Measuring Novel Antecedents of Mental Illness: The Questionnaire of Unpredictability in Childhood

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Abstract

Increasing evidence indicates that, in addition to poverty, maternal depression and other well-established factors, unpredictability of maternal and environmental signals early in life influences trajectories of brain development, determining risk for subsequent mental illness. However, whereas most risk factors for later vulnerability to mental illness are readily measured using existing, clinically available tools, there are no similar measures for assessing early-life unpredictability. Here we validate the Questionnaire of Unpredictability in Childhood (QUIC) and examine its associations with mental health in the context of other indicators of childhood adversity (e.g. traumatic life events, socioeconomic status and parenting quality). The QUIC was initially validated through administration to a cohort of adult females (N = 116) and then further refined in two additional independent cohorts (male Veterans, N = 95, and male and female adolescents, N = 175). The QUIC demonstrated excellent internal ($α$ = .89) and test-retest reliability (r = 92). Scores on the QUIC were positively correlated with other prospective indicators of exposures to unpredictable maternal inputs in infancy and childhood (unpredictable maternal mood and sensory signals), and accuracy of recall also was confirmed with prospective data. Importantly, the QUIC predicted symptoms of anxiety, depression and anhedonia in the three study cohorts, and these effects persisted after adjusting for other previously established risk factors. The QUIC, a reliable and valid self-report assessment of exposure to unpredictability in the social, emotional and physical domains during early life, is a brief, comprehensive and promising instrument for predicting risk for mental illness.

Introduction

It is widely recognized that the family and household are the primary social, emotional and physical contexts in which child development unfolds [1, 2]. It is therefore not surprising that early life experiences such as living in poverty, trauma exposure and harsh parental care exert persisting influences on lifespan trajectories of mental health [3-5]. Although known childhood influences such as these do explain a significant proportion of the variation in mental health risk, there remains a significant gap in our ability to predict who will develop vulnerability or resistance to mental illness.

Recently, a novel conceptualization of early life adversity—unpredictability in the environment—has emerged that may shed additional light on risk for later mental illness and its underlying mechanisms. The importance of unpredictability of sensory inputs is supported by animal models demonstrating that fragmented or unpredictable maternal signals influence the maturation of systems governing emotional and cognitive function in the developing brain [6, 7]. For example, when rodents are exposed to unpredictable maternal signals early in life, these rats exhibit diminished memory function [8, 9] and reduced ability to experience pleasure (anhedonia) beginning in adolescence [10-12]. Further, the predictability of these maternal signals influences synaptic growth and persistence in cognitive and emotional brain circuits, which then affect the maturation of connectivity in these circuits [13, 14]. Importantly, these effects are independent of the quantity and quality of the maternal signals, underscoring the importance of unpredictability of these inputs [10, 15].

Complementary conceptual models also recognize that when characterizing early life adversity, in addition to harshness or cumulative stress exposures, unpredictability

represents a primary and unique determinant of development [16, 17]. Consistent with this view, there is evidence in humans that exposure to unpredictability in social, emotional and physical domains in early life influences developmental trajectories. For example, mother-child dyadic synchrony is a positive predictor of more optimal child development [18, 19], and it is well established that a hallmark of secure attachment is the receipt of reliable and appropriate maternal care [20]. Similarly, more residential transitions, changes in parental occupation status, less routinization in the family unit and more chaos in the household each have been linked to poorer child mental health [21-24]. In addition, new findings specifically indicate that unpredictable patterns of both maternal behavior and mood, independent of its quality or valence (e.g. maternal sensitivity or level of depressive symptoms), uniquely predicts child mental health risk [15, 25].

Despite the emerging evidence from both animal models and humans indicating that unpredictability of inputs shapes the developing brain and affects risk trajectories of mental health, no instrument exists to provide a comprehensive assessment of exposures to unpredictability in childhood. The primary goal of this study was to evaluate the Questionnaire of Unpredictability in Childhood (QUIC) – a self-report measure that assesses predictability (social, emotional and physical) in the childhood environment. To this end, we examined the psychometric properties (internal consistency and test-retest reliability) of the QUIC in three independent cohorts. We also determined its construct validity by examining its associations with prospectively assessed aspects of the childhood environment. The second goal of the study was to test the hypothesis that

increased exposures to unpredictability in childhood, determined by the QUIC, would predict increased mental health symptoms.

Methods

Overview

An initial set of items were generated by a subset of the authors (EPD, LMG) for inclusion in the Questionnaire of Unpredictability in Childhood (QUIC). The items were intended to reflect unpredictability in various aspects of a child's environment (social, emotional and physical domains). Data were collected in three independent cohorts to refine the scale and determine its reliability and validity. Cohort 1 consisted of adult females ($N = 116$), Cohort 2 of male Veterans ($N = 95$) and Cohort 3 of male and female adolescents ($N = 175$). In addition to completion of the QUIC, participants completed other instruments to assess reliability and validity.

Description of Scale

The QUIC is a series of items that respondents endorse as applying to their life prior to age 18, with a subset of questions focusing specifically on events more likely to occur in earlier childhood (prior to age 12). Items were developed by the authors and then further refined with conceptual and empirical analyses. Examples include "I experienced changes in my custody arrangement", "At least one of my parents regularly checked that I did my homework", and "At least one of my parents was disorganized". The initial version comprised 43 items which are endorsed as either "yes" or "no" (some of which are reverse coded). All items were evaluated for clarity, endorsement rates, correlation with related items, and fit to subscales, with 5 items ultimately eliminated. The final scale consists of 38 items and five subscales (Table 1): Parental Involvement (9

items), Parental Predictability (12 items), Parental Environment (7 items), Physical Environment (7 items) and Safety and Security (3 items). Scores on the scale can range from 0 to 38, with a higher score indicating greater exposure to unpredictability in the environment prior to 18 years of age. More detailed information about scale development is given in the Supplemental Materials.

Description of Study Cohorts

<u>Cohort 1: Adult Females</u>

The cohort of adult females consisted of 116 women participating in an ongoing, longitudinal study of maternal and child health (see Table 2 for demographics). In addition to completing the QUIC, women completed the Trauma History Questionnaire (THQ) [26], which consists of 24 yes/no items that address lifetime traumatic events related to crime, general disaster and trauma, and physical and sexual experiences. For the purposes of comparison with the QUIC, items endorsed as occurring prior to the age of 18 were summed to create a childhood traumatic life events score. Mental health risk in this cohort was assessed with the 10-item Edinburgh Postnatal Depression Scale (EPDS) [27] at 6-months postpartum. Current family income-to-needs ratio also was considered and was calculated by dividing the total annual household income by the appropriate U.S. Census Bureau poverty threshold based on family size. To evaluate temporal stability of the QUIC, a subset of these women completed the measure twice (mean time between assessments = 13.6 weeks). The protocol was approved by the institutional IRB and all participants provided written and informed consent.

Cohort 2: Male Veterans

The QUIC was administered to 95 male military Veterans (See Table 2 for demographics). Veterans were either participating in a follow-up assessment from a prospective, longitudinal study of deployment trauma in male Marines and Navy Corpsmen [28] or were contributing data to the Center of Excellence for Stress and Mental Health TBI/PTSD biorepository data archives, which collects biological samples and trauma-related mental health information in treatment-seeking Veterans within the San Diego Veterans Affairs Healthcare System. Both protocols were approved by the Veterans Affairs IRBs, and all participants provided written and informed consent. In addition to the QUIC, the Veterans also completed the 28-item Childhood Trauma Questionnaire (CTQ) [29], which assesses the severity of childhood emotional abuse and neglect, physical abuse and neglect, and sexual abuse. Mental health risk was assessed with the 22-item Anhedonic Depression scale of the Mood and Anxiety Symptom Questionnaire (MASQ-AD) [30][1]. This scale measures symptoms of low positive emotion and anhedonia considered to be specific to depression and has been utilized independently of the full MASQ scale [31].

Cohort 3: Adolescents

This study cohort consisted of 175 adolescents (52% female) and their mothers participating in an ongoing, longitudinal study of maternal and child health (see Table 2 for demographics). These mother-child pairs have been followed prospectively from the prenatal period through adolescence. The study protocol was approved by the

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[1] In this cohort only, one of the 22 items ("felt like I had a lot of energy") was not administered due to an oversight. The MASQ-AD score for this cohort was therefore the sum of 21 items.

institutional IRB and written and informed consent was obtained from the mothers and assent from the children beginning at age seven.

Assessments during infancy and childhood: Unpredictability of maternal sensory signals was measured when the children were 6 and 12 months of age. Briefly, maternal auditory, tactile and visual signals were coded from videos of 10-minute mother-child play periods. Predictability of sensory signals was characterized for each video using entropy rate as detailed in Davis et al. [15]. The predictability measure used here is the average of the entropy rate at 6 months and 12 months, with missing values imputed via regression. Predictability of maternal mood was measured in infancy (at 3, 6, 12, and 24 months) and childhood (at 5, 6, and 9 years) as described in Glynn et al. [25]. Scores during infancy and childhood were separately averaged.

Assessments in adolescence: Adolescents (mean age = 13.7) completed the QUIC and measures of mental health risk. Adolescents reported on their anxiety symptoms using the 20-item trait anxiety scale from the State-Trait Anxiety Inventory for Children (STAIC) [32] and depressive symptoms with the 12-item Children's Depression Inventory (CDI 2) [33]. As in the cohort of male Veterans, symptoms of anhedonia were measured with the MASQ-AD. Adolescents additionally reported on parenting style using the Alabama Parenting Questionnaire (APQ) [34], which assesses five domains of parenting quality including consistency of discipline and parental supervision. At the concurrent assessment point, mothers provided demographic information and reported on their adolescents' life events using the Coddington Life Events Scale for children (CLES) [35]. They also completed the 15-item Chaos, Hubbub and Order Scale (CHAOS) [36], which assesses unpredictability and confusion in the home. Family income-to-needs ratio was

calculated using the same method described for Cohort 1. Missing data for APQ scales (5.7%), CLES (5.7%), CHAOS (11.4%) and income-to-needs ratio (1.7%) were addressed through multiple imputation [38]. Ten complete data sets were generated using the multiple imputation procedure in SPSS (version 23) which uses a series of sequential imputation models [38]. Multiple regression models were fit to each of the complete data sets and the results combined using the standard approach for multiple imputation [39].

Results

Mean Scores and Endorsement Rates

Means and standard deviations for the overall scale score and 5 subscales for each of the three cohorts are provided in Table 3 (a summary of the distribution of endorsement rates as well as endorsement rates for each item can be found in Table S1). Compared to adult females and adolescents, the male Veterans had higher scores on the overall scale and on 4 of the 5 subscales (all p's < .01). No differences were observed between male and female adolescents on any of the scale scores. Although scale sum scores differed across cohorts, inspection of the distribution of responses across cohorts (i.e. the probability that a single item was endorsed more or less frequently compared to others within a cohort) did not reveal notable or consistent differences (Table S1).

Evidence for Internal Reliability

Cronbach's alphas demonstrated strong internal consistency for the overall score across the three cohorts ($α$ = .84-.92; see Table 4). Internal consistency also was good for the subscales, with the adolescents showing slightly lower alphas than the two adult

cohorts. Further, alpha values tend to be smaller for scales with fewer items [37] and that is true here for the 3-item Safety and Security subscale.

Evidence for Test-Retest Reliability

Test-retest reliability was excellent, with $r = .92$ for the overall scale score. Temporal stability also was strong for each of the subscales, ranging from .75 to .88 (Table 4).

Evidence for Validity of Retrospective Recall

Maternal report data collected prospectively and longitudinally beginning in infancy in the adolescent cohort provides strong evidence for accuracy of reporting on the QUIC. Consistent with prospectively collected data, 83% of children who endorsed item 20, "I moved frequently", in fact moved three or more times during their lifetimes, and 99% of children who reported parental divorce (item 29) had parents who were either legally divorced (93%) or permanently separated (6%).

Evidence for Construct Validity

Evidence for construct validity was provided by associations between the QUIC and the two prospectively assessed, observational measures of exposure to unpredictable maternal inputs. Specifically, adolescents who reported higher scores on the QUIC had been exposed to more unpredictable maternal sensory signals measured in infancy ($r = .23$, $p < .05$), and also to more unpredictable maternal mood assessed in both infancy ($r = .17$, $p < .05$) and childhood ($r = .28$, $p < .001$). In addition, higher scores on the QUIC were associated with self-report measures evaluating unpredictability within a specific domain. As shown in Table S1, adolescent reports of more inconsistent discipline and less parental supervision and maternal reports of greater household chaos

all were positively associated with QUIC scores. As shown in Table 5, as expected, the QUIC also was positively associated with exposures to traumatic and stressful life events in all three cohorts.

Evidence for Predictive Validity: QUIC Predicts Mental Health Risk

The links between the QUIC and mental health indicators are shown in Table 5. Among the adult women, higher scores on the QUIC were associated with elevated postpartum depressive symptoms ($r = .27$, $p < .05$), and male Veterans who reported more childhood unpredictability on the QUIC reported higher levels of anhedonic symptoms ($r = .28$, $p < .01$). Similarly, adolescents who reported greater childhood unpredictability on the QUIC had elevated symptoms of anhedonia ($r = .37$, $p < .001$), depression ($r = .42$, $p < .001$) and anxiety ($r = .43$, $p < .001$).

To determine whether the QUIC adds predictive power beyond other measures of specific aspects of unpredictability (e.g. household chaos, inconsistent parental discipline) and other previously established indicators of childhood adversity (income-to-needs ratio, life events), we tested the links between adolescent mental health and the QUIC after statistical consideration of these factors. The relation between the QUIC and adolescent anhedonia, depression and anxiety symptoms remained after adjustment for the APQ scales, INR, household chaos, and child life events supporting its unique predictive validity (see Table 6). In addition, modeling the QUIC with measures of childhood traumatic life events did not substantively alter the relation between the QUIC and anhedonia in the male Veterans ($\beta = .28$, $p < .05$ vs $\beta = .34$, $p < .05$) or with depression in the adult females ($\beta = .30$, $p < .05$ vs $\beta = .28$, $p = .06$; see Table S3 for these regression models).

Discussion

Accumulating evidence suggests that predictability or patterns of inputs in the social, emotional and physical environments during development shapes risk for psychopathology, indicating a need for efficient and accurate methods for assessing exposure to unpredictability in early life. To address this gap, we developed the QUIC, which represents the first comprehensive measure of exposures to unpredictability in the social, emotional and physical environment in childhood. This 38-item scale is easy to administer and contains five subscales. The QUIC exhibits good internal and test-retest reliability and is correlated with prospective and observational indicators of unpredictable maternal sensory signals and maternal mood in childhood, as well as reports of unpredictability in parenting practices and household chaos, providing strong support for its construct validity. It also was positively correlated with other validated and widely-used measures of adversity in childhood such as the CTQ [29] and THQ [26].

In addition to demonstrating its sound psychometric properties, we also present data in three independent cohorts indicating that the QUIC not only reliably predicts mental health, but additionally predicts mental health beyond other widely used measures of early adversity. In a cohort of adult females, higher QUIC scores were associated with increased postpartum depressive symptoms. In a group of male Veterans, elevated scores on the QUIC predicted higher levels of anhedonia symptoms. Last, among male and female adolescents, QUIC scores were positively associated with risk for symptoms of anhedonia, anxiety and depression. Importantly, these relations were not accounted

for by other well-established childhood indicators of risk, including income-to-needs ratio, exposure to stressful life events, parenting style and household chaos.

This initial validation study is not without its limitations. First, our samples were predominantly Latino and non-Hispanic white and therefore it is critical that the QUIC's psychometric properties be examined in other populations including greater numbers of African American and Asian participants. Similarly, two of the three cohorts comprised only one gender and so further examination of potential gender differences also is warranted. In addition, both indicators of early life adversity (e.g., traumatic life events) and mental health outcomes (e.g., depression) were assessed with different instruments and this limited our ability to compare the relative predictive validity across the three independent cohorts. However, this limitation is balanced by the fact that the findings were similar regardless of the assessment tools employed, increasing confidence that our findings are not specific to any particular instrument.

Increasing evidence supports the role of predictability of signals in early life as a potent contributor to lifespan health and development. Although self-report measures of specific aspects of unpredictability do exist (e.g., household chaos and family routines), until now, no comprehensive measure of unpredictability in childhood has been available. The QUIC's generalizability to populations other than those studied here remains to be established, but this new instrument's performance in the current study supports its promise for future use in both research and clinical contexts and for identification of new avenues for intervention.

Table 1. *QUIC items by subscale.*

Parental Monitoring and Involvement

Prior to age 12: I had a set morning routine on school days (i.e., I usually did the same thing each day to get ready). (R)

Prior to age 12: My parents kept track of what I ate (e.g., made sure that I didn't skip meals or tried to make sure I ate healthy food). (R)

Prior to age 12: My family ate a meal together most days. (R)

Prior to age 12: My parents tried to make sure I got a good night's sleep (e.g., I had a regular bedtime, my parents checked to make sure I went to sleep). (R)

Prior to age 12: I had a bedtime routine (e.g., my parents tucked me in, my parents read me a book, I took a bath). (R)

Prior to age 12: In my afterschool or free time hours at least one of my parents knew what I was doing. (R)

Prior to age 12: At least one of my parents regularly checked that I did my homework. (R)

Prior to age 18: At least one of my parents regularly kept track of my school progress. (R)

Prior to age 18: At least one parent made time each day to see how I was doing. (R)

Parental Predictability

Prior to age 12: My parents were often late to pick me up (e.g. from school, aftercare or sports).

Prior to age 12: I usually knew when my parents were going to be home. (R)

Prior to age 18: At least one of my parents had punishments that were unpredictable.

Prior to age 18: I often wondered whether or not one of my parents would come home at the end of the day.

Prior to age 18: My family planned activities to do together. (R)

Prior to age 18: At least one of my parents would plan something for the family, but then not follow through with the plan.

Prior to age 18: My family had holiday traditions that we did every year (e.g., cooking a special food at a particular time of year/decorate the house the same way). (R)

Prior to age 18: At least one of my parents was disorganized.

Prior to age 18: At least one of my parents was unpredictable.

Prior to age 18: For at least one of my parents, when they were upset I did not know how they would act.

Prior to age 18: One of my parents could go from calm to furious in an instant.

Prior to age 18: One of my parents could go from calm to stressed or nervous in an instant.

Parental Environment

Prior to age 18: There was a long period of time when I didn't see one of my parents (e.g. military deployment, jail time, custody arrangements).

Prior to age 18: I experienced changes in my custody arrangement.

Prior to age 18: At least one of my parents changed jobs frequently.

Prior to age 18: There were times when one of my parents was unemployed and couldn't find a job even though he/she wanted one.

Prior to age 18: My parents had a stable relationship with each other. (R)

Prior to age 18: My parents got divorced.

Prior to age 18: At least one of my parents had many romantic partners.

Physical Environment

Prior to age 18: There were often people coming and going in my house that I did not expect to be there.

Prior to age 18: I moved frequently.

Prior to age 18: I changed schools frequently.

Prior to age 18: I changed schools mid-year.

Prior to age 18: I lived in a clean house. (R)

Prior to age 18: I lived in a cluttered house (e.g., piles of stuff everywhere).

Prior to age 18: In my house things I needed were often misplaced so that I could not find them.

Safety And Security

Prior to age 18: There was a period of time when I often worried that I was not going to have enough food to eat.

Prior to age 18: There was a period of time when I often worried that my family would not have enough money to pay for necessities like clothing or bills.

Prior to age 18: There was a period of time when I did not feel safe in my home.

Note. (R) indicates item is reverse scored

Table 2. *Description of study cohorts*

	Adult Females (*N* = 116)	Adult Males (*N* = 95)	Adolescents (*N* = 175)
Age (mean years)	30	35	14
Sex (% female)	100	0	52
Race/ethnicity (%)			
Caucasian, non-Hispanic	35	63	39
Hispanic/Latino(a)	42	14	30
Asian	12	5	6
Black	3	11	5
Multi-ethnic	7	7	21
Highest level of education (mean years)	15	14	--
Annual household income (mean USD)	75 634	--	145 314

Note. Income data not available for adult males.

Table 3. *Means and standard deviations of QUIC score and subscale scores*

			Adolescents		
	Adult Females (*N* = 116)	Adult Males (*N* = 95)	All (*N* = 175)	Females (*n* = 91)	Males (*n* = 84)
Total QUIC Score (38 items)	7.7 (6.8)	10.8 (8.4)	7.4 (5.5)	7.3 (5.6)	7.5 (5.4)
Parental monitoring and involvement (9 items)	1.6 (2.0)	2.6 (2.8)	1.1 (1.4)	1.1 (1.4)	1.2 (1.3)
Parental predictability (12 items)	3.2 (2.9)	3.9 (3.2)	3.4 (2.5)	3.4 (2.7)	3.4 (2.2)
Parental environment (7 items)	1.4 (1.7)	2.3 (2.1)	1.3 (1.6)	1.3 (1.6)	1.4 (1.7)
Physical environment (7 items)	1.0 (1.4)	1.2 (1.6)	1.1 (1.4)	1.1 (1.4)	1.2 (1.5)
Safety and security (3 items)	0.4 (0.8)	0.9 (1.0)	0.4 (0.7)	0.5 (0.7)	0.3 (0.6)

Table 4. *Psychometric properties of the QUIC*

	Test-Retest Reliability (*r*'s)	Internal Consistency (Cronbach's alphas)		
	Adult Females (*N* = 58)	Adult Females (*N* = 116)	Adult Males (*N* = 95)	Adolescents (*N* = 175)
Total QUIC Score (38 items)	.92	.90	.92	.84
Parental monitoring and involvement (9 items)	.75	.77	.87	.53
Parental predictability (12 items)	.87	.80	.83	.69
Parental environment (7 items)	.88	.70	.76	.70
Physical environment (7 items)	.80	.68	.68	.65
Safety and security (3 items)	.80	.58	.56	.42

Table 5. *Associations between the QUIC, early life adversity and mental health risk (bivariate correlations)*

	1.	2.	3.	4.	5.	6.
Adult Females						
1. QUIC	--					
2. Childhood traumatic events (CTQ)	.26†	--				
3. Income-to-needs ratio	-.09	.08	--			
4. Depressive symptoms (EPDS)	.30*	.05	-.19	--		
Adult Males						
1. QUIC	--					
2. Childhood traumatic events (CTQ)	.61**	--				
5. Anhedonia symptoms (MASQ-AD)	.28**	.06			--	
Adolescents						
1. QUIC	--					
2. Childhood life events (CLES)	.37**	--				
3. Income-to-needs ratio	-.16*	-.17*	--			
4. Depressive symptoms (CDI)	.42**	.08	-.09	--		
5. Anhedonia symptoms (MASQ-AD)	.37**	.18†	-.08	.61**	--	
6. Anxiety symptoms (STAIC)	.43**	.12	-.10	.63**	.47**	--

Note. $^\dagger p < .10$, $^* p < .05$, $^{**} p < .01$; QUIC = Questionnaire of Unpredictability in Childhood, THQ = Trauma History Questionnaire, EPDS = Edinburgh Postnatal Depression Scale, CTQ = Childhood Trauma Questionnaire, MASQ-AD = Anhedonic Depression scale of the Mood and Anxiety Symptom Questionnaire, CLES = Coddington Life Events Scale, CDI = Children's Depression Inventory, STAIC = State-Trait Anxiety Inventory for Children.

Table 6. *Multiple regression models with* the *QUIC and other indicators of early life adversity predicting adolescent mental health outcomes*

Predictors	DV: Adolescent Depressive Symptoms		DV: Adolescent Anxiety Symptoms		DV: Adolescent Anhedonia Symptoms	
	B (SE)[a]	*β*[b]	*B (SE)*[a]	*β*[b]	*B (SE)*[a]	*β*[b]
Age	0.29† (0.17)	.13	0.66† (0.34)	.16	0.01 (1.02)	.00
Sex	1.28* (0.58)	.16	3.68** (1.15)	.25	1.51 (2.71)	.05
APQ Positive Parenting	0.01 (0.16)	.01	-0.04 (0.32)	-.01	0.38 (0.76)	.06
APQ Inconsistent Discipline	0.06 (0.11)	.04	0.15 (0.21)	.05	0.43 (0.49)	.08
APQ Poor Monitoring/Supervision	0.12 (0.14)	.07	0.37 (0.28)	.12	0.15 (0.61)	.02
APQ Parental Involvement	-0.37** (0.14)	-.26	-0.19 (0.27)	-.07	-1.16† (0.64)	-.23
APQ Corporal Punishment	0.05 (0.23)	.02	0.31 (0.43)	.06	0.37 (1.09)	.03
Income-to-Needs Ratio	-0.00 (0.00)	-.09	0.00 (0.00)	-.01	0.00 (0.01)	.00
Child Life Events (CLES)	-0.08 (0.08)	-.08	-0.04 (0.16)	-.02	0.12 (0.38)	.03
Household Chaos (CHAOS)	-0.03 (0.03)	-.06	-0.05 (0.06)	-.06	-0.03 (0.16)	-.02
QUIC	**0.23*** (0.06)**	**.31**	**0.52*** (0.12)**	**.38**	**0.66* (0.30)**	**.24**

Note. [a] Coefficients are pooled estimates from the 10 imputed datasets. [b]Coefficients were derived by averaging across the 10 imputed datasets. Complete case analyses were also performed and did not differ from results of analyses with imputed data reported here. QUIC = Questionnaire of Unpredictability in Childhood. APQ = Alabama Parenting Questionnaire. CLES = Childhood Life Events Scale. CHAOS = Chaos, Hubbub, and Order Scale. †$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

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Scale Development

In item writing, two authors (EPD and LMG), originally generated a list of 43 items that focused broadly on aspects of unpredictability in the social, emotional and physical environment during childhood. In terms of response scales, the decision was made to employ a dichotomous response (as opposed to a Likert-type scale) for a number of reasons including: 1. Some of the items (e.g. "My parents got divorced") were by nature dichotomous, and thus this choice allows us to keep the response metric consistent.   2. The ultimate goal for this instrument is application in a wide variety of clinical and research settings in diverse populations and there is evidence that Likert-type response scales are vulnerable to response-style biases (e.g. extreme response style) across different cultural and demographic groups (c.f. 1-3). 3. There is little evidence that increasing the number of response categories results in substantive increases in the reliability or validity of a scale (c.f. 4-6).

After the initial generation of items, the authors administered the item set repeatedly to a group of experts and non-experts of both genders with ages ranging from 12 to 75. During this iterative process, the items were discussed and revised extensively for clarity and ease of endorsement. Through the discussion with the group, an earlier age frame for some items was adopted (<12) because it became apparent that some activities happened very rarely at older ages and would lead to difficulty in determining answers. For example, respondents reported that they did not have bedtime routines in their teenage years.

The next step in scale development involved administering the QUIC to the three cohorts described in detail in the Methods (male and female adolescents, adult females and male Veterans). After data collection, the QUIC data were then analyzed both conceptually and empirically. Four of the study authors (EPD, LMG, MAH, HSS) independently generated a list of potential domains for subscales. After deliberation on these independent assessments, the group came to consensus on 5 subscales: Parental Involvement, Parental Predictability, Parental Environment, Physical Environment and Safety and Security. Each of the four members of the group then independently assigned each item to one of the subscales. The average agreement of subscale assignment for the items that were retained in the final scale was 97% across the four evaluators (i.e., the four evaluators agreed on which of the 5 subscales an item belonged for 34 of the 38 items). This exercise was further supported by examination of each item's correlation with related items and fit to subscales. Exploratory factor analyses were also utilized to support the development of the scale, but were not relied on because such analyses do not perform reliably for dichotomous measures. As result of this process 5 items were eliminated because they either did not fit well with any of the subscales conceptually or empirically (low correlation with the other items) or had a very low frequency of endorsement, yielding the final scale of 38 items.

Table S1. *Item-by-item endorsement rates*

	Adult Females (N = 116)	Male Veterans (N = 95)	Adolescents All (N = 175)	Adolescents Females (n = 91)	Adolescents Males (n = 84)
Summary of endorsement rates					
Minimum	3	10	3	4	1
25%ile	13	18	11	10	11
50%ile	16	26	16	17	16
75%ile	30	38	24	23	29
Maximum	48	54	49	50	49
Parental involvement and monitoring					
Prior to age 12: Had a set morning routine ®	9	17	10	10	11
Prior to age 12: Parents kept track of what I ate ®	29	38	21	21	21
Prior to age 12: Family ate a meal together most days ®	16	27	14	15	13
Prior to age 12: Parents made sure I got a good night's sleep ®	14	23	6	8	4
Prior to age 12: Had a bedtime routine ®	41	40	25	21	29
Prior to age 12: In afterschool hours a parent knew what I was doing ®	7	23	9	4	13
Prior to age 12: Parent regularly checked I did my homework ®	15	38	15	13	18
Prior to age 18: Parent regularly kept track of my school progress ®	14	33	3	6	1
Prior to age 18: Parent made time to see how I was doing ®	13	23	10	10	10

Parental predictability					
Prior to age 12: Parents often late to pick me up	17	10	15	19	12
Prior to age 12: Usually knew when parents would be home ®	4	20	11	7	16
Prior to age 18: Parent had punishments that were unpredictable	41	37	37	35	39
Prior to age 18: Wondered if parent would come home at end of the day	9	17	20	20	20
Prior to age 18: Family planned activities to do together ®	20	31	13	14	11
Prior to age 18: One of parents would plan something and not follow through	26	30	38	41	36
Prior to age 18: Family had holiday traditions we did every year ®	14	15	7	8	7
Prior to age 18: Parent was disorganized	41	42	43	44	43
Prior to age 18: Parent was unpredictable	33	38	29	25	31
Prior to age 18: When parent was upset, did not know how they would act	30	42	33	33	32
Prior to age 18: Parent could go from calm to furious in instant	40	54	49	50	49
Prior to age 18: Parent could go from calm to stressed or nervous in instant	48	53	45	47	42
Parental environment					
Prior to age 18: Long period of time when I didn't see parent	16	24	19	14	25
Prior to age 18: Experienced changes in custody arrangement	14	26	13	13	13
Prior to age 18: Parent changed jobs frequently	11	26	16	18	14
Prior to age 18: Times when parent was unemployed and couldn't find job	20	32	23	25	21
Prior to age 18: Parents had a stable relationship with each other ®	36	54	21	19	24
Prior to age 18: Parents got divorced	30	40	24	20	29
Prior to age 18: Parent had many romantic partners	16	23	17	17	17

Physical environment					
Prior to age 18: Often people coming and going in house unexpectedly	3	13	13	11	14
Prior to age 18: Moved frequently	22	25	15	14	17
Prior to age 18: Changed schools frequently	12	15	9	8	11
Prior to age 18: Changed schools mid-year	21	28	10	12	7
Prior to age 18: Lived in a clean house ®	11	13	11	8	16
Prior to age 18: Lived in a cluttered house	16	16	17	19	16
Prior to age 18: In house things were often misplaced so could not find them	16	14	36	34	38
Safety and security					
Prior to age 18: Period of time I worried would not have enough food	4	19	7	8	6
Prior to age 18: Period of time I worried family would not have enough money	23	45	17	22	11
Prior to age 18: Period of time I did not feel safe in my home	16	22	16	17	16

Note. ® indicates item is reverse scored.

Table S2. *Associations between QUIC and other indicators of early life adversity among adolescents (Cohort 3).*

	Unpredictability in Childhood (QUIC)
Parenting (APQ)	
Positive Parenting	-.31**
Inconsistent Discipline	.24**
Poor Monitoring/Supervision	.25**
Parental Involvement	-.39**
Corporal Punishment	.17
Household Chaos	.15†
Child Life Events	.37**

†*p* < .10, *p* < .05, **p* < .01

Table S3. *Multiple regression models with QUIC and childhood traumatic events predicting mental health outcomes in male Veterans and adult females*

Predictors	DV: Anhedonia Symptoms in Male Veterans		DV: Postpartum Depressive Symptoms in Adult Females	
	B (SE)	β	B (SE)	β
Childhood Traumatic Events[a]	-1.99 (2.06)	-.13	-0.06 (0.39)	-.02
QUIC	**0.63* (0.24)**	**.34**	**0.23[†] (0.12)**	**.28**

Note. [a]Childhood traumatic life events were assessed with the Childhood Trauma Questionnaire (CTQ) in male Veterans and with the Trauma History Questionnaire (THQ) in adult females. [†]$p = .06$, * $p < .05$, ** $p < .01$, *** $p < .001$.

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Appendix

Questionnaire of Unpredictability in Childhood (QUIC)

Instructions and Items:

This set of questions asks about your childhood experiences. When we say parents, we mean whoever in your life fills that role for you (e.g. biological parents, step parents, grandparents, foster parents). This could be one person, or this could be multiple people.
Please list those people's relationship to you below:

_____ _____ _____ _____ _____

First, we are going to ask about a specific part of your childhood, which is when you were less than 12 years old. These answers should be based on your own memories <u>prior to the age of 12</u>, not on things you later learned from your parents or others.

<u>Please answer these questions based on your typical or average experiences.</u>

Typical or average experiences from earliest <u>memory to age 12</u>...	Yes	No
1. I had a set morning routine on school days (i.e., I usually did the same thing each day to get ready).	1	0
2. My parents were often late to pick me up (e.g. from school, aftercare or sports).	1	0
3. My parents kept track of what I ate (e.g., made sure that I didn't skip meals or tried to make sure I ate healthy food).	1	0
4. My family ate a meal together most days.	1	0
5. My parents tried to make sure I got a good night's sleep (e.g., I had a regular bed time, my parents checked to make sure I went to sleep).	1	0
6. I had a bedtime routine (e.g., my parents tucked me in, my parents read me a book, I took a bath).	1	0
7. In my afterschool or free time hours at least one of my parents knew what I was doing.	1	0
8. I usually knew when my parents were going to be home.	1	0
9. At least one of my parents regularly checked that I did my homework.	1	0

Now we are going to ask you about your experiences from <u>birth to age 18</u> (or your whole life, if you are less than 18 years old). Again, this should be based on your own memories prior to the age of 18, not on things you later learned from your parents or others.

<u>Please answer these questions based on your typical or average experiences.</u>

Typical or average experiences from <u>earliest memory to age 18...</u>	Yes	No
10. At least one of my parents regularly kept track of my school progress.	1	0
11. At least one of my parents had punishments that were unpredictable.	1	0
12. I often wondered whether or not one of my parents would come home at the end of the day.	1	0
13. There were often people coming and going in my house that I did not expect to be there.	1	0
14. At least one parent made time each day to see how I was doing.	1	0
15. My family planned activities to do together.	1	0
16. At least one of my parents would plan something for the family, but then not follow through with the plan.	1	0
17. My family had holiday traditions that we did every year (e.g., cooking a special food at a particular time of year/decorate the house the same way).	1	0
18. There was a long period of time when I didn't see one of my parents (e.g. military deployment, jail time, custody arrangements).	1	0
19. I experienced changes in my custody arrangement.	1	0
20. I moved frequently.	1	0
21. At least one of my parents changed jobs frequently.	1	0
22. There were times when one of my parents was unemployed and couldn't find a job even though he/she wanted one.	1	0
23. There was a period of time when I often worried that I was not going to have enough food to eat.	1	0
24. There was a period of time when I often worried that my family would not have enough money to pay for necessities like clothing or bills.	1	0
25. There was a period of time when I did not feel safe in my home.	1	0
26. I changed schools frequently.	1	0

Typical or average experiences from <u>earliest memory to age 18</u>...	Yes	No
27. I changed schools mid-year.	1	0
28. My parents had a stable relationship with each other.	1	0
29. My parents got divorced.	1	0
30. At least one of my parents had many romantic partners.	1	0

For the next set of questions, we are asking if this is true for at least one of your parents. **Please answer these questions based on your typical or average experiences.**

Typical or average experiences from <u>earliest memory to age 18</u>...	Yes	No
31. At least one of my parents was disorganized.	1	0
32. At least one of my parents was unpredictable.	1	0
33. For at least one of my parents, when they were upset I did not know how they would act.	1	0
34. One of my parents could go from calm to furious in an instant.	1	0
35. One of my parents could go from calm to stressed or nervous in an instant.	1	0

For the next set of questions, we are asking about your household. If you lived in more than one household, please answer about the household in which you spent the most time. **Please answer these questions based on your typical or average experiences.**

Typical or average experiences from <u>earliest memory to age 18</u>...	Yes	No
36. I lived in a clean house.	1	0
37. I lived in a cluttered house (e.g., piles of stuff everywhere).	1	0
38. In my house things I needed were often misplaced so that I could not find them.	1	0

Scoring Information:

The QUIC consists of an overall score and five separate subscale scores. Higher scores indicate more exposure to unpredictability in childhood. To obtain the overall score or subscale scores, reverse score select items (indicated by an R after the item number) and then calculate the sum of the items in each scale:

Parental monitoring and involvement = 1R + 3R + 4R + 5R + 6R + 7R + 9R + 10R + 14R

Parental predictability = 2 + 8R + 11 + 12 + 15R + 16 + 17R + 31 + 32 + 33 + 34 + 35

Parental environment = 18 + 19 + 21 + 22 + 28R + 29 + 30

Physical environment = 13 + 20 + 26 + 27 + 36R + 37 + 38

Safety and security = 23 + 24 + 25

Overall = Sum of all subscales.