# Efficacy in Occupational Health and Safety Training of Dairy Workers:

## Predictors of Test Performance on a Dairy Safety Knowledge Test From a Demographic Cohort

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## BACKGROUND

Efficacy-driven assessments of culturally and linguistically appropriate occupational health and safety training for workers who speak English as a second language are uncommon.

To meet this challenge, the Idaho Dairymen's Association (IDA) created a dairy safety training course in multiple languages to promote worker safety and used pre-and-post tests to verify changes in safety knowledge (SK). Using additional demographic data collected from dairy safety course participants, this study aimed to 1) verify if participants improved between pre-and-post test scores 2) identify demographic variables which contributed the most to baseline and change in test scores and 3) determine if reading ease scores in English and Spanish could predict test performance by dairy safety question, and in concordance with a panel of native Spanish speakers.

## METHODS

> A Wilcoxon rank sum test was used to assess if post-test scores were significantly different than pre-test (baseline) scores for Spanish and English speakers.
> Preliminary analyses of demographic variables were used to build baseline and change in test score models.
> Multivariate iterative linear models were used to identify primary predictors of baseline and change in test scores.
> Simple linear regression models investigated predictive value of reading ease scores on test performance.

### Figure 1: Boxplots of baseline test scores and change in test scores by education level
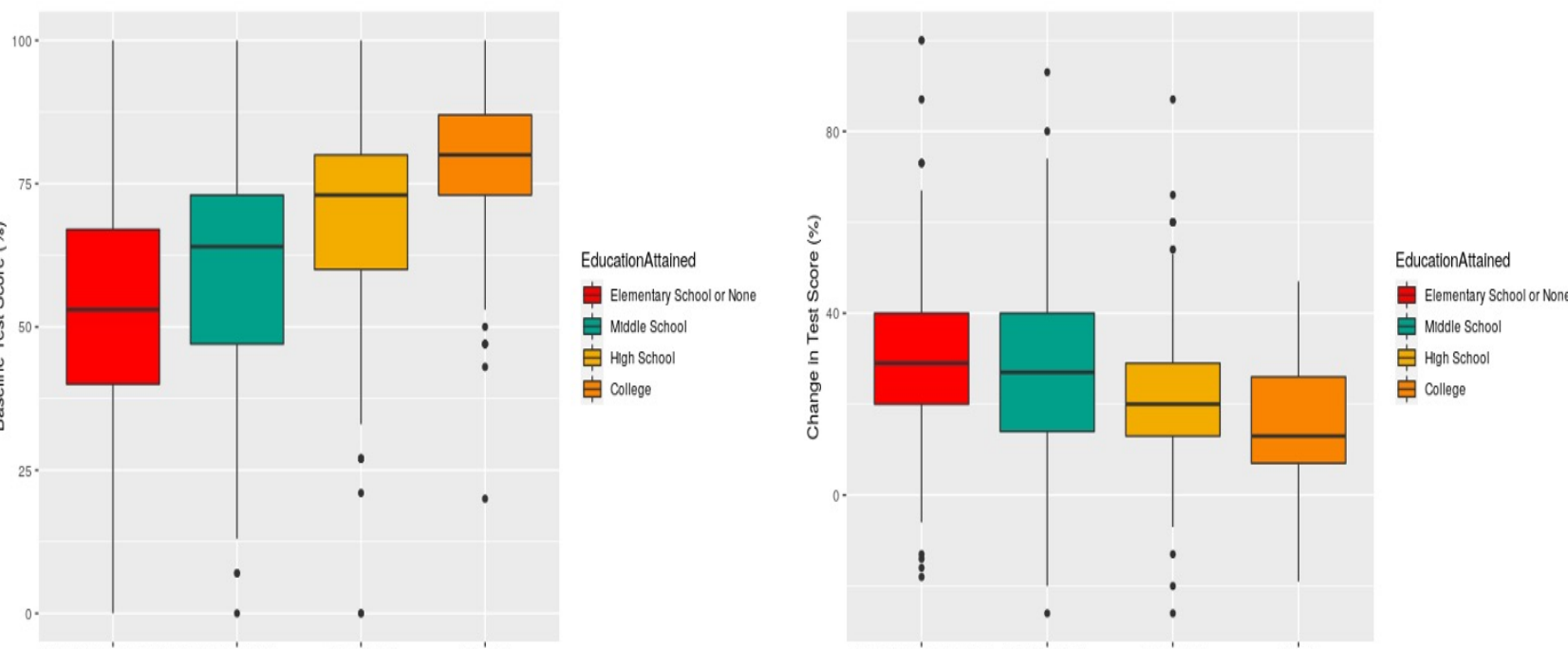


## RESULTS

> English and Spanish speakers significantly and statistically improved between baseline and post-test scores.
> Education level, native language, occupation and years in dairy work were included in the baseline score prediction model.
> Higher baseline test scores were primarily driven by education level; native language was a secondary driver and was closely correlated with occupation.
> Baseline test scores were the main predictor of change in test scores.

### Figure 2: Boxplots of baseline test scores and change in test scores, displayed by language group
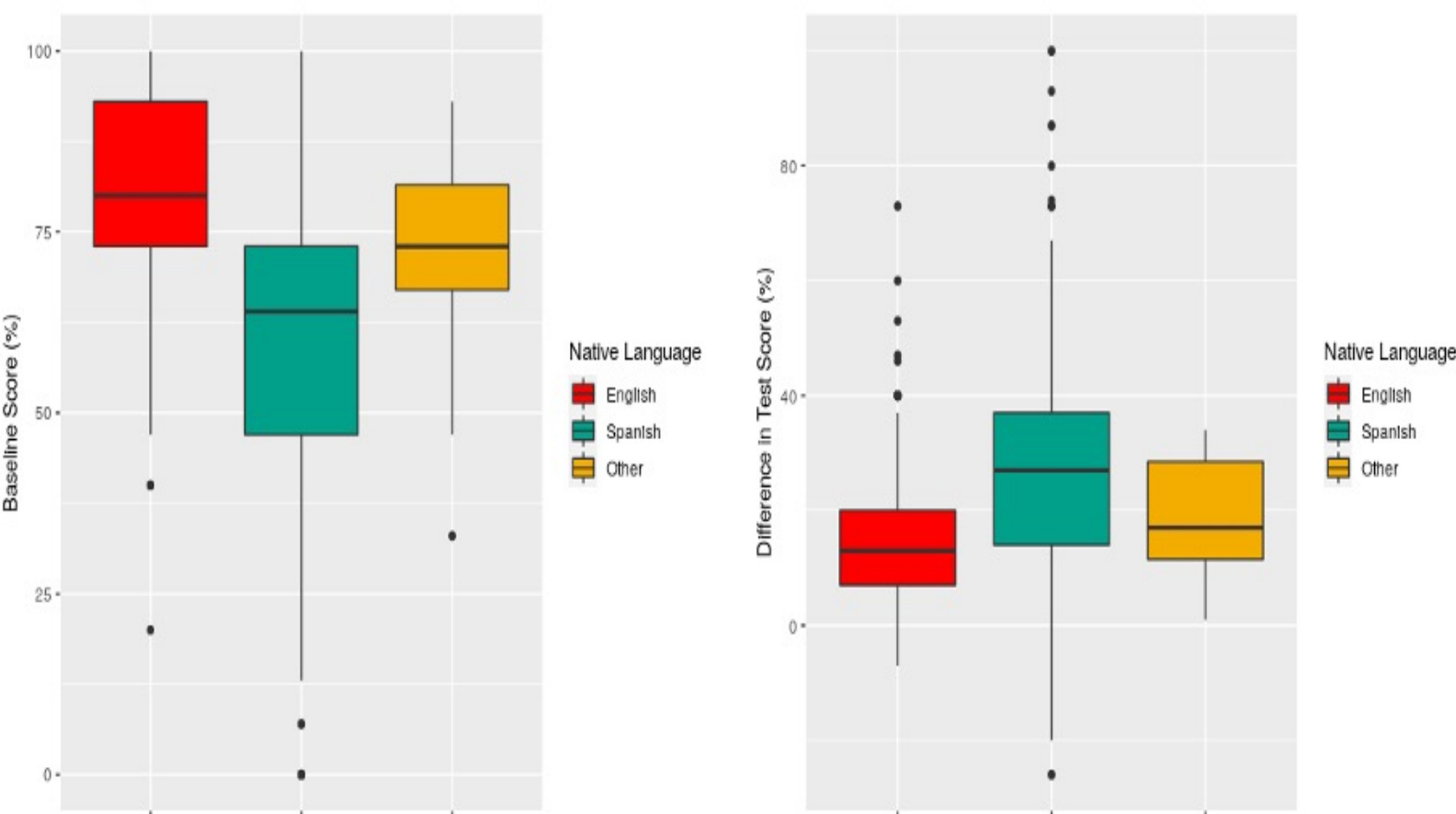


## RESULTS

> Reading ease score could not predict performance by dairy safety test question: adjusting for pre or post test question status resulted in better model fit and was more predictive in Spanish speaking populations.
> Reading ease score did not correlate to perceived reading ease scores of dairy safety questions by a native Spanish speaker panel.

### Figure 3: Reading ease score by performance on dairy safety test by question
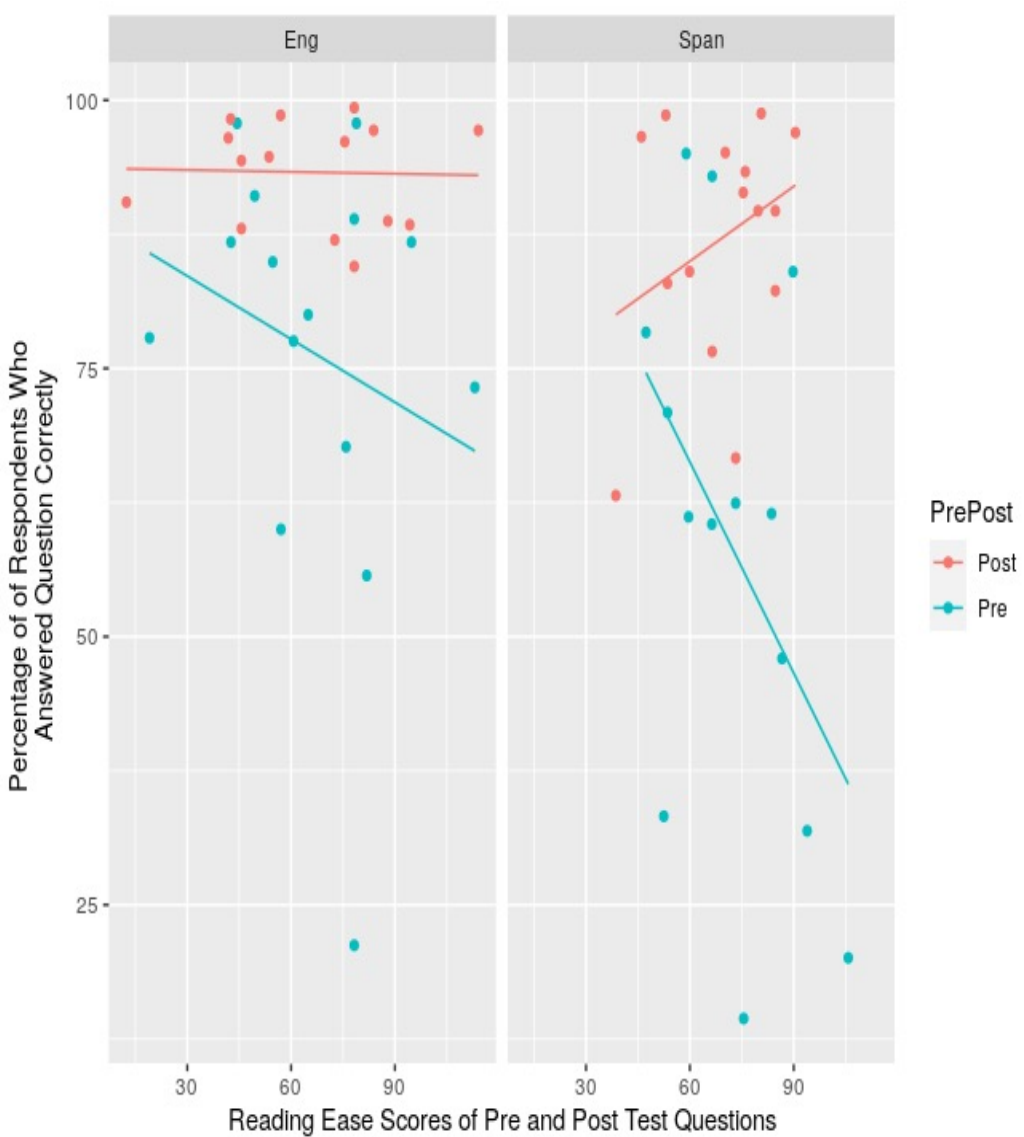


## DISCUSSION

While English and Spanish speakers improved between baseline and post-test scores, recommendations were made to better serve the primarily Spanish speaking population (particularly participants with fewer years of formal education or low rates of literacy):

> Utilize appropriate training strategies within the dairy safety course, such as working in teams, playing games to review course content, providing questions with images, and incorporating hands-on demonstrations.

> Eliminate written pre-and-post assessments in favor of oral presentation of questions or group discussions.

### Table 1: Pre-score, post-score, and difference in test scores by language

|  | English (N=157) | Spanish (N=1165) | Other (N=16) | Overall (N=1338) |
|---|---|---|---|---|
| **Pre-percent** |  |  |  |  |
| Mean (SD) | 79.9 (13.9) | 61.3 (18.5) | 71.6 (15.9) | 63.6 (18.9) |
| Median [Min, Max] | 80.0 [20.0, 100] | 64.0 [0, 100] | 73.0 [33.0, 93.0] | 67.0 [0, 100] |
| **Post-percent** |  |  |  |  |
| Mean (SD) | 96.1 (6.43) | 88.0 (11.6) | 90.4 (9.93) | 89.0 (11.4) |
| Median [Min, Max] | 100 [60.0, 100] | 93.0 [13.0, 100] | 93.0 [67.0, 100] | 93.0 [13.0, 100] |
| **Difference in Score** |  |  |  |  |
| Mean (SD) | 16.2 (13.0) | 26.7 (17.1) | 18.9 (11.1) | 25.4 (16.9) |
| Median [Min, Max] | 13.0 [-7.00, 73.0] | 27.0 [-26.0, 100] | 17.0 [1.00, 34.0] | 26.0 [-26.0, 100] |

## PARTICIPANT DEMOGRAPHICS

> Data was collected from **1,338** participants

> English speakers (**n=157**) had the highest baseline test scores (**80%**); Spanish speakers (**n=1,165**) improved the most between pre and post-test scores (an increase of **26.7 points**)

> **74%** of participants originated from Mexico

> **70%** of Spanish speakers had a middle school education or less; **89%** of English speakers had a high school education or greater

> **41%** of participants worked as milkers, and of these, **95%** of milkers identified as Spanish speaking; all dairy owners (**n=22**) were English speaking

> Only **16%** of course participants were women

> The average worker in the study was **36 years old** and had spent approximately **9 years** working in the dairy industry

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