Assessing change in knowledge using self-report: Comparing three question types in an evaluation of parent education in the neonatal intensive care unit (NICU)

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INTRODUCTION

NICU Family Support is a nationwide program that provides information and comfort to families during the hospitalization of their newborns and during the transition home. The parent education component, consisting of five Core Curriculum classes with standardized content and guidelines, is evaluated using post-only, self-report assessments completed by attendees. Forms followed a consistent format across topics to allow aggregation, and items regarding class content mapped directly to learning objectives and key messages outlined in curriculum guidelines. Over one year of implementation, data was collected from 4,521 attendees (response rate 74.6%), across 70 hospitals. This analysis sought to understand differences in assessing change in knowledge based on three different question types.

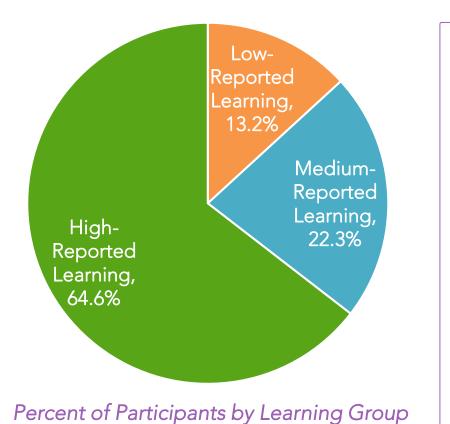| SURVEY DESIGN METHOD USED	DESCRIPTIVE RESULTS	DATA QUALITY: ITEM NON-RESPONSE	COMPARABILITY TO OTHER METHODS	EVIDENCE OF VALIDITY: KEY MESSAGES COVERED

METHOD ONE: Rating of how much participants learned on key messages for the session topic

How much did you learn about each of the following topics during this parent hour?

	Nothing	A Little Bit	A Lot	Does not apply. I already knew this
The recommended way to clean your hands...	○	○	○	○
This NICU's rules on family participation and visiting...	○	○	○	○
Ways to be involved in your baby's care in the NICU...	○	○	○	○
Where to go for support...	○	○	○	○

Method 1. Participants rated how much they learned on four key messages for each topic. In order to combine across topics, the responses are averaged to create a composite score that ranges from 1 (nothing) to 3 (a lot). A score is assigned for all participants who answered at least one item; an "N/A" response is excluded from the average. Low-reported (1-2.25), medium-reported (2.26-2.75), and high-reported (2.76-3) learning groups were created using the composite scores.
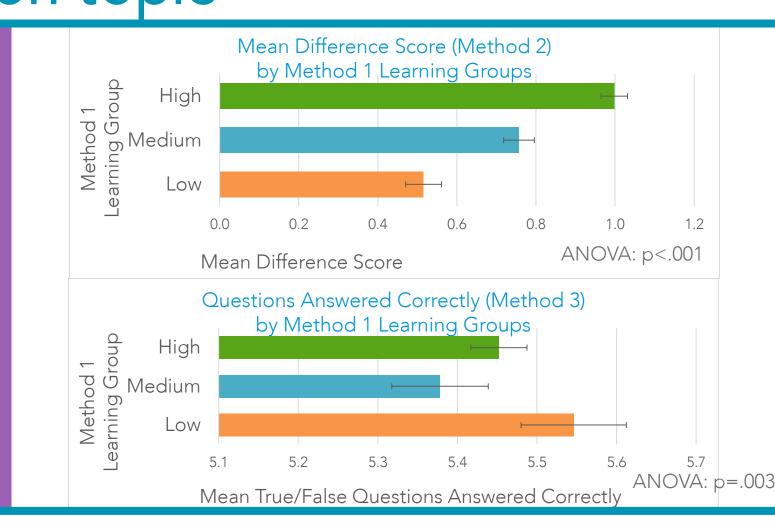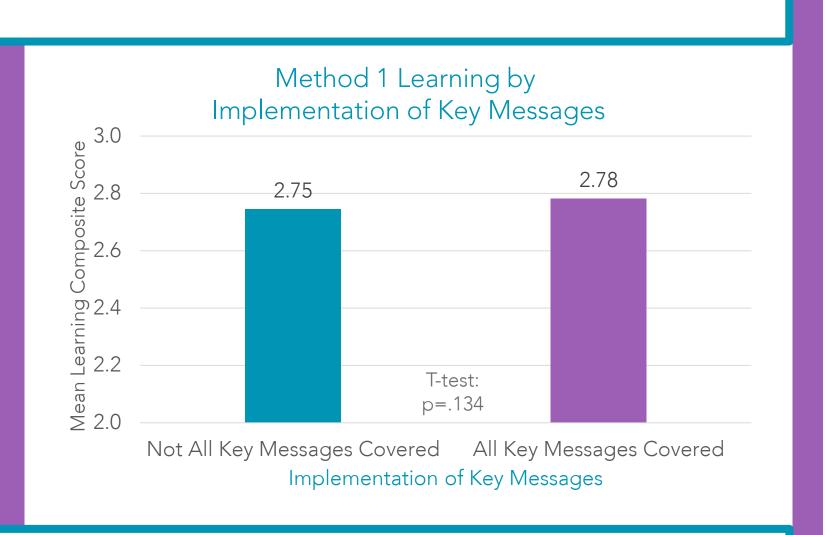

Percent of Participants by Learning Group Using Method 1

Low-Reported Learning, 13.2%
Medium-Reported Learning, 22.3%
High-Reported Learning, 64.6%

Learning Composite Score (ranges from 1 to 3)
Mean: 2.78
Standard Deviation: 0.35

Average Method 1 Item Non-Response (across all five topics)
0.9%
Range: 0.8 – 1.1%

Respondents receiving a Learning Composite Score:
n = 4,370 (96.7%)

Mean Difference Score (Method 2) by Method 1 Learning Groups
Method 1 Learning Group: High, Medium, Low — Mean Difference Score — ANOVA: p<.001

Questions Answered Correctly (Method 3) by Method 1 Learning Groups
Method 1 Learning Group: High, Medium, Low — Mean True/False Questions Answered Correctly — ANOVA: p=.003

Method 1 Learning by Implementation of Key Messages
Mean Learning Composite Score
Not All Key Messages Covered: 2.75
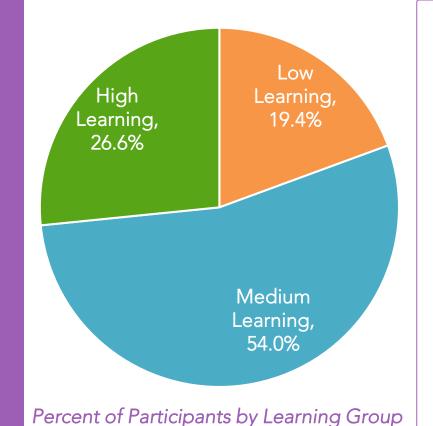All Key Messages Covered: 2.78
T-test: p=.134

METHOD TWO: Retrospective pre and post ratings of knowledge before and after the class on key messages

For each of the statements below, please select one choice for Ⓐ and one choice for Ⓑ.

Ⓐ Before the Parent Hour, I knew... Ⓑ Now, after the Parent Hour, I know...

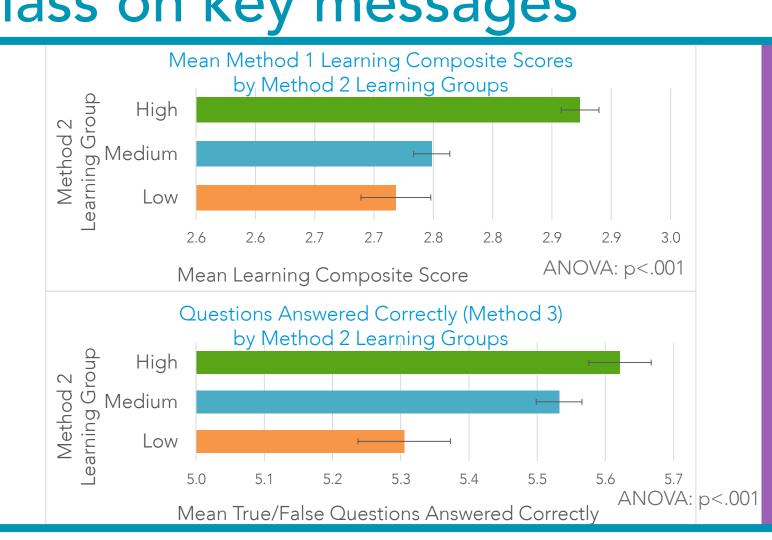|	Strongly Disagree	Disagree	Agree	Strongly Agree	Strongly Disagree	Disagree	Agree	Strongly Agree
The recommended way to clean your hands...	○	○	○	○	○	○	○	○
This NICU's rules on family participation and visiting...	○	○	○	○	○	○	○	○
Ways to be involved in your baby's care in the NICU...	○	○	○	○	○	○	○	○
Where to go for support...	○	○	○	○	○	○	○	○

Method 2. Participants responded to a set of retrospective pre/post items to rate how much they knew before and how much they knew after the class on key messages. A pre-knowledge score and post-knowledge score are created by averaging the four statements in each section. Scores range from 1 to 4, and are only assigned if at least three statements have been filled out. Difference scores (ranging from -3 to +3) are assigned by subtracting the two for those participants with both a before and after score. Low (<=0), medium (0-1), and high (>1) learning groups were created using the difference score.
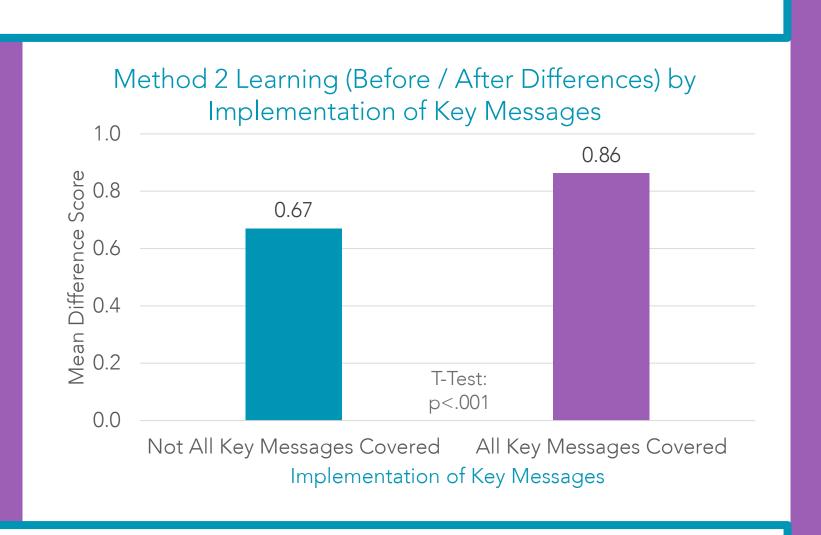

Percent of Participants by Learning Group Using Method 2 Difference Score

High Learning, 26.6%
Low Learning, 19.4%
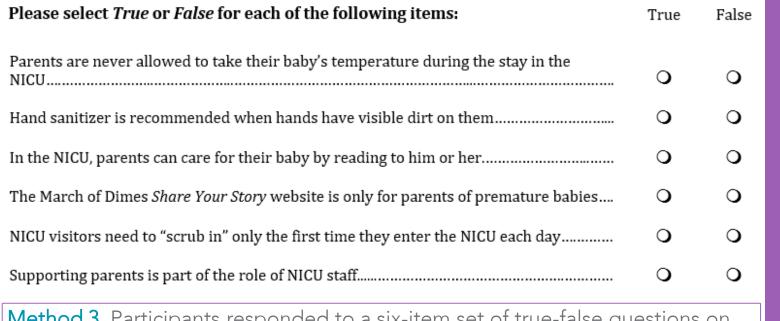Medium Learning, 54.0%

Pre & Post-Knowledge Scores (range from 1 to 4)
Mean, Pre: 2.96
Standard Deviation: 0.73
Mean, Post: 3.79
Standard Deviation: 0.38

Difference Score (ranges from -3 to +3)
Mean: 0.86
Standard Deviation: 0.79

Average Method 2 Item Non-Response (across all five topics)

Before: 4.2%
Range: 3.6 – 4.9%

After: 6.0%
Range: 5.8 – 6.3%

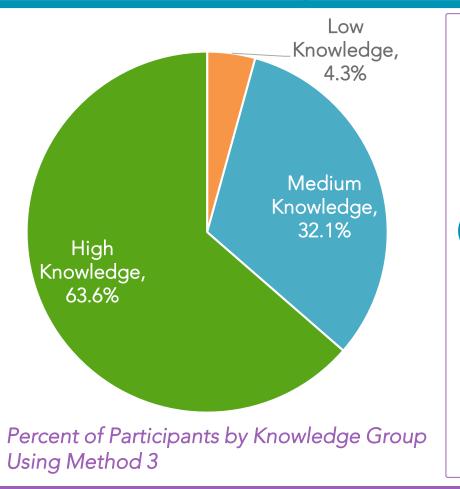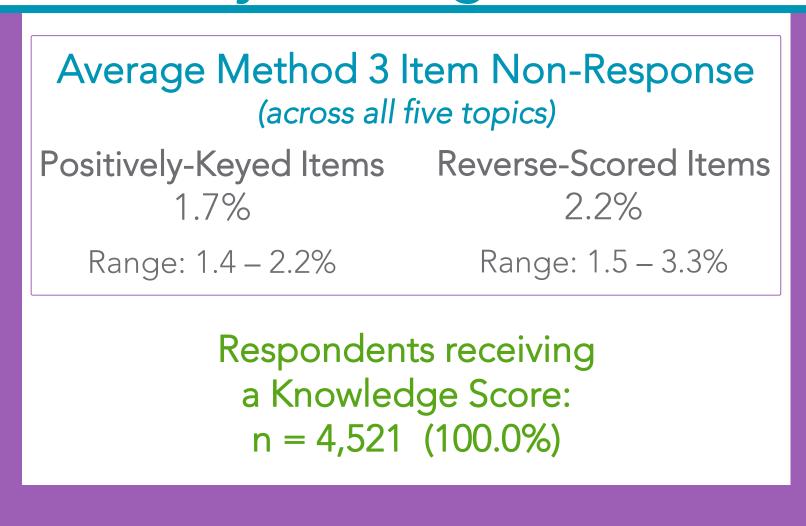Respondents receiving a Difference Score:
n = 4,131 (91.4%)

Mean Method 1 Learning Composite Scores by Method 2 Learning Groups
Method 2 Learning Group: High, Medium, Low — Mean Learning Composite Score — ANOVA: p<.001

Questions Answered Correctly (Method 3) by Method 2 Learning Groups
Method 2 Learning Group: High, Medium, Low — Mean True/False Questions Answered Correctly — ANOVA: p<.001

Method 2 Learning (Before / After Differences) by Implementation of Key Messages
Mean Difference Score
Not All Key Messages Covered: 0.67
All Key Messages Covered: 0.86
T-Test: p<.001

METHOD THREE: True-False quiz on important facts related to key messages

Please select True or False for each of the following items:

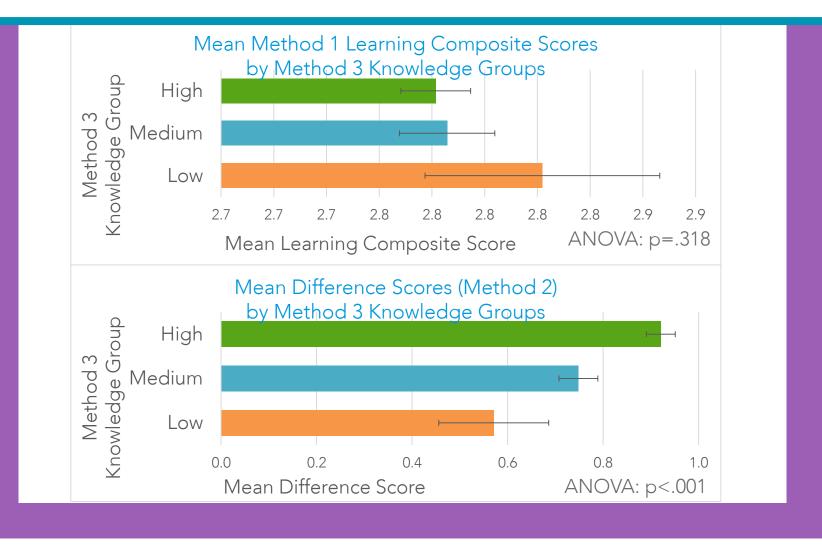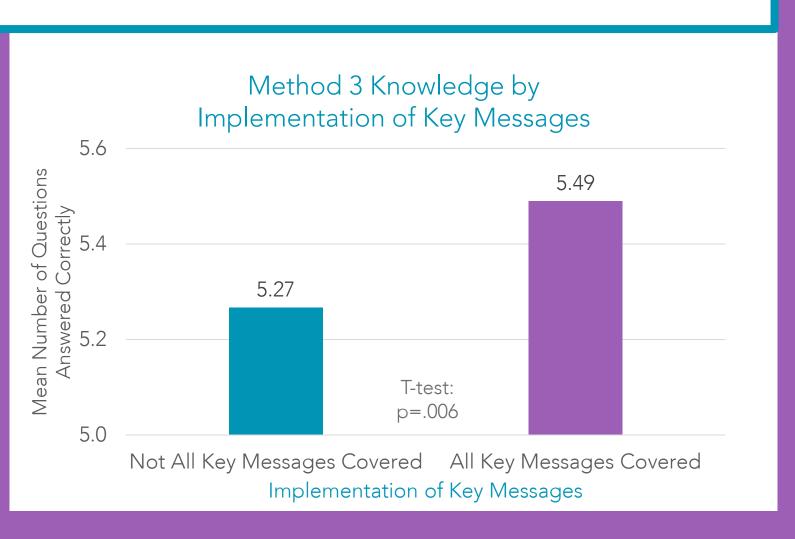|	True	False
Parents are never allowed to take their baby's temperature during the stay in the NICU...	○	○
Hand sanitizer is recommended when hands have visible dirt on them...	○	○
In the NICU, parents can care for their baby by reading to him or her...	○	○
The March of Dimes Share Your Story website is only for parents of premature babies...	○	○
NICU visitors need to "scrub in" only the first time they enter the NICU each day...	○	○
Supporting parents is part of the role of NICU staff...	○	○

Method 3. Participants responded to a six-item set of true-false questions on important facts related to the key messages for each of the five topics. All topics included two or three reverse-scored items. Non-responses were scored as incorrect. Participants were assigned to low (0-3), medium (4-5), and high (6) knowledge groups based on the number of true-false items answered correctly, from 0 to 6.

Percent of Participants by Knowledge Group Using Method 3

Low Knowledge, 4.3%
Medium Knowledge, 32.1%
High Knowledge, 63.6%

True-False Questions Answered Correctly (ranges from 0 to 6)
Mean: 5.44
Standard Deviation: 0.97

Average Method 3 Item Non-Response (across all five topics)

Positively-Keyed Items: 1.7%
Range: 1.4 – 2.2%

Reverse-Scored Items: 2.2%
Range: 1.5 – 3.3%

Respondents receiving a Knowledge Score:
n = 4,521 (100.0%)

Mean Method 1 Learning Composite Scores by Method 3 Knowledge Groups
Method 3 Knowledge Group: High, Medium, Low — Mean Learning Composite Score — ANOVA: p=.318

Mean Difference Scores (Method 2) by Method 3 Knowledge Groups
Method 3 Knowledge Group: High, Medium, Low — Mean Difference Score — ANOVA: p<.001

Method 3 Knowledge by Implementation of Key Messages
Mean Number of Questions Answered Correctly
Not All Key Messages Covered: 5.27
All Key Messages Covered: 5.49
T-test: p=.006

DISCUSSION

Data were examined to determine the utility and reliability of three methods, based on item completion and alignment of responses across methods. Significant differences in learning and knowledge scores using Method 2 groups show comparability, however association between Method 1 and Method 3 is unclear. Method 2 leads to the highest level of missing data compared to the other methods. Methods 2 and 3 show higher learning and knowledge for those attending a class where all key messages were covered, providing evidence of validity.

CONCLUSIONS

Question type can influence self-report responses, leading to consistency or variation of results and their interpretation. When assessing change in knowledge, it is important to recognize the implications of the methodology chosen to collect information in order to draw meaningful conclusions.

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