified as being in precontemplation stage were more likely to display resistance to a recommendation of hearing aids (80% declined)
			Gender (F) = 42%		
Ingo et al (2016)	Sweden	Adults who failed online hearing screening	N = 122	Prospective	8%, 39%, 41%, and 12% of the participants were in precontemplation, contemplation, preparation, and action stages, respectively, during an 18-month follow-up
			Mean age = 69 yrs	Cross sectional	Since failing the online screening 18 months ago, 61% of participants had sought help
			Gender (F) = 43%		A good predictive validity for a one-item measure of SoC was reported
Ferguson et al (2016a)	United Kingdom	First-time adult HA users	N = 68	Prospective	At the time of assessment, 86% of the participants were in preparation stage; however, by the time of fitting appointment, 90% of the participants were in action stage
			Mean age ≈71 yrs	Quasi-randomized interventional	Readiness to address hearing difficulties predicted HA outcome for the control group
			Gender (F) ≈50%		

Table 1. Continued

Study	Country	Population	Sample Characteristics	Study Design	Main Findings Related to Stages of Change
Ferguson et al (2016b)	United Kingdom	First-time adult HA users	N = 30 Mean age = 68 yrs Gender (F) = 40%	Prospective Nonrandomized interventional	Positive expectations and readiness to improve hearing predicted outcome for HA in terms of satisfaction and benefit
Rothpletz et al (2016)	United States	Older adults (≥65 yr) who failed hearing screening	N = 27 Mean age = 72 yrs Gender (F) = 74%	Prospective Cross sectional (phase 1)	Study participants who had failed the hearing screening had higher scores for contemplation and preparation stages followed by action stage and the lowest score for precontemplation stage

Notes: HA = Hearing aid; HL = Hearing loss; SoC = Stages of change.

54% chose hearing aids, 24% chose communication programs, and 22% chose no intervention. Multiple interrelated predictors were identified, which include applications of subsidized hearing services, hearing impairment, communication self-efficacy, "powerful others" as locus of control, hearing disability perceived by others and self, perceived communication program effectiveness, and perceived suitability of individual communication program.

In this study, 60% of participants were in the contemplation stage, which may explain why nearly half of them did not elect hearing aids. Results suggested that after adjusting for covariance, no significant association was found between stages of change and intervention decision.

Laplante-Lévesque et al (2012) investigated predictors of uptake and successful outcomes in 153 middle age and older adults with acquired hearing loss who were seeking help for the first time. They identified six predictors of successful intervention outcomes, which include higher socioeconomic status, greater self-reported hearing disability, lower precontemplation stage of change, greater action stage of change, lower chance locus of control, and greater hearing disability perceived by self and others. Of these, the two most robust predictors of intervention uptake and successful outcomes were self-reported hearing disability and stages of change. Of note, stages of change in this context refers to adults with hearing loss who acknowledge their hearing loss, evaluated the pros and cons of employing a particular solution, and are most likely to pursue intervention. The authors suggest the "intervention uptake is the result of a complex chain of cognitive and behavioural processes and the factors influencing them are not static but rather change over time" (p. 92). They concluded that clinicians should offer intervention options and discuss the most robust predictors of intervention uptake and successful outcomes (i.e., self-reported hearing disability and stages of change) with patients to make optimal decisions.

Laplante-Lévesque et al (2013) also investigated TTM in audiological rehabilitation. At baseline, participants completed the URICA and other self-report measures such as hearing disability and years since hearing loss onset. Participants underwent a hearing test and were offered intervention options: hearing aids, communication program, and no intervention. Their intervention uptake and adherence were assessed 6 mo later, and their intervention outcome was assessed 3 mo after completion of intervention. The principle components' analysis identified four stages in the URICA (i.e., precontemplation, contemplation, preparation, and action), and the URICA was found to have good internal consistency (i.e., Cronbach's alpha of 0.89). Most participants (i.e., 80%) were in the action stage, and other participants were in precontemplation (2%), contemplation (10%), and preparation (8%). Cluster analysis identified four stages-of-change clusters: active change (58% of sample), initiation (35% of sample), disengagement (4% of sample), and ambivalence (3% of sample). Those who reported more advanced stages of change had greater hearing impairment, reported greater hearing disability, and noticed hearing loss for longer duration. Those in more advanced stages were more likely to uptake intervention and reported successful intervention outcome, although this did not predict intervention adherence. Overall, the authors suggested TTM has a good construct and demonstrated concurrent and predictive validities.

Hence, this model has validity for use in hearing rehabilitation. Of note, they suggested change might be better represented on a continuum—rather than by movement across discrete stages (i.e., from one stage to next).

Laplante-Lévesque et al (2015) studied the stages of change in 224 adults who failed an online hearing screening. In addition to the online hearing screening, participants completed the URICA and supplemental questionnaires. In this sample, 9% were in precontemplation, 38% were in contemplation, 50% were in preparation, and 3% of participants were in action stages. Of note, participants who failed the hearing screening were in lower stages of change. Also, participant's stages of change were positively associated with self-reported hearing disability. This notion was supported by an earlier study by Milstein and Weinstein (2002). However, there was lack of association between speech-in-noise recognition threshold and stages of change, suggesting a complex interplay between impairment, disability, and behavior of adults who failed the online hearing screening and had not yet sought help.

In a cross-sectional study, Manchaiah et al (2015) studied the stages of change profiles among adults experiencing hearing difficulties who had not taken action with respect to hearing rehabilitation. The study included 90 participants who completed self-reported measures online as a prerequisite for a clinical trial. Over 90% of study participants were in contemplation (i.e., 45%) and preparation stages (i.e., 48%). No significant differences were found among the groups with highest stages of change scores and factors such as years since hearing disability, self-reported hearing disability, self-reported anxiety and depression, and self-reported acceptance of hearing disability. In addition, cluster analysis revealed three stages-of-change clusters, which were referred to as decision-making (53% of sample), participation (28% of sample), and disinterest (19% of sample). It was suggested that at a population level, the stages of change model is applicable with respect to audiological rehabilitation to predict readiness for change.

More recently, 182 adults seeking hearing help for first-time participants were involved in an investigation using TTM and the HBM (Saunders et al, 2016a). Participants completed various measures including URICA, Health Belief Questionnaire (Saunders et al, 2013), Hearing Handicap Inventory for the Elderly (Ventry and Weinstein, 1982), and the Psychosocial Impact of Hearing Loss (Day and Jutai, 1996) scale. This investigation examined participant's hearing related beliefs and behaviors. The study sample included those with no hearing loss (25.8%), slight hearing loss (50.5%), moderate-to-severe hearing loss (23.1%), and unclassified hearing loss (0.5%). Results suggested the majority of first-time help seekers were in the action stages of change (77.5%), and participants with more severe hearing loss were in the advanced stages of change with higher contemplation and action scores than precontemplation when compared with those with no hearing loss or slight hearing loss. Participants with less hearing loss were higher in the precontemplation stage and lower in contemplation and action stages. The study showed a significant correlation between the URICA and HHI scores as people who reported higher hearing difficulties scored lower on precontemplation scores. Overall, this investigation suggests the degree of hearing loss and duration of hearing disability impacts readiness to change.

Saunders et al (2016b) evaluated predictors of hearing aid uptake and outcomes in 160 adult first-time help seekers using health behavior theories TTM and HBM. Participants completed questionnaires within two months and, again, after six months of their first appointment. All participants completed the URICA, Health Belief Questionnaire, Hearing Handicap Inventory for the Elderly, and Psychosocial Impact of Hearing Loss, whereas those who obtained hearing aids also completed International Outcome Inventory for Hearing Aids (Cox and Alexander, 2002). The results demonstrated 80% of those in the action stage had acquired hearing aids after 6 mo, whereas less than 15% of participants in precontemplation stage acquired amplification after 6 mo. Regression analysis showed age, duration of hearing loss, and having higher URICA scores in the action stage were significant predictors of behavior change (i.e., hearing aid uptake). These results suggest attitude and belief in the initial stages were associated with future hearing aid uptake. Attitudes and beliefs were changed after behavior change. Specifically, attitudes and beliefs after behavior change were better predictors of hearing aid outcome when compared with attitudes and beliefs before behavior change. Considering the relationship between attitudes, beliefs, and behavior change, the authors suggest the counseling-based interventions with a focus on behavior change have the potential to influence hearing rehabilitation uptake.

Ekberg et al (2016) investigated how the client's readiness for change can be identified through interactions with audiologists during history taking and initial appointments. They analyzed 62 video-recorded appointments using conversation analysis. The study suggests readiness for change can be observed through interactions with the audiologist. They report the way people describe their hearing and hearing loss during history taking corresponds to the way they respond to rehabilitation recommendations during management phase. Those identified as being in precontemplation stage displayed resistance to a recommendation of hearing aids (80% declined), whereas those who completed additional stages of change made appointments for hearing aid trials. These results suggest participants' stage of change had an impact on responding to hearing aid

recommendations. This study suggests audiologists should pay close attention to issues relating to readiness to change during history taking, and rehabilitation recommendations should be based on the same. Otherwise, this may result in a communication gap between audiologists and patients, which would ultimately result in the dismissal of rehabilitation recommendations.

Ingo et al (2016) conducted a study to explore the prevalence of readiness for help-seeking at a hearing center, hearing aid uptake, and to explore the predictive validity of stages of change measures. 122 participants of their initial 224 people who failed online hearing screening within the last 18 mo completed follow-up questionnaires which included three stages of change measures (i.e., URICA, the staging algorithm based on a single question, and the visual analog scale (VAS) "The Line [TL]," using the stages of change theory—see next section for further details) and questions about seeking hearing help and hearing aid uptake. It included questions on experience with hearing aid help-seeking and hearing aid uptake. Results showed that since failing the hearing screening, 61% of participants had sought help and 25% had obtained hearing aids. No association was found between readiness based on URICA or TL and participants help-seeking. However, participants who were in preparation and action stages based on the staging algorithm were more likely to have sought help 18 mo later, with a probability of 0.42 (Ingo et al, 2016). These results suggest that a staging algorithm based on a single question has predictive ability in terms of help-seeking.

Ferguson and colleagues (2016a, 2016b) studied first-time hearing aid users using TTM. The first study evaluated the feasibility of motivational engagement (i.e., motivational talk developed by the Ida Institute) for first-time hearing aid users (Ferguson et al, 2016a). This interventional study employed a quasi-randomized design and 68 participants (i.e., 32 in experimental group and 36 in control group). A range of outcome measures was used, and readiness measures included Hearing HealthCare Intervention Readiness (Weinstein, 2012) and the Ida Institute's TL (i.e., VAS) and The Circle (TC). Although those who underwent motivational engagement demonstrated greater self-efficacy, reduced anxiety, and greater engagement with the audiologist, there were no significant differences between the groups at the ten-week postfitting appointment. Readiness assessment based on TL showed higher readiness with scores generally falling between 6 and 8 on a 10-point scale. Assessment based on the use of TC showed most participants were at the preparation stage (86%) during the initial stage, and at the time of hearing aid fitting, the majority of participants had moved to the action stage (90%). Of note, readiness to address hearing difficulties predicted hearing aid outcome (i.e., use and satisfaction) for the control group but not for members of the experimental group who underwent motivational engagement.

In another prospective interventional study, Ferguson et al (2016b) evaluated 30 first-time hearing aid users. At the time of intervention, the predictor variables self-efficacy, expectations, and readiness to improve hearing were measured. The outcome measures included the Glasgow Hearing Aid Benefit Profile (Gatehouse, 1999) and Satisfaction with Amplification in Daily Life (Cox and Alexander, 1999). They reported that hearing sensitivity (i.e., audiograms) was not correlated with hearing aid outcomes. In this study, readiness was measured using the Ida Institute's TL. Self-efficacy measured using the Measure of Audiological Rehabilitation Self-efficacy for Hearing Aids (West and Smith, 2007) questionnaire predicted hearing aid satisfaction but not hearing aid outcome. However, they reported that positive expectations and readiness to improve hearing were useful predictors of hearing aid outcome with regard to satisfaction and benefit but not hearing aid use. Hence, the authors concluded an assessment of hearing aid expectations and the patient's readiness to improve their hearing might be useful in defining the most successful hearing aid candidates.

In a cross-sectional survey, Rothpltez et al (2016) measured help-seeking readiness and acceptance of Internet-based hearing healthcare websites among 27 older adults (≥55 yr) who failed online hearing screening. They used URICA and Patient Technology Acceptance Model (Or, 2008) questionnaires. The study participants had higher scores for contemplation and preparation stages followed by action stage and the lowest score for precontemplation stage. These results suggest that most participants were aware of their hearing problems and were considering or intending to take action toward resolving their hearing problems. The current study sample had higher scores on the action stage, when compared with a previous study of adults who failed an online hearing screening (Laplante-Lévesque et al, 2015)

Stages of Change Measures

There are various standardized and nonstandardized instruments, which have been used to measure readiness to change. However, two commonly used generic measures include (1) staging algorithm (Prochaska et al, 1994) and (2) URICA (McConnaughy et al, 1983).

Table 2 provides details of the instruments used in measuring the readiness (stages of change) in studies of attitudes and behaviors of adults with hearing loss. URICA is the only standardized measure used to study the stages of change in people with hearing loss. In addition to URICA, four other nonstandardized methods have been used in stages of change (or readiness) assessment in studies related to hearing loss. These

Table 2. Questionnaires Used in Measuring Stages of Change (or Readiness) in Studies on Attitudes and Behaviors of Adults with Hearing Loss

	Stages of Change Measure		URICA Scores Reporting Method			
Study	Questionnaire/ Tools Used	Standardized	Stage Scores	Composite Scores	Stage with Highest Scores	Stages-of-Change Clusters
Milstein and Weinstein (2002)	RCQ (staging algorithm)	No	NA	NA	NA	NA
Laplante-Lévesque et al (2011)	URICA	Yes	√	×	×	×
Laplante-Lévesque et al (2012)	URICA	Yes	√	×	×	×
Laplante-Lévesque et al (2013)	URICA	Yes	√	√	√	√
Laplante-Lévesque et al (2015)	URICA	Yes	√	√	√	√
Manchaiah et al (2015)	URICA	Yes	√	√	√	√
Saunders et al (2016a)	URICA	Yes	√	×	√	×
Saunders et al (2016b)	URICA	Yes	×	×	√	×
Ekberg et al (2016)	Interview observations	No	NA	NA	NA	NA
Ingo et al (2016)	The Line (one-item)	No	√	×	√	×
	RCQ (staging algorithm)	No				
	URICA	Yes				
Ferguson et al (2016a)	HHCIR	Yes	NA	NA	NA	NA
	Ida Institute—Circle	No				
	The Line (one-item)	No				
Ferguson et al (2016b)	The Line (one-item)	No	NA	NA	NA	NA
Rothpletz et al (2016)	URICA	Yes	√	×	×	×

Notes: HHCIR = Hearing Health Care Intervention Readiness; NA = Not Applicable; RCQ = The Readiness for Change Questionnaire (also called as Hearing Status Questionnaire); SoC = Stages of Change; URICA = University of Rhode Island Change Assessment.

include (1) staging algorithm, (2) TL (one item with VAS), (3) Ida Institute—TC, and (4) observations during the interview.

URICA is a neutral questionnaire consisting of 32 items with eight questions each for four stages (i.e., precontemplation, contemplation, action, and maintenance), 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 "problem" may be replaced by a specific condition (e.g., hearing problem) to adopt the questionnaire to a specific population. Precontemplation and contemplation are earlier stages, whereas action and maintenance are considered later stages within this continuum. Proponents of this model argue that people in later stages of change are most likely to display help-seeking, intervention uptake, adherence, and successful outcome (Prochaska et al, 2009). Laplante-Lévesque et al (2013) adopted and validated the URICA for use within the hearing loss population. They used the first 24 items from three stages (i.e., precontemplation, contemplation, and action) as the rest of the items from maintenance stage were not appropriate for the population they were studying. URICA scores can be reported in at least four different methods, which include (1) stage scores, (2) composite scores, (3) stage with the highest score, and (4) stages-of-change clusters (for more details refer to Laplante-Lévesque et al, 2013). It is clear from Table 2 that there is great variation in reporting of URICA scores in studies related to hearing loss. Of note, most studies only report mean stage scores and/or percentage of population in stage with highest scores. We recommend future studies report URICA scores in all four methods, which can be helpful while comparing results across studies.

The staging algorithm is a one-item questionnaire, which assesses the stages of change (Milstein and Weinstein, 2002). This one-item questionnaire is also known as The Readiness for Change Questionnaire or Hearing Status Questionnaire. 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 (Milstein and Weinstein, 2002).

TL is a one-item measure of readiness for hearing help-seeking. The question is worded as: "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 VAS. However, in some studies, an 11-point scale from 0 (not important at all) to 10 (highly important) has been used (Ingo et al, 2016).

The Ida Institute (Denmark) adopted a circular model of stages of change for people with hearing loss from the original model (Prochaska and DiClemente, 2005). TC provides a visual representation of patients' readiness to receive hearing care recommendations. This can be derived from a combination of self-assessment (from the patient) and the audiologist's observations. TC can help facilitate the hearing care professionals guide clinical interactions (e.g., offering information, advice, encouragement, and support) and to make

clinical decisions (e.g., offering treatment recommendations such as hearing aids).

The stages of change characteristics can also be examined using observations and qualitative methods (Ekberg et al, 2016). Using the semistructured interview, the client's responses to audiologist's questions can be analyzed carefully to determine which stage the client is likely to be (i.e., precontemplation, contemplation, and preparation).

Overall, although new methods (especially the single item questions) may be helpful for clinical use, considering the limited literature in this area, it is advisable to use multiple measures, including the standardized measure in research studies (Ingo et al, 2016).

The Applications of Stages of Change Model in Adults with Hearing Loss in Terms of Four Outcomes

The application of stages of change model in adults with hearing loss is viewed in terms of four main outcomes (i.e., help-seeking, rehabilitation uptake, rehabilitation use, and rehabilitation outcome). Table 3 highlights the application of stages of change model in adults with hearing loss in these four main outcomes. Previous studies suggest those who are in later stages of change are more likely to seek help (Manchaiah et al, 2015, Ingo et al, 2016). Stages of change scores were not associated with intervention decisions (Laplante-Lévesque et al, 2011) or use (Ferguson et al, 2016b) but were associated with intervention uptake (Laplante-Lévesque et al, 2012) and intervention outcome (Ferguson et al, 2016b; Saunders et al, 2016b). Other demographic factors appear to have an association with stages of change. For example, stages of change were positively associated with factors such as age, duration of hearing loss, self-reported hearing disability, and measured hearing loss (Laplante-Lévesque et al, 2015; Saunders et al, 2016a). It is important to note that intervention decisions are the first step in rehabilitation decision and may not relate to uptake, use, adherence, and successful outcome. Previous studies have identified discrepancies between intervention intention and intervention behavior, e.g., intervention action and successful intervention outcome (Meister et al, 2008). Most studies on stages of change are related to help-seeking and rehabilitation uptake, and only a few studies have focused on rehabilitation use and its outcome.

DISCUSSION

The current review examined the applications of TTM (stages of change) in studying the attitudes and behaviors of adults with hearing loss. Generally, it appears that help-seeking, intervention uptake, and successful outcomes are most typically displayed in people who are in the later stages of change (Prochaska et al, 2009). Moreover, the early stages of change (i.e., precontemplation, contemplation, preparation, and action) seem to correlate well with the phases of the patient journey identified in qualitative studies (Manchaiah et al, 2011).

We can draw preliminary conclusions that TTM is useful in studying the attitudes and behaviors of people with hearing loss, although caution is needed as most of these studies are based on a cross-sectional design (Armitage et al, 2003). TTM has been studied extensively, and there are a number of studies reporting positive applications across a variety of behaviors, populations, and settings. However, some studies have raised concerns about the staging algorithm and linear associations between stages of change and other components of the model such as decisional balance and self-efficacy (Herzog and Blagg, 2007). This is because the cross-sectional studies revealing the linear association only provide partial evidence in support of the stages of change model (Sutton, 2001). Sutton (2001) argued that we could draw any number of stages by choosing two

Table 3. Applications of the Stages of Change Model in Adults with Hearing Loss in Terms of Four Outcomes

	Help-Seeking	Rehabilitation Uptake (or Intervention Decision)	Rehabilitation Use	Rehabilitation Outcome
Milstein and Weinstein (2002)	√	√	×	×
Laplante-Lévesque et al (2011)	×	√	×	×
Laplante-Lévesque et al (2012)	×	√	×	√
Laplante-Lévesque et al (2013)	√	×	×	×
Laplante-Lévesque et al (2015)	√	×	×	×
Manchaiah et al (2015)	√	×	×	×
Saunders et al (2016a)	√	×	×	×
Saunders et al (2016b)	×	√	×	√
Ekberg et al (2016)	×	√	×	×
Ingo et al (2016)	√	×	×	×
Ferguson et al (2016a)	×	×	×	√
Ferguson et al (2016b)	×	×	√	√
Rothpletz et al (2016)	√	×	×	×

points on the behavioral intention (i.e., readiness) continuum. Some authors suggest a "disconnect" between precontemplation, contemplation, and preparation stages and also between action and maintenance stages (Armitage, 2009). Others argue that we might completely abandon this model (West, 2005). As such, one alternative would be to view the change as a continuum rather than separate stages (Laplante-Lévesque et al, 2013, Manchaiah et al, 2015) and to use the behavioral intention scores of readiness. Moreover, the use of a single health behavior model is not ideal as different models have unique and different constructs (Nigg et al, 2002; Noar and Zimmerman, 2005). Hence, there is need for a holistic and cross-theoretical approach (Saunders et al, 2016a).

Implications for Rehabilitation

Use of stages of change model(s) can provide a new perspective when conceptualizing and categorizing patients with hearing loss. For example, professionals in hearing rehabilitation have suggested patients with hearing loss can be broadly categorized into four groups (Stephens and Kramer, 2009);: (1) positively motivated without complicating factors, (2) positively motivated with complicating factors, (3) want help but reject key component, and (4) deny problems. From the stages of change perspective, those who are in later categories (3 and 4 mentioned previously) may be in earlier stages of change. Although people are different when viewed via cross-sectional data, they may progress to later stages of change with more readiness to seek help and interventions. Hence, rehabilitation should focus on attitude and belief modification with specific focus on improving the motivation.

Whereas the use of this theoretical model (TTM) is being explored in audiology, there is reason to believe TTM could be useful to audiology professionals. This theory is an individual or interpersonal theory that deals with knowledge, attitudes, beliefs, and behaviors. That is, it appears people must make the decision to change on their own, although others (e.g., family members and healthcare professionals) may help make the decision (Hernandez, 2011). This theory describes how people acquire a positive behavior or modify problem behavior(s). Research in other areas demonstrated that help-seeking, intervention uptake, adherence, and successful outcomes are usually displayed in people who are in the later stages of change (Prochaska et al, 2009). Concepts, which are described by health behavior models such as TTM, are applicable to many clinical settings, including aspects of audiological rehabilitation (Babeu et al, 2004; Manchaiah, 2012).

Further Research

The review highlighted that most of the existing studies using TTM focus on help-seeking and hearing rehabilitation uptake. Hence, future studies should focus on the relationship between stages of change and rehabilitation use and rehabilitation outcome. Further, there is a great need for longitudinal and interventional studies, which may test the robustness of the stages of change construct and its predictive validity. Some researchers suggest change may be better represented as a continuum (Laplante-Lévesque et al, 2013, Manchaiah et al, 2015), which should be considered while planning future studies. Various factors and cognitive and behavioral processes, which may facilitate or hinder progression in terms of stages of change, need to be carefully examined. In addition, there is a need to explore the relationship between different stages of change measures (Ingo et al, 2016) to assess the feasibility of single item measures (i.e., staging algorithm, Ida Institute—TL) especially for clinical purposes. Considering the studies using stages of change were performed in developed countries, it would be interesting and useful to conduct international and cross-culture studies (Zhao et al, 2015).

CONCLUSIONS

This literature review suggests TTM is useful in studying the attitudes and behaviors of adults with hearing loss. There were positive associations between stages of change and help-seeking, intervention uptake, and hearing rehabilitation outcome (i.e., benefit and satisfaction) but not with intervention decision and intervention use. It appears help-seeking, intervention uptake, and successful outcomes are usually displayed in people in later stages of change, although some discrepancies exist. Of note, those with greater self-reported hearing disability and measured hearing loss seem to be in the later stages of change. Audiologists' recommendations, hearing screening, and counseling-based interventions did not seem to promote change. That is, those in earlier stages of change declined or disregarded recommendations about hearing rehabilitation. Based on these studies, we suggest information about readiness and stages of change in people with hearing loss may help tailor intervention and training plans for individuals. However, longitudinal and interventional studies are needed to further test the predictive validity of the stages of change model.

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