



Determining Psychological Predictors for Attrition in a Longitudinal Study of STEM Persistence

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INTRODUCTION

(CPI) is a web-based app that guides and motivates students as they select activities which engage them in the possibility of pursuing a STEM+C career. The app is specifically designed to set women and underrepresented minorities on a path towards STEM careers.¹

A series of surveys (one baseline, four follow-up) are among the methods used to assess the longitudinal effectiveness of CPI.

However, with attrition of over 50% from the baseline to the follow surveys, it must be ensured that the sample is not becoming self selective over time especially with regards to student's psychological attitudes towards STEM that CPI hopes improve.

RESEARCH QUESTION: How do initial psychological attitudes towards STEM as indicated in the baseline survey predict attrition in the subsequent follow ups?

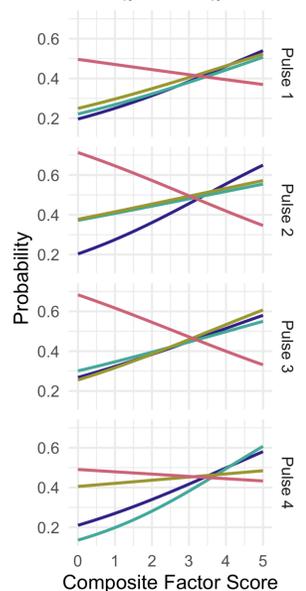
RESULTS

Logistic Regression Predicting Student Survey Taking

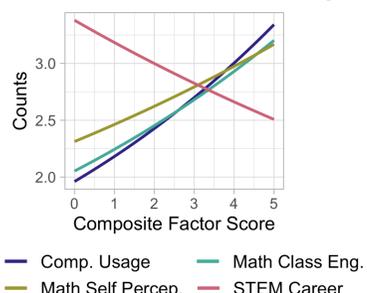
Predictor	B	SE B	p	df	e ^B
Pulse 1, Dec. 2018					
(Intercept)	-3.083	0.606	0.000	466	0.046
Comp. Usage	0.330	0.145	0.023*	466	1.391
Math Class Eng.	0.458	0.149	0.002**	466	1.580
Math Self Percep.	0.064	0.154	0.678	466	1.066
STEM Career	-0.047	0.150	0.757	466	0.955
Pulse 2, Feb. 2019					
(Intercept)	-2.844	0.602	0.000	466	0.058
Comp. Usage	0.314	0.145	0.031*	466	1.369
Math Class Eng.	0.257	0.147	0.080	466	1.293
Math Self Percep.	0.239	0.155	0.123	466	1.269
STEM Career	-0.104	0.150	0.490	466	0.902
Pulse 3, Apr. 2019					
(Intercept)	-1.544	0.571	0.007	466	0.214
Comp. Usage	0.397	0.143	0.006**	466	1.487
Math Class Eng.	0.148	0.143	0.300	466	1.160
Math Self Percep.	0.158	0.151	0.294	466	1.172
STEM Career	-0.309	0.150	0.039*	466	0.734
Pulse 4, Jun. 2019					
(Intercept)	-1.922	0.578	0.001	466	0.146
Comp. Usage	0.266	0.143	0.063	466	1.304
Math Class Eng.	0.209	0.144	0.146	466	1.232
Math Self Percep.	0.301	0.153	0.049*	466	1.352
STEM Career	-0.294	0.150	0.050	466	0.745
Ordinal Logistic Regression Predicting Total Surveys Taken					
(Intercept)	0.310	0.168	0.065	466	1.364
Comp. Usage	0.107	0.041	0.009**	466	1.113
Math Class Eng.	0.089	0.042	0.034*	466	1.093
Math Self Percep.	0.063	0.044	0.154	466	1.065
STEM Career	-0.060	0.041	0.150	466	0.942

*p < .05; **p < .01

Predicted Probabilities for Logistic Reg. *



Predicted Counts for Ordinal Reg. *



* Probability of survey behavior calculated for each predictor with all other predictors set at their respective mean.

METHODS

Participants: Middle schoolers interacting with CPI, n = 467 (241 Male), Mean Age = 12.43

Survey Timeline:

Baseline, Sept. 2018
4 Follow-ups ("Pulse") in Dec. 2018, Feb. 2019, Apr. 2019, Jun. 2019

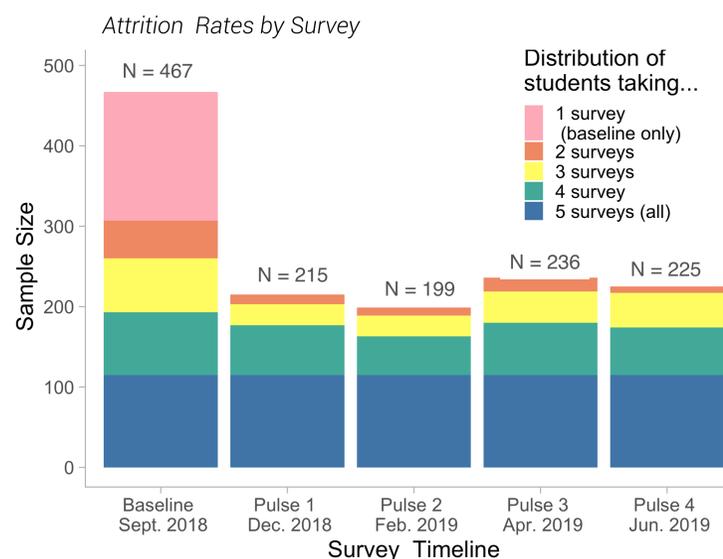


Table 1: Psychological Attitudes Towards STEM

Factor	Example Item (Likert Scale, 1 = Strongly Disagree... 5 = Strongly Agree)	α
COMPUTER USAGE (6 items)	I am good at working with computers.	0.77
MATH CLASS ENGAGEMENT (6 items)	My math class is interesting.	0.85
MATH SELF PERCEPTIONS (9 items)	I see myself as a math person.	0.88
STEM CAREER VALUES (13 items)	I can imagine myself having a career in computer programming.	0.88

DETERMINING PSYCHOLOGICAL ATTITUDES
Exploratory and confirmatory factor analyses of scale items in the baseline survey to determine factor structure. (Final CFA, df= 521, CFI = 0.947, TLI = 0.943, RMSEA = 0.61).

Four underlying psychological attitudes extracted using factor analysis that will be used to predict survey attrition (Table 1).

Composite score calculated for each student by taking the mean of all items composing a psychological attitude

PREDICTING SURVEY BEHAVIOR
Logistic regression predicting whether a survey was taken or not (1,0) based upon the the composite score for each psychological attitude.

Ordinal logistic regression predicting how many surveys a student took in total (1-5) based upon the the composite score for each psychological attitude.

DISCUSSION

Follow up survey taking behavior is self-selective with attitudes about computer usage being the most consistently predictive of attrition across surveys and for predicting the total number of surveys taken.

Given this, longitudinal analysis must be done with great caution.

Survey attrition may be related to overall engagement with the app, suggesting further research regarding the effect of initial psychological STEM attitudes on app engagement.

Inconsistencies between surveys suggest potentially diverging administration protocol, highlighting the need for standardized administration to both mitigate variation in self-selection and attrition.

REFERENCES

1. <https://ywca-sv.org/curated-pathways-to-innovation/>

ACKNOWLEDGEMENTS

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