Adaptation of a Failure Mind-Set Measure for use with a Younger Population

Fabianne M. T. Gondim, Donna Chen, Lorey A. Wheeler[1], Cindy F. Miller[2] & Martin Reisslein[2]

BACKGROUND

- Research shows having a growth mind-set of intelligence, that is, the belief that intelligence can be developed through hard work, instruction, and use of effective strategies, is extremely important for children's learning trajectories and school achievement rates (Mangels, Butterfield, Lamb, Good & Dweck, 2006; Blackwell, Trzesniewski & Dweck, 2007; Haimovitz, Wormington, & Corpus, 2011). Children with a growth mind-set are more likely to increase efforts and be able to learn when work is difficult, whereas children who have a fixed mind-set (i.e., belief that intelligence is innate and cannot be changed) may stop trying and achieve less (Haimovitz & Dweck, 2016).
- Failure mind-sets are beliefs about whether failure enhances or debilitates learning and growth. Haimovitz and Dweck (2016) showed there is a significant relationship between parental failure mind-sets and children's intelligence mind-sets. Children whose parents had a more failure-is-debilitating mind-set were significantly more likely to believe their level of intelligence is fixed. This was true even after their parents' beliefs about their competence was controlled. Little is known about the relationship between children's own failure and intelligence mind-sets.
- To date, there is no failure mind-set measure specifically for young children. Thus, there is a need to adapt the adult measure for the use with children.
- Children's survey responses are affected by their developing cognitive, language, literacy and social-moral development (Arthur, Howell Smith, White, Hawley & Koziol, 2017; Borgers, de Leeuw & Hox, 2000; de Leeuw, 2011). Their developmental stage will affect performance in each of the four stages of the Survey Response Model (Tourangeau, Rips & Rasinski, 2000; secondary source: Arthur et al., 2017), so researchers need to take developmental differences into account when adapting measures. Table 1 presents this model.

Table 1 *Developmental Characteristics Influencing Survey Response Stages*

Stages	Respondents' actions	Measurement Errors occur when	Developmental characteristics influencing the stage
1. Comprehension	Perceiving the question and trying to understand what it means.	Respondents do not completely understand the question before responding	Language/literacy levels; social skills; information processing.
2. Retrieval	Trying to recall the information needed to answer the question.	Respondents are unable to recall the information or retrieve incorrect information.	Working memory capacity; information processing speed.
3. Judgement	Analyzing the adequacy and accuracy of the information retrieved and integrating the answer to the survey's answer format.	Respondents compensate for incomplete of incorrect retrieval by guessing, estimating or basing the answer on schemes or stereotypes.	Social skills; moral reasoning; working memory capacity.
4. Reporting	Deciding how to best report the answer.	The answer is edited to be more socially accepted or the acceptable answer is not available.	Language/literacy levels; information processing speed; working memory capacity; social skills.

Adapted from Arthur, Howell Smith, White, Hawley & Koziol (2017) and de Leeuw (2011).

RESEARCH GOALS

- To adapt Haimovitz and Dweck's (2016) Failure of Mindset measure for the use with children in Kindergarten through 5th grade.

METHOD

Participants

- Data came from two samples (Pilot 1, *N* = 403; Pilot 2, *N* = 545) of the ongoing Equity in Engineering Study (Miller, Wheeler & Reisslein), which is recruiting an ethnically diverse sample of children from Kindergarten through 5th grade from Arizona public schools.
- The combined sample was comprised of 52% female students, and 34% K-1st graders, 30% 2-3rd graders, and 36% 4-5th graders. The ethnic composition was 44% Caucasian, 26% Hispanic/Latino, 10% African-American, 5% Asian, 2% Native American, and 10% other.

Procedures

- We adapted the original measure's items to simplify the language, avoid ambiguity, make sentences shorter, and provide concrete examples from children's daily lives (e.g., making mistakes). This avoids problems in information processing, language/reading comprehension, and information retrieval. Response options were also reduced, to avoid problems with category differentiation (Table 2).
- We piloted the adapted measure twice.
- We used psychometric statistical analyses to confirm if the adapted items were working.

Measures

- Children reported on their failure mind-set on a 4-point Likert scale asking how much they agreed with the items ("Rate how much you agree with the following statements"). Possible answers were 0 = Not at all, 1 = *A little*, 2 = *Sort of*, 3 = *A lot*. (Haimovitz & Dweck, 2016, adapted).

Analytic Plan

- To test if the items were eliciting valid responses, we used Cronbach's alpha to evaluate reliability (internal validity; agreement) among children's responses. Pilot 1 and Pilot 2 samples were analyzed separately and combined. Alpha levels ≥ 0.70 were considered satisfactory.
- To confirm the factor structure of the new items, we conducted a Confirmatory Factor Analysis (CFA; cutoff criteria: RMSA ≤ .08 and CFI ≥ .95 indicating good fit of the model; Hu & Bentler, 1999) with a combined sample from Pilots 1 and 2.

Table 2. *Failure Mind-set Items*

Original	Adapted
Response scale: 6-point rating scale from 1 (strongly disagree) to 6 (strongly agree).	*Response scale: 4-point scale from 0 (Not at all) to 3 (a lot).*
The effects of failure are positive and should be utilized.	I think it is ok to make mistakes.
Experiencing failure facilitates learning and growth.	Making mistakes gives me the chance to learn new things.
Experiencing failure enhances my performance and productivity.	I should work harder and try new strategies when I make mistakes at something.
Experiencing failure inhibits my learning and growth.	If I make mistakes at something, it means I am likely not good at it.
Experiencing failure debilitates my performance and productivity.	I should give up when I make mistakes at something.
The effects of failure are negative and should be avoided.	I should try not to make mistakes.

RESULTS

Adaptation Success

Reliability

- In Pilot 1, alpha levels for all three scales were below acceptable values, indicating the items were not eliciting valid answers from students (Table 3).
- In Pilot 2, alpha levels indicated the students still did not properly understand/report *Debilitating* items but provided valid answers for *Enhancing* items.
- The analyses using the combined sample yielded similar results to those from Pilot 2.

Confirmatory Factor Analysis (CFA)

- Evidence suggested the items from the adapted Failure Mind-Set scale loaded on two underlying factors: Failure Enhancing (ENH) and Failure Debilitating (DEB). However, item 6 ("*I should try not to make mistakes*") was not loading well in the debilitating subscale. It had the lowest loading: 0.212 (Figure 1).

Table 3. *K-5 Failure Mindset Reliability*

	Pilot 1		Pilot 2		Pilots 1 & 2	
Scales	Cronbach's Alpha	N	Cronbach's Alpha	N	Cronbach's Alpha	N
Total	0.585	399	0.519	421	0.560	820
Debilitating	0.508	400	0.431	542	0.545	942
Enhancing	0.511	402	**0.832**	539	**0.785**	941

Note: Items in bold indicate acceptable alpha levels.

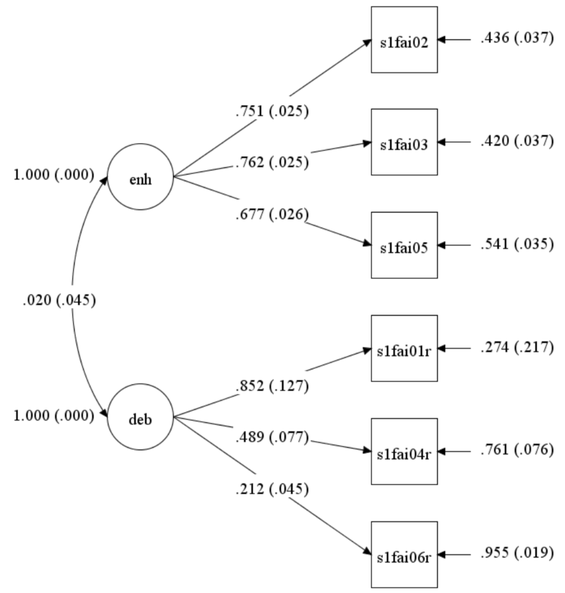

Figure 1. ***Failure Mind-set CFA - Two Factor Model: Enhancing (ENH) and Failure Debilitating (DEB) factors***
Note: $\chi 2$ (8)=19.034, p < .05, RMSEA = .040, 90% RMSEA CI [0.017, 0.064], CFI = 0.987, SRMR = .019.

DISCUSSION

- This study extends the literature by discussing the adaption of a Failure Mind-set measure used originally with adults specifically for young children (K-5th graders).
- The importance of developmental stages to measurement adaptations for children were also described.
- Reliability results indicated our adapted items worked for the Enhancing subscale but not for the Debilitating one, which also made our total scale not work.
- Based on a CFA, the most appropriate path now is to reword item 6 ("*I should try not to make mistakes*"), to check if our scale works when this item loads on its intended Debilitating factor.
- Our study provides evidence that researchers need to be cautious and methodologically rigorously when adapting measures for children.

Acknowledgements

Funding provided by the National Science Foundation, 1561424, Equity in Engineering: Understanding and Promoting All Elementary School Children's Knowledge of and Motivation to Engage in Engineering, C. Miller (P.I.), L. Wheeler (Co-P.I.), M. Reisslein (Co-P.I.). Affiliations: 1.Nebraska Center for Research on Children, Youth, Families, and Schools, University of Nebraska-Lincoln. 2.Arizona State University.

Arizona State University

University of Nebraska Lincoln