

## **Response to Stress Questionnaire (RSQ) – Academic Problems: Psychometric Evidence on a Measure of School-Related Stress and Stress Reactivity among Syrian Children in Lebanese Public Schools**

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### **Abstract**

This study aims to provide evidence on the psychometric properties of the Response to Stress Questionnaire (RSQ) – Academic Problems, tested with Syrian refugee children in Lebanon. We identified two subscales of the RSQ that were originally developed by Connor-Smith et al. (2000) for use with U.S. adult and child populations experiencing various stress situations and adapted these for use with Syrian refugee children in Lebanon. Data were collected from a large sample of 2,271 Syrian refugee children ages 5-15 enrolled in Lebanese public schools in two governorates in Lebanon. Psychometric analyses indicated that the measure captures two unique dimensions of children's response to stress: school-related stress experience and stress reactivity. We provide evidence that the version of the RSQ–Academic Problems tested in this study measures these dimensions with good reliability. We also provide evidence that the measure functions and is understood in the same way by children: with access and without access to social and emotional learning (SEL) programming; at the beginning, middle, and the end of the school year; across gender; and across ages. In addition, the two dimensions captured in this questionnaire were correlated in the expected directions within each timepoint, providing additional evidence of validity. However, while scores on each dimension were positively correlated across the three time points within a school year, the magnitude of the correlations was low – suggesting that children's school-related stress experience and stress reactivity might vary across the school year.

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## Overview of RSQ – Academic Problems: Measurement Library Criteria



RSQ – Academic Problems should have moderate to high evidence of validity/reliability for use as a program evaluation measure. Much of the evidence is positive, and we are confident in the quality of the evidence. We recommend that future studies additionally provide evidence of: convergent validity, or the extent to which scores on the school-related stress and stress reactivity subscales are associated with other theoretically related constructs (e.g., physiological measures of stress), as well as predictive validity, or the extent to which scores predict future long-term outcomes (e.g., mental health, academic skills). Given the strength of the evidence, we recommend this measure for its specified purpose(s) with adaptations for context and attention to the recommendations in the report (see p. 21).

Criteria	Indicators	Notes
Purpose	Program Evaluation	Requires high internal consistency and ideally interrater reliability; strong evidence of validity; sensitivity to change; ideally measurement invariance
Empirical evidence overall	# of types of evidence available	7
	% of evidence meets empirical criteria	100%
	Evidence fit for purpose	Yes for internal structural validity, reliability, and measurement invariance. Additional studies should examine convergent and predictive validity.
Confidence in evidence	Sampling method	Stratified by region and randomized into one of the three treatment arms
	Sample size	Large (~ 2,271)
	Missing data	Missing data addressed using rigorous methods
	Rigor of method	High
Revisions	Clear guidance on what to adjust/refine	Yes

Constructs/sub-constructs assessed	Internal structural validity	Correlational validity	Internal consistency	Measurement invariance			
				Gender	Treatment	Age	Time
School-related stress experiences	✓	✓	✓	✓	✓	✓	✓
Stress reactivity (involuntary engagement)	✓	✓	✓	✓	✓	✓	✓

### Key

✓	Good/excellent evidence against empirical criteria	○	Fair/inconclusive evidence against empirical criteria	✗	Little to no evidence against empirical criteria	NA	Not applicable
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For additional information on the empirical criteria, please see <https://inee.org/measurement-library/measure-review-criteria>.

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## Introduction

In the context of the UN Sustainable Development Goals (SDGs), national and global stakeholders are working to ensure equitable access to high-quality education for refugee children that leads to relevant and effective learning outcomes (The World Bank, 2016; United Nations, 2016). To ensure the sustainability of such efforts, since 2012, stakeholders have sought to include refugees in national education systems in host countries (UNHCR, 2012). Evidence suggests, however, that the experience of refugee children in host-country formal schools is often fraught. In Lebanon, for example, Syrian refugee children enrolled in Lebanese public schools must navigate differences in the curriculum and language of instruction between Lebanon (French or English for core subjects starting in third grade) and Syria (Arabic), while also coping with bullying, violence, or discrimination by teachers and other students (Human Rights Watch, 2016). These academic experiences may be stressful, and they may contribute: in the short-term, to high drop-out and low attendance rates; and in the long-term, to disruptions in the development of children's adaptive stress coping skills as well as other social, emotional, and academic and physical skills (Laurent et al., 2015; Nygaard et al., 2012; Sheridan et al., 2017; Trickett et al., 2011). Therefore, it is important for the practitioners working with refugee children to be able to assess and understand children's academic stress experiences in their daily lives.

However, we are aware of few field-feasible measures of children's academic stress response that have been adapted and tested for use with refugee children in low- and middle-income host-country contexts. In this paper, we provide psychometric evidence of a measure adapted to capture refugee children's stress experiences and potentially maladaptive stress responses in reaction to common stressors they experience in schools: the Response to Stress Questionnaire (RSQ)–Academic Problems. The measure was tested with a large sample of Syrian refugee children ages 5-15 attending Lebanese public schools. Before turning to the psychometric evidence on the measure, we first review the types of stress responses and how the RSQ was originally developed to measure those responses.

### Types of Stress Responses

In the face of multiple stressors in their lives, children may exhibit various involuntary responses to stress. Involuntary responses refer to the emotional and physiological reactions towards stress that are difficult to intentionally control, even when there is conscious awareness of the reactions (Compas, 2000). For example, when facing academic setbacks in school, a child may involuntarily become frustrated and thus anxious with the problem (i.e., emotional reactions) or develop physical symptoms such as increased blood pressure (i.e., physiological reactions). In contrast, voluntary responses refer to conscious efforts to cope with stress and self-regulate accordingly (Compas, 2000). For example, when facing the same setbacks, the child can also actively seek solutions or help to cope with the stress.

Despite limited evidence on how children exactly develop ways to respond to and cope with stress, children do develop typical stress coping skills over time (Wadsworth, 2015). In their early years, children may engage in many “temperamentally based” involuntary stress reactions such as crying and involuntary self-soothing behavior (Compas et al., 2001; Connor-Smith et al., 2000) to regulate their physiology, emotion, and behavior. These reactions are automatic and arguably innate (Compas et al., 2001; Compas et al., 2004). Then, as children become more emotionally and cognitively self-aware through interactions with the people and environment in preschool and primary school, they continue to develop throughout their childhood and early adolescence various advanced cognitive strategies (such as cognitive reappraisal) and behavioral strategies (such as the intentional deployment of coping skills) (Zimmer-Gembeck & Skinner, 2011). By adolescence, children are expected to have developed a set of coping strategies that they can match onto the stressors in context (Wadsworth, 2015), even though they may still exhibit involuntary stress responses from time to time (Epstein-Ngo et al., 2013). Thus, through exposure to mild stress over time, children should be able to gradually develop more voluntary strategies to cope with stressful events, rather than simply resorting to automatic and involuntary responses.

But what could happen if this normative developmental cycle is interrupted? The traumatic and stressful events that refugee children can experience pre-, peri, and post-migration may elicit involuntary responses rather than volitional coping strategies (Zimmer-Gembeck & Skinner, 2011). In turn, children may have difficulty developing effective coping strategies given that meaningful daily interactions with mild stress may be overshadowed by traumatic experiences. As a result, they may tend to resort to more automatic responses to stress (Ullman & Peter-Hagene, 2014), such as negative emotional and physiological responses or complete avoidance and emotional numbing. At the same time, involuntary responses to stress are also associated with higher degrees of internalizing and externalizing symptoms (Wadsworth et al., 2005), which can subsequently exacerbate the perceived stress. Therefore, it is crucial for researchers to identify and measure the level of involuntary responses among refugee children to understand this important construct in their adaptation into host-country schools.

### **The Response to Stress Questionnaire**

The Response to Stress Questionnaire (RSQ: Connor-Smith et al., 2000) was developed in an attempt to capture the ways that individuals react to and cope with specific sources of stress, including parental depression, family conflict, and academic stressors. It originally consisted of two parts: (a) stress experience, or the level of stress experienced about a specific target domain (e.g., academic stressors, family depression); and (b) response to stress, or how often the respondent uses or experiences each type of stress response in reaction to the specific stress experiences reported in the first part of the measure. The response to stress section of the original measure consists of 57 items corresponding to three subscales assessing voluntary coping strategies (primary control coping, secondary control coping, and disengagement coping) and two subscales assessing involuntary responses (involuntary engagement and involuntary

disengagement). Previous studies to use RSQ reported moderate to high test-retest reliability and internal consistency of the response to stress section of the measure across multiple samples (test-retest reliability = (0.69-0.81 across subscales); Cronbach's alpha = (0.67-0.92 across subscales and different stressors; Connor-Smith et al., 2000). Evidence of internal consistency was also established on various samples of the adolescent population (e.g., Navajo adolescents, alpha > 0.79; Wadsworth et al., 2004) or on the same subscales as the original study but adapted for a different stressor (e.g., economic stress and parental conflict, alpha > 0.67; Compas et al., 2001).

In order to capture refugee children's stress experiences and stress responses in public school settings, we adapted the child self-report version of the RSQ-Academic Problems. We specifically included subscales intended to assess: (a) academic problems, which we hereafter refer to as "school-related stress experiences": 10 items asking about levels of stress experienced in school, and (b) involuntary engagement response to stress, which we hereafter refer to as "stress reactivity (involuntary engagement)": 15 items on the involuntary emotional and physiological responses to school-related stressors. This subscale was chosen because it captures a type of stress response linked to adverse outcomes and likely to be displayed by younger children and in extreme stress situations.

## Research Aims

This report presents the psychometric evidence on two subscales of the RSQ: school-related stress experiences and stress reactivity. These subscales were used to evaluate the impact of a non-formal remedial education program infused with social and emotional learning (SEL) principles. Data from measures used for program evaluation purposes must meet a high standard of validity, reliability, and measurement invariance across different groups, including treatment groups, time, gender, and age. Meeting such psychometric standards facilitates stakeholders' ability to detect and have confidence in program impacts – which is particularly critical given that such evidence is often used for accountability purposes and for program and policy decision-making that can have widespread consequences.

Through our analysis, we aim to provide:

- 1) **Structural evidence of the validity and reliability of RSQ** among Syrian refugee children, including (a) evidence of the extent to which the internal factor structure of items is consistent with the constructs that the measure was intended to assess; and (b) evidence of internal consistency.
- 2) **Correlational evidence of validity**, including (a) correlational patterns across the constructs within the RSQ; and (b) correlations across time within each construct.
- 3) **Evidence for measurement invariance**, across (a) treatment groups, (b) child gender, (c) child age groups (< 8: early childhood; 8-9: early middle childhood, 10-11: middle

childhood, >12: adolescence), and (d) time (i.e., longitudinal invariance, across fall, spring, and summer).

## Methods

### Sample

All data presented here were collected as a part of a large and multi-year set of cluster randomized controlled trials of non-formal remedial and SEL programming provided by the International Rescue Committee (IRC) to Syrian refugee children in Lebanon in school years 2016-2018. The data we draw on for this report were collected from students who participated in the evaluation study in school year 2016-2017. The 87 community-based sites recruited in the Akkar ( $N = 43$ ) and Bekaa ( $N = 44$ ) regions were stratified by region and randomized into one of the three treatment arms: 21 waitlist control sites, 33 Healing Classrooms Tutoring sites, and 33 Healing Classrooms Tutoring + skill-targeted Mindfulness activities sites (see Tubbs Dolan et al., under advanced review, for additional details on the design and results of the program evaluation). The data were collected at baseline (fall: December), midline (spring: March), and endline (summer: May).

The sample included children whose caregivers registered for the program within the first two weeks of the launch of the remedial support program in the recruited sites ( $N = 4,598$ , 49% female). The RSQ was administered to a randomly selected half of the sample to reduce the respondent burden ( $N = 2,271$ , 50% female). Due to eligibility restrictions for the remedial program service, all participating students were required to be enrolled in Lebanese public schools. The participating students' ages ranged from 5 to 15 ( $M = 8.79$ ,  $SD = 2.37$ ); their grade level ranged from 1 to 9 in Lebanese public schools ( $M = 2.69$ ,  $SD = 1.75$ ); and the vast majority of them were aged 12 or younger (92%) and attended 6<sup>th</sup> grade or lower (96%).

### Measure

The version of RSQ used in this study was constructed with two sets of self-reported items. The first set contains 10 items from the RSQ's School-Related Stress Experiences subscale (RSQS1-10), which asks students to rate on a 4-point scale how stressed they are when encountering each of 10 school-related problems (1 = Not at all; 2 = A little; 3 = Somewhat; 4 = Very). The second set uses 15 items from the RSQ's Stress Reactivity (Involuntary Engagement) subscale (RSIE1-15) on a 4-point scale, ranging from 1 = Not at all to 4 = A lot. This subscale was intended to capture five dimensions of involuntary engagement: physical arousal (items 1, 3, 6); intrusive thoughts (items 2, 4, 5); rumination (items 7, 10, 13); emotional arousal (items 9, 11, 14); and involuntary action (items 8, 12, 15).

## Analysis and Results

All descriptive, bivariate correlation and reliability analyses were conducted using Stata SE version 15.1, and all measurement modeling was conducted using Mplus 8.3 (Muthén & Muthén,

2018). In order to account for the structural characteristics of the data, two important specifications were made for all measurement models. First, given item response options in the measure, items were specified as categorical. Because modeling categorical responses as normally and continuously distributed can lead to an inflation of model fit statistics and biased estimation of factor loadings and standard errors, we used a weighted least-squares mean and variance-adjusted (WLSMV) estimator with a probit-link function (Beauducel & Herzberg, 2006; Lei, 2007). Second, we used robust standard errors to adjust for clustering because (a) students were nested within community sites; and (b) it was an effective and efficient way to model complex data when sample size at the cluster level was not small (Huang, 2016). In all models, model fits were evaluated using Hu and Bentler's (1999) criteria: RMSEA (Root Mean Square Error of Approximation) < 0.06, CFI (Comparative Fit Index) < 0.95, TLI (Tucker–Lewis Index) < 0.95, SRMR (Standardized Root Mean Squared Residual) < 0.08. Missing data were pairwise deleted (i.e., all available information was used from all cases) to preserve the full sample (Asparouhov & Muthén, 2010). As a result, we were able to include and obtain factor scores for all children who were ever assessed for any items of RSQ in the analysis regardless of missing information on specific items.

Table 1

*A full list of RSQ items included in the data collections in Lebanon: Item variable names, original subscales and descriptions*

Item	Original subscales	Item description
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#### Response to Stress Questionnaire: School-Related Stress Experiences

This is a list of things about school that children and teenagers sometimes find stressful or a problem to deal with. Please tell me how stressful the following things have been for you in the past six months.

RSQS1	School-Related Stress Experiences	Doing badly on a test or paper
RSQS2		Getting bad grades or report cards
RSQS3		Not understanding classes
RSQS4		Not understanding homework
RSQS5		Feeling pressured to do something
RSQS6		Having bad classes or teachers
RSQS7		Having trouble studying
RSQS8		Not having your homework done
RSQS9		Teachers that yell or get angry
RSQS10		Pressure from parents or teachers to perform perfectly

#### Response to Stress Questionnaire: Stress Reactivity (Involuntary Engagement) Subscale



I'm going to read to you a list of things that children and teenagers sometimes do, think, or feel when they are dealing with school problems. Everyone deals with problems in their own way – some students do a lot of the things on this list or have a bunch of feelings, other kids just do or think a few of these things.

Think of all the stressful parts of school that we just talked about. For each item I read to you, tell me shows how much you do or feel these things when you have problems with school like the ones you indicated above. Please tell me everything you do, think, and feel, even if you don't think it helps make things better.

RSIE1	Physical arousal	When dealing with school problems, I feel sick to my stomach or get headaches
RSIE2	Intrusive thoughts	I keep remembering the school problems that happened or can't stop thinking about what might happen
RSIE3	Physical arousal	I get really jumpy when I am dealing with the stress of school problems
RSIE4	Intrusive thoughts	When I am trying to sleep, I can't stop thinking about the stressful aspect of school problems that happened or I have bad dreams about them
RSIE5	Intrusive thoughts	Thoughts about school problems just pop up into my head
RSIE6	Physical arousal	When I'm dealing with school problems, I feel it in my body: <ol style="list-style-type: none"> <li>1. My heart races</li> <li>2. I feel hot or sweaty</li> <li>3. My breathing speeds up</li> <li>4. My muscles get tight</li> </ol>
RSIE7	Rumination	When something stressful happens related to school problems, I can't stop thinking about how I am feeling
RSIE8	Involuntary action	When something stressful happens related to school problems, I can't always control what I do
RSIE9	Emotional arousal	When I am faced with school problems, right away I feel really: <ol style="list-style-type: none"> <li>1. Angry</li> <li>2. Sad</li> <li>3. Worried/anxious</li> <li>4. scared</li> </ol>
RSIE10	Rumination	After something stressful happens related to school problems, I can't stop thinking about what I did or said
RSIE11	Emotional arousal	When something stressful happens related to school problems, I get upset by things that don't usually bother me
RSIE12	Involuntary action	When stressful things happen related to school problems I sometimes act without thinking

RSIE13	Rumination	When something stressful happens related to school problems, I can't stop thinking about why this is happening
RSIE14	Emotional arousal	My thoughts start racing when I am faced with school problems
RSIE15	Involuntary action	When I am dealing with the stress of school problems, sometimes I can't control what I do or say

*Note.* Survey prompts were originally constructed for a paper-and-pencil survey and have been modified for in-person verbal interviews for this study.

### **Aim 1: Structural Evidence of Validity and Reliability**

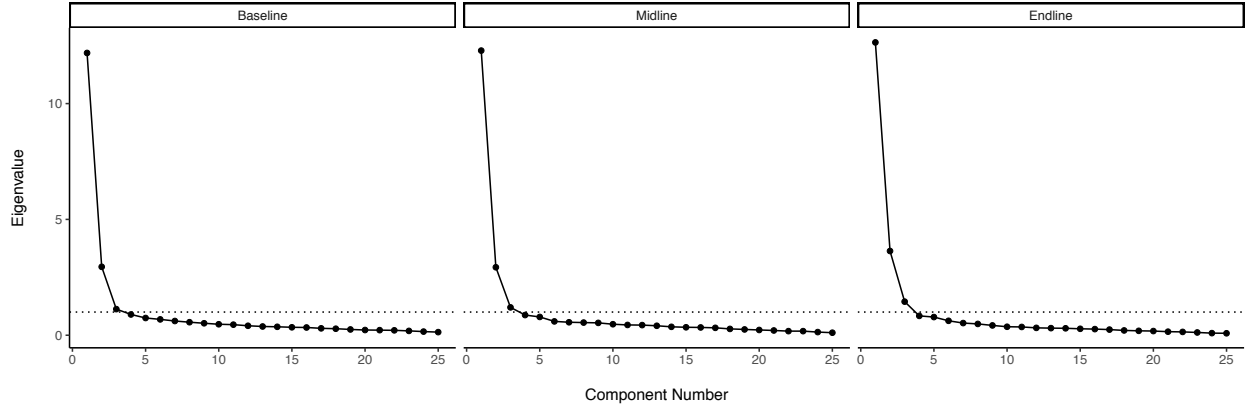
To address Aim 1, we conducted (a) exploratory and confirmatory factor analyses (EFA and CFA); and (b) estimation of internal consistency statistics (Cronbach's  $\alpha$  and McDonald's  $\omega$ ).  
Exploratory and Confirmatory Factor Analysis

Before beginning analyses, we randomly divided our sample in half in order to create exploratory and confirmatory samples at each time point. Exploratory samples were used to first examine multiple versions of data-driven models, of which a final proposed solution was selected based on conceptual and empirical considerations. Confirmatory samples were then used to test the proposed factor structure, thereby building confidence in the stability of empirically derived exploratory factor analytic estimates (Osborn & Fitzpatrick, 2012). CFA models with a good model fit and the same factor structure across baseline, midline, and endline were used as final models for subsequent analysis.

Scree plots of the eigenvalues obtained during the EFA step suggested either a 2- or 3-factor structure (see Figure 1). The originally hypothesized two-factor structure – including one factor representing students' school-related stress experiences (RSQS) and a second factor representing stress reactivity (involuntary engagement) responses to stress (RSIE) – had a good fit across all waves of the data. Given the consistency with the existing measure and good model fit across waves, this two-factor model was used for the subsequent analysis.

Figure 1

*Scree plots of eigenvalues from exploratory factor analysis at all waves*



We then ran a CFA with the two theory-based factors extracted from the EFA model at baseline (Figure 2). This same model was also tested at midline and endline, yielding a good model fit. All items loaded onto their respective factors at each time point at  $\lambda > 0.50$ ; with many items with higher factor loadings,  $\lambda > 0.70$  (see also Table 2 for descriptive statistics and Table 3 for the factor loadings of each item at all waves).

Figure 2

*Factor structure diagrams displaying model parameters at all waves*

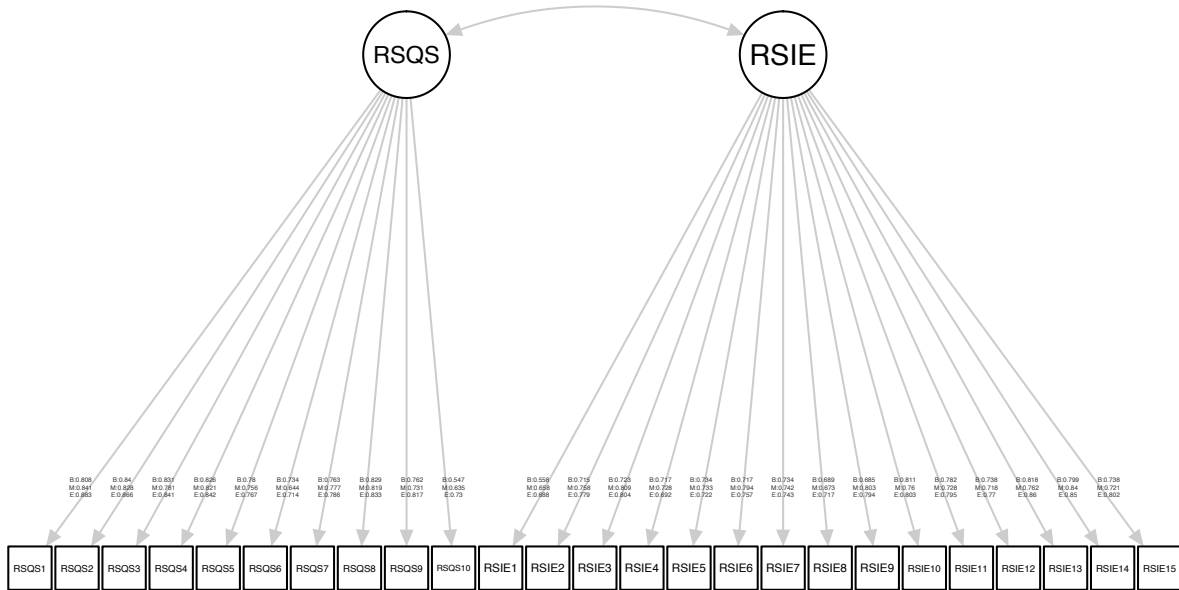


Table 2

*Descriptive statistics of indicators by proposed construct*

	Baseline			Midline			Endline		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
RSQS1	2100	2.553	1.313	1709	2.473	1.249	1799	2.521	1.271
RSQS2	2100	2.683	1.320	1705	2.609	1.289	1799	2.615	1.270
RSQS3	2098	2.382	1.281	1701	2.209	1.232	1800	2.299	1.231
RSQS4	2099	2.331	1.289	1701	2.184	1.236	1800	2.266	1.218
RSQS5	2100	2.212	1.290	1707	1.998	1.214	1800	2.107	1.228
RSQS6	2097	2.372	1.332	1710	2.161	1.274	1802	2.190	1.245
RSQS7	2097	2.284	1.278	1708	2.090	1.209	1797	2.167	1.223
RSQS8	2097	2.474	1.328	1707	2.305	1.289	1797	2.287	1.250
RSQS9	2097	2.647	1.332	1714	2.463	1.310	1798	2.348	1.289
RSQS10	2095	2.158	1.323	1704	1.949	1.211	1799	2.000	1.219
RSIE1	2103	2.173	1.243	1730	1.963	1.153	1812	1.872	1.116
RSIE2	2101	2.304	1.265	1729	1.980	1.200	1811	1.831	1.108
RSIE3	2102	2.281	1.260	1728	1.984	1.198	1811	1.848	1.109
RSIE4	2101	2.046	1.250	1728	1.845	1.157	1809	1.757	1.095
RSIE5	2102	2.011	1.190	1728	1.861	1.144	1806	1.827	1.116
RSIE6	2093	2.704	1.300	1720	2.661	1.247	1812	2.487	1.239
RSIE7	2096	1.962	1.162	1728	1.893	1.146	1810	1.721	1.050
RSIE8	2061	1.815	1.124	1728	1.736	1.095	1805	1.670	1.034
RSIE9	2075	2.697	1.285	1723	2.604	1.259	1811	2.458	1.250
RSIE10	2091	2.067	1.226	1729	1.831	1.136	1811	1.779	1.094

RSIE11	2097	1.984	1.204	1729	1.731	1.086	1808	1.705	1.063
RSIE12	2096	1.752	1.110	1729	1.581	0.993	1810	1.596	1.004
RSIE13	2096	2.033	1.230	1729	1.892	1.162	1810	1.723	1.067
RSIE14	2095	2.022	1.235	1728	1.823	1.137	1807	1.667	1.034
RSIE15	2098	1.886	1.180	1728	1.704	1.075	1809	1.657	1.041

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*Note:* All item scores range from 1-4.

Table 3

*Factor loadings of the RSQ at all waves from the CFA final model*

		Baseline			Midline			Endline		
		b	SE	p	b	SE	p	b	SE	p
Factor 1: School-related stress experiences										
(Baseline $\alpha = .891$ , $\omega = .938$ ; Midline $\alpha = .894$ , $\omega = .935$ ; Endline $\alpha = .919$ , $\omega = .954$ )										
RSQS1	Doing badly on a test or paper	0.808	0.017	<.001	0.841	0.017	<.001	0.883	0.013	<.001
RSQS2	Getting bad grades or report cards	0.84	0.015	<.001	0.828	0.019	<.001	0.866	0.014	<.001
RSQS3	Not understanding classes	0.831	0.013	<.001	0.781	0.019	<.001	0.841	0.015	<.001
RSQS4	Not understanding homework	0.826	0.016	<.001	0.821	0.016	<.001	0.842	0.015	<.001
RSQS5	Feeling pressured to do something	0.78	0.019	<.001	0.756	0.025	<.001	0.767	0.018	<.001
RSQS6	Having bad classes or teachers	0.734	0.02	<.001	0.644	0.034	<.001	0.714	0.018	<.001
RSQS7	Having trouble studying	0.763	0.018	<.001	0.777	0.019	<.001	0.786	0.024	<.001
RSQS8	Not having your homework done	0.829	0.014	<.001	0.819	0.02	<.001	0.833	0.017	<.001
RSQS9	Teachers that yell or get angry	0.762	0.022	<.001	0.731	0.026	<.001	0.817	0.022	<.001
RSQS10	Pressure from parents or teachers to perform perfectly	0.547	0.037	<.001	0.635	0.029	<.001	0.73	0.023	<.001
Factor 2: Stress reactivity (Involuntary engagement)										
(Baseline $\alpha = .913$ , $\omega = .948$ ; Midline $\alpha = .916$ , $\omega = .951$ ; Endline $\alpha = .923$ , $\omega = .957$ )										
RSIE1	When dealing with school problems, I feel sick to my stomach or get headaches	0.558	0.029	<.001	0.658	0.024	<.001	0.688	0.025	<.001
RSIE2	I keep remembering the school problems that happened or can't stop thinking about what might happen	0.715	0.022	<.001	0.758	0.02	<.001	0.779	0.022	<.001
RSIE3	I get really jumpy when I am dealing with the stress of school problems	0.723	0.02	<.001	0.809	0.018	<.001	0.804	0.019	<.001

RSIE4	When I am trying to sleep, I can't stop thinking about the stressful aspect of school problems that happened or I have bad dreams about them	0.717	0.02	<.001	0.728	0.022	<.001	0.692	0.028	<.001
RSIE5	Thoughts about school problems just pop up into my head	0.734	0.02	<.001	0.733	0.023	<.001	0.722	0.026	<.001
RSIE6	When I'm dealing with school problems, I feel it in my body: (a) My heart races (b) I feel hot or sweaty (c) My breathing speeds up (d) My muscles get tight	0.717	0.026	<.001	0.794	0.021	<.001	0.757	0.019	<.001
RSIE7	When something stressful happens related to school problems, I can't stop thinking about how I am feeling	0.734	0.022	<.001	0.742	0.019	<.001	0.743	0.022	<.001
RSIE8	When something stressful happens related to school problems, I can't always control what I do	0.689	0.024	<.001	0.673	0.036	<.001	0.717	0.023	<.001
RSIE9	When I am faced with school problems, right away I feel really: (a) Angry (b) Sad (c) Worried/anxious (d) scared	0.685	0.028	<.001	0.803	0.02	<.001	0.794	0.018	<.001
RSIE10	After something stressful happens related to school problems, I can't stop thinking about what I did or said	0.811	0.018	<.001	0.76	0.021	<.001	0.803	0.019	<.001
RSIE11	When something stressful happens related to school problems, I get upset by things that don't usually bother me	0.782	0.021	<.001	0.728	0.02	<.001	0.795	0.019	<.001

RSIE12	When stressful things happen related to school problems I sometimes act without thinking	0.738	0.023	<.001	0.718	0.025	<.001	0.77	0.023	<.001
RSIE13	When something stressful happens related to school problems, I can't stop thinking about why this is happening	0.818	0.016	<.001	0.762	0.021	<.001	0.86	0.016	<.001
RSIE14	My thoughts start racing when I am faced with school problems	0.799	0.018	<.001	0.84	0.017	<.001	0.85	0.014	<.001
RSIE15	When I am dealing with the stress of school problems, sometimes I can't control what I do or say	0.738	0.025	<.001	0.721	0.025	<.001	0.802	0.02	<.001

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**Internal consistency of subscales.** For assessing internal consistency, Cronbach’s alpha ( $\alpha$ ) of each latent factor within each data collection time point was calculated. We also assessed McDonald’s omega ( $\omega$ ; Hayes & Coutts, 2020; McDonald, 1999) of each latent factor as a more general reliability estimate that does not assume equal factor loadings (i.e., tau-equivalence). The recommendation from the contemporary literature of assessing reliability for multidimensional measures, like RSQ, is to avoid  $\alpha$  and use  $\omega$  (Revelle and Zinbarg 2009; Zinbarg et al. 2005). Therefore, we report both reliability statistics but focus on the interpretation of  $\omega$ . While there are no definitive and universal guidelines for interpreting  $\alpha$  and  $\omega$ ,  $\alpha > 0.7$  is generally accepted as acceptable/high reliability, and Nájera Catalán (2019) suggests a higher standard for  $\omega > 0.8$  as excellent evidence of internal consistency.

Table 3 presents both the unweighted (Cronbach’s  $\alpha$ ) and the weighted (McDonald’s  $\omega$ ) internal consistency estimates for evidence of reliability of each of the empirically derived RSQ subscales. We found excellent internal consistency for both subscales at all waves (School-Related Stress: Baseline  $\alpha = .891$ ,  $\omega = .938$ ; Midline  $\alpha = .894$ ,  $\omega = .935$ ; Endline  $\alpha = .919$ ,  $\omega = .954$ ; Stress Reactivity (Involuntary Engagement): Baseline  $\alpha = .913$ ,  $\omega = .948$ ; Midline  $\alpha = .916$ ,  $\omega = .951$ ; Endline  $\alpha = .923$ ,  $\omega = .957$ ).

## **Aim 2: Correlational Evidence of Validity**

To address Aim 2, we examined (a) correlations between constructs within the measure; and (b) correlations across time within each construct using factor scores of each subscale.

It is important to note that we did not have *a priori* expectations about the pattern of correlations given that this was the first time RSQ was tested with Syrian children attending public schools in Lebanon; as such, we treated this analysis as exploratory. The magnitude of these correlations should be interpreted based on theory and evidence about the expected relationship between the constructs.

**Correlation across subscales.** As seen from Table 4, correlations between the two subscales at each time point were moderate to high ( $r_s > 0.56$ ), positive, and statistically significant at all waves. This indicates that students who felt more stressed by school-related issues were also likely to have more involuntary and reactive responses.

**Correlation across time.** As seen from Table 4, the correlation across waves for each subscale was generally low to moderate ( $r_s < 0.42$ ), although all were statistically significant. This suggests that scores on each of the RSQ subscale constructs were relatively time-variant and subject to change.

Table 4

*Construct-level correlations across waves*

	1	2	3	4	5	6
1. RSQS_1	--					
2. RSIE_1	0.639***	--				
3. RSQS_2	0.281***	0.230***	--			
4. RSIE_2	0.193***	0.283***	0.658***	--		
5. RSQS_3	0.238***	0.209***	0.417***	0.301***	--	
6. RSIE_3	0.154***	0.222***	0.291***	0.395***	0.564***	--

Notes. Baseline = \_1, Midline = \_2, Endline = \_3. The orange cells indicate longitudinal stability.

RSQS. School-related stress. RSQS1-10

RSIE. Stress reactivity. RSIE1-15

### Aim 3: Evidence of Measurement Invariance

To address Aim 3, we conducted (1) measurement invariance tests across treatment, gender, and age groups in each wave; and (2) longitudinal invariance testing across baseline, midline, and endline. Measurement invariance refers to the extent to which a set of items measures an underlying construct of interest in the same way across groups or times (Reise, Widaman, & Pugh, 1993). If a measure operates or is understood differently in different groups, then one should not compare group differences on observed scores (Glanville & Wildhagen, 2007). For example, without evidence of measurement invariance, one should not compare boys' and girls' stress response, compare the responses of those with and without access to SEL interventions, or track changes in students' stress responses over time.

For each set of analyses, we tested for levels of measurement invariance by fitting a series of nested models in which we progressively constrained the model parameters to equality across groups/time points. Specifically, we fitted models within each time point and then across time points to test the equality of 1) the factor structure in treatment and control groups and time points (configural invariance); 2) the factor loadings across groups/time points (metric invariance); and 3) the item intercepts or thresholds across groups/time points (scalar invariance) (Gregorich, 2006; Millsap, 2012). We assessed the relative fit of each of these models against the configural model using criteria suggested by Chen (2007; metric invariance:  $\Delta CFI < 0.01$ ;  $\Delta RMSEA < 0.015$   $\Delta SRMR < 0.030$ ; scalar invariance:  $\Delta CFI < 0.01$ ,  $\Delta RMSEA < 0.015$ ,  $\Delta SRMR < 0.010$ ). If the imposition of equality constraints did not provide a significant decrement of model fit, we concluded that the hypothesis of invariance was supported.

**Treatment invariance.** We found evidence of scalar invariance at all waves between treatment and control groups (see Table 5 for model fits). This means that we can compare

mean differences on the school-related stress and stress reactivity subscales between treatment and control groups, without bias due to the treatment group status.

**Gender and age measurement invariance.** We found that the RSQ subscales tested here were scalar invariant at all waves across gender and age groups (see Tables 6 and 7 for model fits), suggesting that we can compare mean differences by gender and age on the RSQ subscales without bias due to child gender or age.

**Invariance across time.** As shown in Table 8, a series of longitudinal invariance models were tested to confirm that change from baseline to midline to endline in school-related stress and stress reactivity can be estimated. Model fit difference between configural, metric, and scalar models suggested the factor structure, loadings, and thresholds of the items were invariant from baseline to endline. In other words, we found no significant difference in the item and measure functioning across waves, and we can compare baseline, midline, and endline scores on each of the two subscales in the RSQ.

Table 5

*Treatment group invariance model fit*

k	$\chi^2$	df	p	$\Delta\chi^2$	df	p	CFI	TLI	RMSEA	SRMR
Baseline										
297	1681.574	828	< .001	NA	NA	NA	0.967	0.964	0.038	0.051
251	1560.516	874	< .001	69.738	46	0.0135	0.974	0.973	0.033	0.054
111	1688.921	1014	< .001	185.514	140	0.006	0.974	0.977	0.031	0.055
Midline										
297	1389.363	828	< .001	NA	NA	NA	0.976	0.974	0.034	0.049
251	1333.092	874	< .001	70.593	46	0.0113	0.98	0.979	0.03	0.054
111	1471.426	1014	< .001	143.783	140	0.396	0.98	0.982	0.028	0.054
Endline										
297	1996.139	828	< .001	NA	NA	NA	0.968	0.965	0.048	0.968
251	1886.403	874	< .001	102.249	46	< .001	0.972	0.971	0.044	0.972
111	2040.794	1014	< .001	211.302	140	< .001	0.972	0.975	0.041	0.972

Note. SRMR, not WRMR (reported in the following tables) is reported here, due to the varying availability of the specific fit indices on different Mplus versions.

Table 6

*Gender group invariance model fit*

k	$\chi^2$	df	p	$\Delta\chi^2$	df	p	CFI	TLI	RMSEA	WRMR
Baseline										
199	1888.002	551	< .001	NA	NA	NA	0.959	0.955	0.048	2.279
176	1677.8	574	< .001	47.711	23	0.0018	0.966	0.964	0.043	2.369
106	1743.055	644	< .001	104.046	70	0.0052	0.966	0.968	0.04	2.406
Midline										
199	1300.47	551	< .001	NA	NA	NA	0.977	0.975	0.04	1.889
176	1177.194	574	< .001	29.733	23	0.1572	0.981	0.98	0.035	1.959
106	1257.086	644	< .001	120.037	93	0.0311	0.981	0.982	0.033	2.007
Endline										
199	2376.219	551	< .001	NA	NA	NA	0.958	0.955	0.06	2.832
176	2153.264	574	< .001	56.451	23	0.0001	0.964	0.962	0.055	2.912
106	2220.289	644	< .001	95.777	70	0.0221	0.964	0.967	0.052	2.938

Note. WRMR (Weighted Root Mean Square Residual), instead of SRMR is reported here due to the varying availability of the specific fit indices on different Mplus versions.

Table 7

*Age group invariance model fit*

k	$\chi^2$	df	p	$\Delta\chi^2$	df	p	CFI	TLI	RMSEA	WRMR
Baseline										
395	2524.58	1105	< .001	NA	NA	NA	0.957	0.953	0.049	2.668
326	2335.545	1174	< .001	117.873	69	< .001	0.965	0.964	0.043	2.849
116	2513.715	1384	< .001	362.263	279	< .001	0.966	0.97	0.039	2.913
Midline										
395	2079.58	1105	< .001	NA	NA	NA	0.97	0.967	0.045	2.373
326	1933.963	1174	< .001	84.881	69	0.0941	0.977	0.976	0.039	2.524
116	2121.746	1384	< .001	297.042	279	0.2189	0.977	0.98	0.035	2.577
Endline										
395	2977.463	1105	< .001	NA	NA	NA	0.961	0.957	0.061	3.134
326	2705.379	1174	< .001	110.627	69	0.0011	0.968	0.967	0.054	3.274
116	2921.296	1384	< .001	375.696	279	< .001	0.968	0.972	0.05	3.345

Note. WRMR (Weighted Root Mean Square Residual), instead of SRMR is reported here due to the varying availability of the specific fit indices on different Mplus versions.

Table 8

*Longitudinal invariance model fit*

k	$\chi^2$	df	p	$\Delta\chi^2$	df	p	CFI	TLI	RMSEA	SRMR
315	4101.341	2685	< .001	NA	NA	NA	0.976	0.975	0.015	0.043
269	4109.476	2731	< .001	124.766	46	< .001	0.976	0.976	0.015	0.044
123	4325.008	2877	< .001	486.642	146	< .001	0.975	0.976	0.015	0.044

## Conclusion

In this study, we adapted the Response to Stress Questionnaire to assess Syrian refugee students' experiences of and response to school-related stress. It was used to evaluate the impact of access to non-formal, SEL-infused tutoring programming among Syrian refugee children enrolled in Lebanese public schools. Evidence indicates that this version of the RSQ holds promise for use as a program evaluation measure, with evidence of validity based on internal structural and correlational patterns; evidence of reliability based on internal consistency estimates; and evidence of measurement invariance across treatment groups, gender, age groups, and time.

First, measures used for program evaluation purposes must have strong evidence of validity, or evidence that scores on the measure can be interpreted as capturing the focal constructs – in this case, stress and stress reactivity. Factor analyses of RSQ suggested two factors consistent with existing theory and prior empirical evidence about the structure of the measure. Exploratory and confirmatory factor analytic models provided a good fit to the data, and all items loaded highly onto the factors at all waves. This provides strong evidence for the internal structure validity of the measure.

Second, data from program evaluation measures must be highly reliable, as measurement error can attenuate the ability to detect program impact (Raudenbush & Sadoff, 2008). We found both subscales of the RSQ had high internal consistency, indicating that children generally gave consistent ratings on items within these RSQ subscales ( $\omega > 0.90$ ).

Third, data from program evaluation measures should also provide evidence that the measure is understood and reported in the same way and on the same scale by children in different treatment and demographic groups, as well as overtime. This criterion is known as measurement invariance. Establishing the measurement invariance of an assessment used in a rigorous program impact evaluation enables us to confidently assess whether children's responses to stress are improving or declining over time – and whether such changes are the result of our SEL programming (Halpin et al., 2019; Halpin & Torrente, 2014). RSQ has strong evidence on:

- Treatment invariance, indicating that one can compare the average scores of the treatment and control groups without bias due to treatment conditions.
- Gender invariance, indicating that one can compare the average scores of boys and girls without bias due to gender.
- Age invariance, indicating that one can compare the average scores of children in different age groups without bias due to age.
- Longitudinal invariance, indicating that one can directly assess growth overtime on the constructs assessed by the empirically derived RSQ subscales.



## Limitations

The RSQ has strong evidence that the resulting data can be used to make valid inferences about Syrian refugee children's experiences of and response to stress in Lebanese public schools. However, it is important to note that the measure tested in this study does not include all of the items in the original RSQ measure (57 items), and we do not provide evidence of the other RSQ subscales (primary control, secondary control, disengagement coping, involuntary disengagement). Similarly, this study only provides evidence on the ability of the RSQ to measure the level of stress experiences and stress reactivity about school-related problems. For the use of the RSQ with other stressors, further evidence is needed.

In addition, the correlations between the same constructs over time – approximately in 3-month intervals across a school year – were low to moderate for all subscales. We are unaware of other studies that have examined the longitudinal stability of the level of stress and stress reactivity among children using self-report methods, and therefore we are not able to interpret these findings in the context of prior evidence<sup>2</sup>. We also found very few studies that examined children's stress experiences and stress response longitudinally. Studies with physiological measures of stress, e.g., salivary cortisol level, suggest that children who are exposed to adversity in their early lives are likely to have acute and hyperactive responses to stress when exposed to stressful situations (Laurent et al., 2015; Trickett et al., 2010). In addition, longitudinal studies on child-report measures of post-traumatic stress reaction show a significant change in stress reactions over time, with low to moderate levels of correlations across time (Aziz & Vostanis, 2000; Nygaard, Jensen, & Dyb, 2012). Given the existing evidence, we argue children's stress experiences and their stress responses are not stable traits. Rather, they are temporary reactions to the immediate situation, and they are likely to change in response to the presence and absence of stressors in, and given their own adaptation to, the school environment.

## Recommendations for the Use of the Response to Stress Questionnaire (RSQ)

While the evidence provided in this study largely supports the use of RSQ for evaluation purposes with Syrian refugee children in public schools in Lebanon, a few implications should be noted when researchers and practitioners consider the use of RSQ for their own purposes. We recommend a set of strategies and future directions to ensure that children's response to school-related stress via self-report methods are accurately interpreted:

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<sup>2</sup> The only study we were able to find that tested repeated measures of the RSQ was Connor-Smith et al. (2000). Authors assessed the test-retest reliability of the RSQ among college students within a 1- to 2-week interval, and they reported that involuntary engagement subscale scores were highly correlated between the two waves of data collection ( $r = 0.81$ ; stress experiences subscale reliability was not reported). Given the much shorter time interval and the older population in the Connor-Smith et al. (2000) study, it is not generalizable to the current study.

1. We recommend future studies to explore triangulation with measuring several aspects of children's response to stress through multiple sources of reporting and methods (e.g., child-report, physiological arousal (e.g., heart rate with stressful stimuli), parent-report, teacher-report) to further validate and better understand the stress experience and response in the target population.
2. Given the findings suggesting the stress and stress response is likely time-varying, we recommend the prompt to refer to a shorter time frame (e.g., two weeks) than the currently suggested 6-month period. Perceived stress and stress responses are likely to be immediate reactions to the stressors present at the time, and especially for young children, it may be challenging to recall the stress level and responses over a lengthy period of time.
3. Small adjustments can be made to the measure to potentially mitigate the effect of cognitive anchoring biases such as the recency effect, and in turn, improve the stability of children's ratings of their stress response. Such mitigation strategies can include embedding explicit prompts in the introductory statement to ask respondents to think back to their experience of stress in school for a certain period of time (e.g., "Think back to this [particular school-related stressor] happened over the past two weeks. In general, I feel...").

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