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Using Teach-Back to Understand Participant Behavioral Self-Monitoring Skills across Health Literacy Level and Behavioral Condition

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Abstract

Objective—To assess differences, by health literacy status and behavioral condition, in participants' abilities to accurately self-monitor behaviors and recall key behavioral messages using data from a teach-back call.

Design—Cross-sectional.

Setting—Rural, southwestern Virginia.

Participants—Adults (n=301). Majority (81.1%) were female, 31.9% had ≤high school education, 66.1% earned <$25,000 per year, and 32.9% were low health literate.

Intervention—First class session of two community-based behavioral interventions: SIP*smart*ER (reduce sugar sweetened beverage intake) or MoveMore (increase physical activity).

Main Outcome Measures—Reported accuracy of behavioral diary completion, proportion of behavioral messages recalled during the first round of teach-back, and rounds of teach-back.

Analysis—Descriptive statistics and GLM.

Results—Low health literate participants were significantly less accurate in diary completion ($P<.001$), recalled fewer behavioral messages correctly ($P<.001$), and needed more rounds of teach-back ($P<.001$) than high health literate participants. Compared to SIP*smart*ER participants, MoveMore participants more accurately completed diaries ($P=.001$), but recalled a lower proportion of behavioral messages correctly ($P<.001$) and required more rounds of teach-back

Conclusions and Implications—Health literacy status and behavioral target impact ability to self-monitor and recall key concepts. Researchers should consider using teach-back early in the intervention to assess and reinforce participants' ability to self-monitor.

Keywords

self-report; beverages; physical activity; health literacy

Introduction

Self-monitoring is a behavior change technique commonly used in individual counseling and group interventions[1] which helps individuals regulate behaviors by building awareness of current behaviors through systematic observation and recording.[2] Use of self-monitoring in interventions targeting healthy eating and physical activity (PA) has been positively associated with program effectiveness.[3] Data from self-monitoring can facilitate meaningful interactions between individual goal-setting and program evaluation components. Participants use self-monitoring data to set and progress towards behavioral goals while program delivery personnel and investigators use these data for intermediate outcome assessments.

Accuracy in self-monitoring requires an individual to have specific knowledge about the target behavior (e.g., what the behavior entails), language skills to record information, and numeracy skills to calculate sums and/or averages. Therefore, self-monitoring accuracy may also be influenced by the type of behavior being measured or by a participant's health literacy, i.e., "the capacity to obtain, process, and understand basic health information to make appropriate health decisions."[4] However, the influence of these factors on ability to self-monitor has not been studied.

The teach-back method is a highly recommended strategy to ensure intervention messages are understood by participants of all health literacy levels.[5,6] When using this method, participants are asked to repeat instructions and/or recall key concepts using their own words shortly after the completion of an intervention activity.[7,8] Studies employing teach-back in one-on-one clinical settings show promising outcomes related to increasing specific content knowledge.[9–13] However, as teach-back could be employed to allow participants to use their own words to recall more than just information from class, its application could be extended to assess participant ability to accurately self-monitor behavior as was done in the *Talking Health* trial.

SIP*smart*ER and MoveMore are the two multi-component, behavior change interventions that comprise *Talking Health*. Both interventions target obesity-related behaviors.[14,15] SIP*smart*ER focuses on strategies to meet recommendations for consumption of less than eight ounces of SSB per day[16] while MoveMore focuses on strategies to meet recommendations of 150 weekly minutes of moderate-intensity aerobic activity and two or more days of muscle-strengthening activities.[17] Both interventions consist of three 90-minute small group class sessions, one teach-back call, and 11 interactive voice response (IVR) telephone calls. The Theory of Planned Behavior[18] and health literacy approaches[19–21] were used to develop education sessions and IVR call scripts. Several phases of formative research guided intervention development,[22,23] and intervention components were pilot tested.[24]

The purpose of this manuscript is to evaluate findings from a teach-back call that immediately followed the first class of these two interventions. Specifically, participants' reported accuracy in self-monitoring their behavior and performance recalling key behavioral messages by health literacy status (HL) and behavioral condition were evaluated. It was anticipated that most participants would report accurate self-monitoring behaviors, and that low health literate (LHL) participants would be less accurate in their self-monitoring, would need more rounds of teach-back, and would answer fewer questions correctly on the first teach-back round than high health literate (HHL) participants. Differences between behavioral conditions were not anticipated as it was assumed the knowledge and skill needed to track and report the behaviors would be similar. Additionally, to inform the translation of teach-back calls into routine practice, this manuscript explores completion rates, call length, and perceptions as there are limited data on participant experience with the teach-back process.

Methods

Talking Health is a six-month, pragmatic, community-based randomized controlled trial testing the effectiveness of SIP*smart*ER, which targets SSB consumption, against a comparison condition designed to increase PA (MoveMore.) A complete description of *Talking Health* is available elsewhere.[25] All study procedures were approved by the Virginia Tech Institutional Review Board. Participants provided written informed consent. Participants received a $25 and $50 gift card at baseline and six-month health assessments, respectively.

Target Population

Participants were from eight southwest Virginia counties with documented health disparities.[26] According to US Census Bureau, the population in these counties is 48.1% female and 93.9% White. Approximately 42.1% of citizens have ≤high school education and the average annual income is $48,104.[27]

Recruitment, Screening, and Eligibility

Participants were recruited by flyers, newspaper and radio advertisements, and word of mouth as well as at free clinics, childcare centers, public libraries, and local festivals.

Interested individuals were screened by the following criteria: age ≥18 years, English speaking, consuming ≥200 calories per day from SSB (assessed with BEV-Q[28]), no contraindications to PA (assessed with adapted Physical Activity Readiness Questionnaire[29]), and having access to a telephone. At baseline health screening, participants were randomized into conditions.

Intervention Description

This manuscript focuses on three intervention components of SIP*smart*ER and MoveMore: first group class, behavioral diaries, and teach-back call.

First group class—The first SIP*smart*ER and MoveMore classes were structurally aligned. These classes addressed concepts relevant to building motivation and skill to perform the target behaviors, such as defining the behavior, describing associated risks, and providing supportive strategies. Additionally, a significant portion of this class was dedicated to instructing participants how to accurately complete behavioral diaries. At the end of the class, participants completed personal action plans, including articulation of short and long-term goals and strategies to overcome barriers.[30]

Behavioral diaries—The diaries were tailored for each intervention. SIP*smart*ER participants recorded ounces of SSBs consumed while MoveMore participants recorded minutes of aerobic and strength training activities. Participants then used these records to calculate daily totals, weekly totals, and weekly averages.

Teach-back call—One week following the first class, participants received a teach-back call during which they verbally described how they had completed their first diary and reported key behavioral messages. During this call, participants reported on four indicators associated with diary accuracy: (1) drinks/activities they included on their diaries as SSB/PA; (2) SSB/PA they forgot to record; (3) how they determined ounces of SSB consumed/PA minutes; and (4) how they averaged their SSB ounces/PA minutes. Using the semi-structured teach-back script, staff probed participant responses to help ensure complete answers. If participants reported inaccurate diary completion indicators, staff reviewed the proper actions with participants to correct their current diary and help them be better able to accurately self-monitor in the future.

Participants also taught-back key behavioral messages, which reflected concepts necessary to support ability to self-monitor and/or engagement in the behavior (See Table 2 for questions). Because of differences in class content and recommendations, there were five questions for SIP*smart*ER participants and eight for MoveMore participants. When questions were answered incorrectly, participants were given the correct answer and had two more opportunities to correctly recall the information.

Data Collection and Measures

Demographic information, including gender, race, age, educational attainment, and income, was collected during eligibility screening. At baseline, the Newest Vital Sign (NVS) was interview-administered. The NVS is a validated HL measure based on the food label and

four of the six questions utilize numeracy skills.[31] HL scores were collapsed into two categories: LHL (0–3 correct answers) and HHL (4–6 correct answers).

The scripted teach-back calls were conducted over the phone by trained graduate students. Participants were called at preferred times, and three attempts were made to reach each participant. All diary and recall questions required open-ended responses, which were subsequently coded as incorrect (0) or correct (1).

At the in-person, six-month assessment, a trained interviewer asked participants to rate their agreement with three questions regarding their satisfaction with the teach-back call on a scale of 1 (strongly disagree) to 10 (strongly agree).

Data Analyses

Quantitative analyses were conducted using SPSS version 22.0. Chi-square tests were used to examine demographic differences between participants in different behavioral conditions as well as differences in responses to individual diary and behavioral message questions by HL. To standardize scores and allow for comparisons across performance measures and conditions, proportion of correctly recalled questions were calculated for the four diary indicators and five/eight behavioral questions. Generalized linear models were used to measure differences in proportion of participants completing diaries correctly, proportion correct on the first round of teach-back, and number of rounds of teach-back as well as responses to satisfaction questions by HL status and randomized condition. Significance is reported at *P*-value <.05.

Results

Participants

In total, 1056 individual were screened, 620 (58.7%) were eligible, and 301 (28.5%) were enrolled into SIP*smart*ER (n=155) and MoveMore (n=146). The majority of participants were female (81.4%) and White (93.0%). The average participant was 41.8 (SD=13.4) years old. Approximately one-third of participants had ≤high school education, 66.1% earned < $25,000 per year, 49.8% were employed, and 32.9% were LHL. There were no differences between SIP*smart*ER and MoveMore participants. Comparisons to Census data for the targeted counties indicate males and ≤high school education were underrepresented, low-income was overrepresented, and race was well-represented.[27]

Accuracy of Diary Completion

During the teach-back call, 87% of participants described completing all diary accuracy indicators correctly. However, the average LHL participant had a significantly lower proportion of the four indicators completed correctly compared to HHL participants (*P*<.001). MoveMore participants had a significantly higher proportion of indicators completed correctly compared to SIP*smart*ER participants (*P*=.001). There was no significant interaction between HL and condition (Table 1).

Among SIP*smart*ER participants, individual diary completion questions answered correctly on the first round ranged from 45.0% to 93.8% (Table 2). A significantly greater percentage

of HHL SIP*smart*ER participants correctly listed just SSBs in their diaries ($P<.01$) and correctly described how to average their weekly SSB intake ($P=.05$) than their LHL peers. Among MoveMore participants, the range of accuracy of individual diary questions was 68.6% to 98.6%. A significantly greater percentage of HHL MoveMore participants correctly described how to record time spent in PA ($P=.02$) and how to average weekly physical activity minutes ($P<.01$) than their LHL counterparts.

Teaching Back Key Messages

LHL participants required significantly more rounds of teach-back to correctly recall key messages than HHL participants ($P<.001$). MoveMore participants required significantly more rounds of teach-back than SIP*smart*ER participants ($P<.001$). (Table 1) The interaction terms for these analyses were not significant.

Similarly, HHL participants answered a significantly greater proportion of teach-back questions correctly on the first round compared to LHL participants ($P<.001$). SIP*smart*ER participants answered a significantly greater proportion of questions correctly during the first round compared to MoveMore participants ($P<.001$) (Table 1). However, there was no significant interaction between HL and condition.

For SIP*smart*ER participants, the percent responding correctly on the first round to individual key message questions ranged from 45.0% to 100.0% (Table 2). For four of five behavioral message questions, LHL participants were significantly less likely than their HHL counterparts to answer correctly on the first round. Among MoveMore participants, overall questions answered correctly ranged from 17.1% to 98.6%. When compared to HHL participants, LHL MoveMore participants were significantly less likely to answer content questions correctly on the first round of teach-back for three of eight questions ($P\leq.001$).

Teach-Back Call Completion and Perceptions

There were no significant differences in the completion rate of the teach-back call by intervention condition [SIP*smart*ER=67.0% ($n=104$); MoveMore = 71.2% ($n=104$)] or HL [LHL=75.8% ($n=74$); HHL=65.8% ($n=129$)]. The average participant took 18.60 minutes ($SD=5.64$) to complete the call. LHL participants (mean=20.43, $SD=6.1$) took significantly longer ($P<.001$) than HHL participants (mean=17.56, $SD=4.86$). There were no differences in length of teach-back call by behavioral condition.

Table 1 shares teach-back call perceptions for the 162 participants who completed both the teach-back call and six-month assessment. There were no significant differences by HL or condition for any of these questions, which were asked on 10-point agreement scales. Across all participants, the perceived helpfulness of the call averaged 8.40 ($SD=2.15$) and the mean difficulty of answering the teach-back questions was 2.72 ($SD=2.40$). Participants across both conditions and HL levels also equally recommended using teach-back calls for future programs.

Discussion

Findings from this study demonstrate that, although the majority of participants report accurate self-monitoring actions following a group-delivered class, self-monitoring accuracy and performance recalling key behavioral messages differ by HL and behavioral condition. Findings suggest the major difference between HL groups was related to numeracy skills: accurately calculating averages (both conditions) and estimating time in PA (MoveMore). This is in-line with evidence suggesting LHL individuals have greater difficulty with numeracy-related tasks.[4]

Ability to recall information during a teach-back call also varied by HL status; LHL participants performed worse than HHL participants. Although several studies have applied teach-back techniques,[9–13] only two known studies have evaluated differences in teach-back performance by HL. Wilson and colleagues[12] found HL impacted the performance of pregnant women (n=35) when recalling the benefits and risks of two vaccines they learned during a clinic visit. Participants who gave incorrect responses had lower HL than those who provided completely or partially correct responses. However, Passche-Orlow and colleagues[9] found no signficiant differences related to inhaler technique and description of self-care regimen by HL following an intervention to improve asthma self-care among adults with severe asthma (n=73). There has been no study to look at teach-back performance by HL in the content of nutrition-related behaviors; Negarandeh and colleagues[13] conducted the only known study to apply teach-back methods in this area and only focused on LHL participants. The findings of this present study, which has a considerably larger sample size than the other known studies, strengthen the evidence that teach-back strategies benefit LHL participants as they may be less able to recall key concepts following an intervention, and elevates the usefulness of teach-back methods in health literacy interventions targeting nutrition behaviors.

Teach-back call perceptions and completion rates indicate the teach-back calls were acceptable to participants across HL and behavioral condition. Findings also suggest that participants who might struggle with recalling key concepts value the opportunity to review materials in a one-on-one setting. These results are of particular importance as few studies have explored if HL influences perceptions of intervention components, including teach-back.[32,33]

Importantly, while skill-building activities are known to be critical for initiating health behaviors and improving health outcomes,[34] the majority of studies exploring HL within the context of nutrition are limited to the readability of educational materials.[35,36] As discussed in systematic reviews of HL[34,35] and by recent viewpoints specifically related to HL within the context of nutrition and food education,[37,38] in order to facilitate behavior change, the incorporation of HL into nutrition interventions must extend beyond readability and building knowledge and into the development of individual skills and confidence to engage in complex, behavior-specific skills, including accurate self-monitoring skills. The findings from this study builds evidence that teach-back – an adaptable and participant-accepted HL technique – can be employed to both reinforce both knowledge and behavior-specific skill.

Limitations

The sample is predominantly female and White, which may limit generalizability. Other study limitations include the cross-sectional design and lack of pre-class data to determine changes in self-monitoring skills or recall of concepts. However, given the exploratory nature of this study, neither of these outcomes was a primary goal.

The completion rates of the teach-back call and six-month assessment may also be viewed as limitations. While this decreased sample size, the authors do not believe completion rates biased findings. The 69% of participants who completed the teach-back were representative of the larger trial sample across most key demographic characteristics, including HL. The only significant difference was that teach-back completers were slightly older than non-completers. The demographic similarities may negate any bias in self-monitoring ability and recall performance. However, the 54% completion of both teach-back call and 6-month health assessment may have biased satisfaction ratings of the call. Participants with more positive attitudes about the program components may have been more likely to complete the program.

Arguably, the NVS which is based on a food label, may appear to be more content appropriate and behavior-specific to determine HL among SIP*smart*ER participants compared to MoveMore participants. However, the NVS was developed for use in non-nutrition specific settings and scores are highly correlated with the Test of Functional Health Literacy in Adults, a more time-consuming measure regularly used to measure HL in health care settings.[31]

Additionally, this study relied on self-reported data to determine accuracy of diary completion, which the authors were unable to check diary against observations. To mitigate this limitation, the semi-structured protocol included standardized probing questions to query details about diary completion.

Implications for Research and Practice

Given recent empahasis on applying concepts of health literacy within the context nutrition and food literacy,[37,38] the presented findings highlight the potential and importance for nutrition educators to incorporate teach-back approaches when working with group-based behavioral interventions. First, as the only known study to use teach-back method in a non-clinical, group setting, the positive findings affirm the importance and practicality of extending the application of non-written, verbal teach-back strategies beyond one-on-one, patient-provider situations. Specifically, the positive perceptions of the call by both LHL and HHL participants indicate that teach-back strategies can be an acceptable means to incorporate universal health literacy precautions within interventions targeting LHL and HHL participants.[39]

Next, the unexpected differences in self-monitoring abilities by behavioral condition, specifically those related to recording only the target behavior, suggest nutrition educators should be mindful when instructing participants, particularly those with LHL, how to record actions perceived as relatively similar (i.e., drinking SSBs versus non-SSBs). The finding suggests distinguishing between relatively similar actions (i.e., drinking SSBs versus non-

SSBs) may be more difficult than identifying a clearly differentiated ones (e.g., aerobic or strength training activity versus sedentary activities). Therefore, different strategies may need to be undertaken to ensure that the message about what the target behavior is and what to record on dairies is clear when the target behavior may be perceived by participants as entwined with another, non-relevant behavior.

Third, given the differences in ability to accurately self-monitor by HL and behavioral condition, researchers working with interventions that rely on self-monitoring for process or outcome data may consider using teach-back in tandem with the first self-monitoring activity to assess and reinforce participants' self-monitoring abilities in addition to its more traditional use of ensuring participants can recall pertinent information. This may allow nutrition educators to address and remediate erroneous self-monitoring actions early in an intervention and promote data accuracy, such as calculating weekly averages.

Last, by including teach-back in interventions, nutrition educators have another tool to ensure the often diverse learning needs of participants are met. This method not only addresses the needs of any LHL participants, but teach-back data can be used to identify areas of weaknesses in intervention design and/or delivery related to the teaching of key behavioral messages.

Opportunities for future research include longitudinal studies to determine if teach-back improves the quality of self-monitoring behaviors over time as well as how HL status and performance on teach-back calls may influence distal health and nutrition outcomes.[35,40] Also, because teach-back can be resource intensive, research is needed to determine if this method can be automated in a way that is effective, cost-efficient, and well received among intervention participants.

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Table 1

Performance on and perceptions of teach-back call by condition and health literacy status

	Overall *Mean (SD)*	**SIP*smart*ER** *Mean (SD)*		**MoveMore** *Mean (SD)*		**F-statistic** *(p-value)*
		LHL	**HHL**	**LHL**	**HHL**	**Overall Model**[a]
Performance on teach-back call	n=208	n=40	n=64	n=35	n=69	
Proportion reporting accurate diaries completion[b]	.87 (.20)	.73 (.28)	.89 (.17)	0.85 (0.20)	.95 (.12)	12.10[f,g] (.01)
Proportion behavioral questions correct on first round[c]	.79 (.20)	.75 (.23)	.93 (.11)	.65 (0.22)	.74 (.17)	21.69[f,g] (<.001)
Number of rounds need[d]	1.77 (.65)	1.75 (.59)	1.33 (.47)	2.17 (.71)	1.99 (.56)	22.15[f,g] (<.001)
Perceptions of teach-back call[e]	n=162	n=32	n=53	n=25	n=52	
Reviewing material personally with staff on the telephone helped me learn it better	8.40 (2.15)	8.91 (1.94)	8.19 (2.67)	8.84 (1.49)	8.10 (1.90)	NS
Answering the questions was difficult	2.72 (2.40)	2.59 (2.67)	2.30 (2.25)	3.04 (2.39)	3.06 (2.37)	NS
I would recommend staff call to personally review class materials	8.59 (2.15)	8.78 (1.75)	8.36 (2.63)	8.84 (1.68)	8.59 (2.07)	NS

LHL = Low health literacy; HHL = High health literacy

[a] Overall model tests for between subjects effects for health literacy status, study condition, and interaction.

[b] Proportion of participants listing appropriate drinks/activities, not forgetting drinks/activities, correctly estimating sizes/time; and accurately calculating weekly average.

[c] SIP*smart*ER and MoveMore participants answered five and eight questions respectively.

[d] Participants had up to three opportunities to teach-back key concepts.

[e] Sample represents participants who have completed both the teach-back call and six-month assessment. Responses were on a 10-point Likert scale agreement scale

[f] Significant differences between conditions at p≤.001.

[g] Significant differences between health literacy groups at p≤.001

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Table 2

Proportion of participants answering correctly on first round of teach-back by condition and health literacy status.

	Overall n (%)	LHL n (%)	HHL n (%)	χ^2 statistic[a] (*p*-value)
SIP*smart*ER	n=104	n=40	n=64	
D1: Only listed SSBs	69 (66.3%)	18 (45.0%)	51 (79.7%)	13.27 (<.001)
D2: Did not forget any consumed SSB	92 (88.5%)	33 (82.5%)	59 (92.2%)	NS
D3: Correctly described how estimated portion size.	96 (92.3%)	36 (90.0%)	60 (93.8%)	NS
D4: Correctly described how to average weekly SSB intake.	86 (82.7%)	29 (72.5%)	57 (89.1%)	4.72 (.03)
B1: Recalled daily SSB recommendation.	82 (75.8%)	27 (67.5%)	55 (85.9%)	5.02 (.03)
B2: Named 3 SSBs.	102 (98.1%)	38 (95.0%)	64 (100.0%)	NS
B3: Named 3 non-SSBs.	97 (93.3%)	34 (85.0%)	63 (98.4%)	7.08 (<.01)
B4: Identified if a drink is SSB or non-SSB.	72 (69.2%)	18 (45.0%)	54 (84.4%)	17.92 (<.001)
B5: Stated 3 health risks of excessive SSB intake.	94 (90.4%)	33 (82.5%)	61 (95.3%)	4.65 (.03)
MoveMore	n=104	n=35	n=69	
D1: Only listed eligible PA.	101 (97.1%)	33 (94.3%)	68 (98.6%)	NS
D2: Did not forget to add any completed PA.	98 (94.2%)	33 (94.3%)	65 (94.2%)	NS
D3: Correctly described how estimated time spent in PA.	95 (91.3%)	29 (82.9%)	66 (95.7%)	4.81 (.03)
D4: Correctly described how to average weekly PA time.	88 (84.6%)	24 (68.6%)	64 (92.8%)	10.43 (.001)
B1: Recalled 4 traits of aerobic activity.	18 (17.3%)	6 (17.1%)	12 (17.4%)	NS
B2: Recalled recommended weekly aerobic activity minutes.	68 (65.4%)	20 (57.1%)	48 (69.6%)	NS
B3: Identified whether or not an activity is aerobic activity.	85 (81.7%)	27 (77.1%)	58 (84.1%)	NS
B4: Recalled recommended weekly days of strength training.	87 (83.7%)	26 (74.3%)	61 (88.4%)	NS
B5: Recalled recommended number of sets.	77 (74.0%)	21 (60.0%)	56 (81.2%)	5.41 (.02)
B6: Recalled recommended number of reps.	97 (93.3%)	31 (88.6%)	66 (95.7%)	NS
B7: Identified whether or not an activity is strength training.	63 (60.6%)	22 (62.9%)	41 (59.4%)	NS
B8: Named 3 health benefits of PA.	98 (94.2%)	30 (85.7%)	68 (98.6%)	7.04 (.01)

D = Diary accurate completion indicator

B = Behavioral message question

[a] Comparison for between health literacy groups using Chi-Square tests.