

## 1. Psychometric Scales

### 1.1. Complete psychometric scales

The Age of Wonder (AoW) surveys were all self-reported. Total scores for each scale were calculated only for participants who responded to every item on that scale. If any responses were missed by a participant, a missingness indicator (NA) was assigned. For scales that can be divided into subscales, the total scores for the lowest order subscales were calculated first. Higher order total scores were then calculated by summing the relevant subscales. If any responses to subscale items were missed by participants, NA was assigned for that subscale and for any higher order scores that were subsequently derived from it. Any reverse coded items were reverse scored prior to calculating totals.

See **Table 1** for a summary of scale properties and responses.

#### *Brief Resilience scale (BRS)*

The Brief Resilience Scale (Smith et al., 2008) is a validated 6-item measure designed to assess an individual's ability to "bounce back" or recover from stress. Scores range from 6-30 with higher scores indicating greater resilience. The authors reported acceptable to good internal consistency in samples of university students, cardiac rehabilitation patients, women with fibromyalgia, and healthy controls ( $\alpha = .80-.91$ ).

#### *Eating Disorder Examination Questionnaire - Short (EDE-QS)*

The EDE-QS (Gideon et al., 2016) is a validated 12-item measure of cognitive and behavioral symptoms of eating disorders, adapted from the 28-item Eating Disorder Examination Questionnaire (EDE-Q; Fairburn et al., 1994). Respondents rate each item on a 0-3 likert scale to indicate the frequency or extent to which they have experienced the corresponding symptom over the past 7 days. Scores range from 0-36 with higher scores indicating a greater number and/or severity of eating disorder symptoms. Gideon et al. (2016) reported good internal consistency ( $\alpha = .91$ ) and temporal stability (ICC = .93;  $p < .001$ ), and high correlations with the EDE-Q and other measures of eating disorder and mental health.

Item 10 on the EDE-QS is a follow-up question to item 9. In the Age of Wonder survey participants who responded '0' to item 9 were instructed to not respond to item 10. For the purposes of calculating total scores for these participants, '0' was imputed for item 10 for any participants who responded '0' to item 9 and did not respond to item 10.

#### *Revised Children's Anxiety and Depression Scale-25 (RCADS-25)*

The RCADS-25 (Ebesutani et al., 2012) is a validated 25-item measure of depression and anxiety in children and adolescents. RCADS-25 consists of a 10-item depression subscale, and a 15-item anxiety subscale that assesses five anxiety disorders (generalised anxiety disorder, separation anxiety disorder, social phobia, obsessive-compulsive disorder, panic disorder). Higher scores indicate more symptoms of anxiety/depression. Ebesutani et al.

(2012) reported acceptable internal consistency in school-based ( $\alpha = .79$ ) and clinic-referred ( $\alpha = .80$ ) samples.

RCADS-25 can be scaled for age and gender using the syntax and T-score conversion tables provided on the RCADS website: <https://rcads.ucla.edu/scoringdownloads>

### *Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS)*

The SWEMWBS (Stewart-Brown et al., 2009) is a validated 7-item measure of psychological wellbeing, adapted from the Warwick-Edinburgh Mental Well-being Scale (Tennant et al., 2007). Scores range from 7-25 with higher scores indicating greater wellbeing.

### *Strengths and Difficulties Questionnaire (SDQ)*

The SDQ (Goodman, 1999) is a validated 25-item multidomain psychiatric screening tool designed for use with children and adolescents. Twenty of the items describe potentially problematic behaviour across four hypothesised, 5-item subscales (emotional, peer, behavioural, and conduct problems), and the remaining five items describe pro-social behaviour (intended to measure strengths, rather than difficulties). Respondents rate each of the 25 items on a 0-3 Likert scale to indicate the extent to which they behave in the manner described by the item. Higher scores on the problem behaviour scales indicate more problems, and higher scores on the pro-social subscale indicate more pro-social behaviour. Two broader, 10-item problem subscales can be formed by combining the emotional and peer subscales into an internalising problems subscale, and combining the behavioural and conduct problems subscales into an externalising problems subscale. Goodman and Lamping (2010) recommended the use of the broader, 10-item scales in community samples, and Štochl et al. (2016) found that this factor structure was the best fit for data collected from the BiB cohort at earlier time points (ages 3, 4 and 5).

### *UCLA Loneliness Scale 3-item/4-item version (UCLA-3/UCLA-4)*

The 3-item UCLA-3 and 4-item UCLA-4 were adapted from the 20-item UCLA Loneliness Scale (Version 3; Russell, 1996), a 20-item self-report measure of loneliness. The UCLA-3 was developed by Hughes et al. (2004) for use in telephone surveys of older adults, and has since been used in numerous studies of adolescents (e.g., [Houghton et al., 2014](#); [Mueller et al., 2021](#); [Rogers et al., 2021](#); [Wang et al., 2024](#); [Zhao et al., 2024](#)). Respondents rate each item on a Likert scale from 1-3 (shortened from the 1-4 Likert scale in the original UCLA Loneliness Scale), indicating how often they experience the feeling described by each item. Higher scores indicate more frequent feelings of loneliness.

Matthews et al. (2016) expanded the UCLA-3 to the UCLA-4 by adding a fourth item from the UCLA Loneliness Scale (Version 3): “How often do you feel alone?” (also with a shortened 0-3 Likert scale). The UCLA-4 is almost identical to the Office for National Statistics (ONS; [2018](#)) recommendation for measuring loneliness in adults; the two differences are [1] that the ONS recommends a single-item “direct measure of loneliness” as the fourth item (i.e., “How often do you feel lonely?”), and [2] that the Likert scale for this item (and only this item) ranges from 1-5 (“Often/always, Some of the time, Occasionally, Hardly ever, Never”) instead of 1-3 (“Hardly ever or never, Some of the

time, Often”).

In the AoW survey the wording of the first item was changed from “How often do you feel that you lack companionship?” to “How often do you feel that you lack friendship?”.

A systematic review by Cole et al. ([2021](#)) found that the various versions of the UCLA Loneliness Scale were the most commonly used loneliness measures among children and adolescents, but that the psychometric properties for these groups were not robust. Cronbach’s  $\alpha$  indicates acceptable internal reliability for the UCLA-3 and UCLA-4 in the curated dataset (see Table 1).

#### *Youth Activity Profile - Sedentary subscale (YAP-S)*

The youth activity profile ([Saint-Maurice & Welk, 2014, 2015](#)) is a validated [web-based](#) self-report measure of physical activity and sedentary behavior in children and adolescents. Only the sedentary behaviour subscale (YAP-S) was included in the AoW survey. Participants rate 5 items on a 1-5 Likert scale to indicate the amount of time spent on sedentary activities. Higher scores indicate more time spent on sedentary activities.

### **1.2. Modified psychometric scales**

A number of psychometric measures were adapted or partially included in the AoW 2023 survey. Total scores have not been calculated as these modified versions have not been validated. See **Table 2** for a summary.

#### *Adolescent Discrimination Distress Index (ADDI)*

The Adolescent Discrimination Distress Index is a 15-item measure of racial and ethnic discrimination that was validated in adolescents in the USA (Fisher et al., 2000). In the Age of Wonder survey, this scale has been adapted to measure various forms of discrimination (ethnicity, sex/gender, disability, religion, class, neurodiversity, sexuality). Four items were removed (1, 2, 3, and 6), item responses were changed from a 1-5 Likert scale to a binary (yes/no) response, and the wording of some items was adapted (e.g., “hassled by a store clerk” was changed to “hassled by staff in a shop”).

#### *Family Affluence Scale (FAS)*

The FAS is a four-item measure of family affluence that was developed for the World Health Organisation’s *Health Behaviour in School-aged Children 2001/02* (Currie et al., 2004), and validated in a large sample of adolescents from 35 countries (Boyce et al., 2006). The four items ask about the respondent’s family possessions, living space, and frequency of family holidays. In the FAS, responses to two items are on a 0-3 Likert scale, one item is a 0-2 Likert scale, and one is a binary (yes/no) response. In the AoW 2024/24 survey, the three Likert scale item responses were changed to binary (yes/no) responses. The wording of the questions was altered, and an additional item was added which asks whether the participant has their own mobile phone.

#### *General Help Seeking Questionnaire (GHSQ)*

The GHSQ (Wilson et al., 2005) is a 10-item measure of help-seeking. Each item describes a potential source of help (e.g., “Parent”, “Mental health professional”, “Phone helpline”) and participants respond on a 1-7 Likert scale to indicate how likely they would be to seek help from that source (higher scores indicate greater likelihood). The GHSQ is formed of two subscales, measuring help seeking in response to personal/emotional problems, and help seeking in response to suicidal thoughts, respectively. The Aow survey includes only the first of these two subscales.

One point (8) was added to the Likert scale for the first item (1.a), to indicate “I don’t have a girlfriend, boyfriend or partner”. The last item (1.j, “I would seek help from another not listed above”) was changed from 1-7 Likert scale to a binary (yes/no) response. One item was added (between items 1.h and 1.i) to measure the likelihood that participants would seek help with personal/emotional problems from a teacher. The order of GHSQ items was otherwise preserved, and the wording was modified for some items (e.g., “Intimate partner (e.g., girlfriend, boyfriend, husband, wife, de’ facto)” changed to “Girlfriend/boyfriend or partner”; “Phone helpline (e.g. Lifeline)” changed to “Phone helpline (e.g. lifeline/samaritans/NSPCC)”).

#### *Physical Activity Questionnaire for Adolescents (PAQ-A)*

The PAQ-A is a 10-item self-report scale designed to measure adolescents’ physical activity over the previous 7 days (Kowalski et al., 2004). Items 2-6 measure physical activity at different times during the week (during PE, at lunch, after school, in the evening, on the weekend) on a 1-5 Likert scale, with higher scores indicating more physical activity. Item 10 asks whether the respondent was sick, or whether anything else prevented them from taking part in physical activity in the last week (with a binary yes/no response). These 6 items were included in the Aow survey, and 3 bespoke items were added. Two of the bespoke items ask about active travel to and from school, respectively, similar to items on the Youth Activity Profile - Activity subscale (YAP-A; [Saint-Maurice & Welk, 2014, 2015](#)). The third additional item asks about physical activity at break time, again similar to an item on the YAP-A, and similar to the item that distinguishes the PAQ-A from the Physical Activity Questionnaire for Children (Kowalski et al., 2004).

#### *Psychosis-Like Symptoms (PLIKS-8)*

The PLIKS-8 (as referred to in the Aow protocol, Shire et al., 2024) consists of 24 items designed to capture psychosis-like experiences, based on the semi-structured interview administered in the Avon Longitudinal Study of Parents and Children (ALSPAC) birth cohort and described by [Horwood et al. \(2008\)](#). Eight items ask about specific psychosis-like experiences including hallucinations (auditory and visual) and delusions (spied on, persecution, thoughts being read, reference, control, grandiose ability), with responses on a 1-3 Likert scale (1 = Yes, definitely; 2 = Yes, maybe; 3 = No, never). Each of these eight items has one or more follow-up questions such as “how upsetting did you find this?” (on a 1-4 Likert scale from 1 = Not at all upsetting, to 4 = Very upsetting) and “How often [did you experience this] in the past year?” (with five response options: 1 = Once or twice; 2 = Less than once a month; 3 = More than once a month; 4 = Nearly every day; 5 = Not at all).

This is not a validated self-report measure of psychosis or psychosis-like experiences, and there is no guidance on creating scale sum scores. However, researchers may wish to investigate specific psychosis-like experiences for their prevalence or correlation with other variables.

### **1.3. Scales removed from the AoW survey for 2023-24**

A further three scales were listed in the AoW protocol (Shire et al., 2024), but were removed when the AoW survey was revised for the 2023/2024 wave of data collection.

#### *Multidimensional Scale of Perceived Social Support (MSPSS)*

The MSPSS ([Zimet et al., 1988](#)) is a measure of perceived social support that was removed from the revised AoW 2023/2024 survey. A small number of bespoke questions in the AoW survey ask about social support: “There is an adult at school I can talk to if something is worrying me”, “How many in-person friends do you have?”, “How many online friends do you have?”, “Do you have any close friends?”.

#### *Pupils Attitudes Towards Technology (PATT)*

The PATT ([Ardies et al., 2013](#)) is a measure of attitudes towards technology that was removed from the revised AoW 2023/2024 survey. A range of bespoke questions in the AoW survey ask about digital and social media, including social media platforms used, time spent using them, and positive and negative experiences of using social media.

#### *Striving Against Inferiority Scale (SAIS)*

The SAIS ([Gilbert et al., 2007](#)) is a measure of social striving to avoid perceived inferiority, which was removed from the revised AoW 2023/2024 survey. A number of bespoke questions in the AoW 2023/2024 survey cover some similar themes, such as: “How often do you think that people compare you to others to see if you match up?”, “Would you say your family is richer compared to your friends?”, and seven questions relating to academic pressure from school/family.

**Table 1***Validated psychometric scales in the Age of Wonder 2023-2024 data (N = 7555)*

Scale	Construct(s)	N items	Likert scale	Range	Higher score indicates	Year group(s)	N valid responses	Cronbach's $\alpha$	Modified wording
BRS	Resilience	6	1-5	6-30	Greater resilience	8	1792	.63	
EDEQ-S	Eating Disorder	12	0-3	0-36	Greater severity	8, 9, 10	6411	.92	?
RCADS	Anxiety	15	0-3	0-45	Greater severity	8, 10	3970	.90	
	Depression	10	0-3	0-30	Greater severity	8, 10	3754	.91	
	Total	25 (anxiety + depression subscales)	0-3	0-75	Greater severity	8, 10	3891	.94	
SWEMWBS	Wellbeing	7	1-5	7-35	Greater wellbeing	8, 9, 10	6854	.80	
SDQ	Conduct problems	5	0-2	0-10	More problems	9	2417	.62	
	Hyperactivity/impulsivity	5	0-2	0-10	More problems	9	2413	.76	
	Emotional problems	5	0-2	0-10	More problems	9	2439	.80	
	Peer problems	5	0-2	0-10	More problems	9	2419	.56	
	Externalising problems	10 (conduct + hyperactivity subscales)	0-2	0-20	More problems	9	2361	.80	
	Internalising problems	10 (emotional + peer subscales)	0-2	0-20	More problems	9	2384	.79	
	Total difficulties	20 (externalising + internalising subscales)	0-2	0-40	More problems	9	2294	.84	
	Prosocial behaviour	5	0-2	0-10	More prosocial behaviour	9	2443	.68	
UCLA-3	Loneliness	3	1-3	3-9	Greater loneliness	8, 9, 10	7166	.82	Yes
UCLA-4	Loneliness	4	1-3	3-12	Greater loneliness	8, 9, 10	7131	.86	Yes
YAP-S	Sedentary activity	5	1-5	5-25	More time spent on sedentary activity	8, 9, 10	6597	.53	

*Note.* BRS = Brief Resilience Scale; EDEQ-S = Eating Disorder Examination Questionnaire - Short; RCADS = Revised Children's Anxiety and Depression Scale; SWEMWBS = Short Warwick–Edinburgh Mental Well-being Scale; SDQ = Strengths and Difficulties Questionnaire; UCLA-3 = University of California, Los Angeles Loneliness Scale - 3 item version; UCLA-4 = University of California, Los Angeles Loneliness Scale - 4 item version; YAP-S = Youth Activity Profile - Sedentary subscale. Cronbach's  $\alpha$  refers to internal consistency among participants who completed the whole scale in the Age of Wonder 2023-2024 data. Values between .70-.95 indicate acceptable internal consistency reliability.

**Table 2***Psychometric scales substantially modified or removed from the Age of Wonder 2023-2024 data*

Scale	Construct	Year Group(s)	Item(s) removed	Response scale(s) changed	Order changed	Modified wording	Modification(s)
ADDI	Discrimination distress	8, 9, 10	1, 2, 3, 6	Yes	Yes	Yes	Four of fifteen items removed. Likert scale (0-5) responses to all items changed to binary (yes/no) response. Adapted to measure various forms of discrimination in addition to racial discrimination.
FAS	Family wealth	8, 9, 10	-	Yes	Yes	Yes	Likert scale responses to items 1, 3, and 4 changed to binary (yes/no) responses. Item 3 was already a binary response.
GHSQ	Help seeking	8, 9, 10	-	Yes	Yes	Yes	Likert scale (1-7) response to one item (1j) changed to binary (yes/no) response. If appropriate, responses to this item could potentially be pro-rated to calculate GHSQ total scores. An additional, non-GHSQ item asks about seeking support from a teacher.
MSPSS	Social support	-	All	-	-	-	Whole scale removed.
PAQ-A	Physical activity	8, 9, 10	1, 7, 8, 9	No	Yes	No	Four items removed, three items added.
PATT	Attitudes towards technology	-	All	-	-	-	Whole scale removed.
PLIKS-8	Psychosis-like experiences	10	NA	NA	NA	NA	These questions were adapted from a structured clinical interview and have not been validated as a self-reported scale. Questions ask about eight psychosis-like experiences, with various follow-up questions and varying likert scale lengths/interpretations.
SAIS	Social striving	-	All	-	-	-	Whole scale removed.

*Note.* ADDI = Adolescent Discrimination Distress Index; FAS = Family Affluence Scale; GHSQ = General Help Seeking Questionnaire (personal or emotional problems subscale only); MSPSS = Multidimensional Scale of Perceived Social Support; PAQ-A = Physical Activity Questionnaire for Adolescents; PATT = Pupils Attitudes Towards Technology; PLIKS-8 = Psychosis-Like Symptoms Questionnaire; SAIS = Striving Against Inferiority Scale.

**Table 3***Exposures measured in the Age of Wonder 2023-2024 data*

<b>Exposure</b>	<b>Year group(s)</b>	<b>N responses</b>	<b>Variable description</b>
Religion	8, 9, 10	7485	A question regarding the participant's religious beliefs with a categorical response.
Sleep	8, 9, 10	6775 - 7007	Questions regarding sleep and wake times on school and non-school nights, as well as quality of sleep and feeling of tiredness throughout the day.
Identity and discrimination	8, 9, 10	6376 - 6521*	This section assesses participants' perceived experiences of discrimination across various settings and identifies the aspects of their identity they believe were the basis for these incidents. Reasons for discrimination include ethnicity, sex/gender, disability, religion, class, neurodiversity, sexuality and an 'other' category.
School experience	8, 9, 10	6706 - 6924	Questions regarding enjoyment of school, problems with bullying, as well as feelings of safety, trust and pressure
Activities	8, 9, 10	7285 - 7374	Questions regarding the types of activities people have participated in over the past month. Responses are on a 3-point Likert-type scale. Questions cover participation in/attendance at events focussing on music, writing, volunteering, art, visual, reading, poetry, performance, parties, museums, political, religious, gaming, spectating, theatre, clubbing, scouts, and library.
Special educational needs	8, 9, 10	7293	One question regarding SEN provision. 3-point Likert-like response.
Smoking/vaping	8, 9, 10	7197 - 7258*	Initial questions regarding whether a person smokes or vapes and follow-up questions regarding their frequency of smoking or vaping behaviour

Alcohol	8, 9, 10	7237*	Initial question regarding whether the person has ever tried alcohol, then follow-up questions regarding age at first alcoholic drink, drinking frequency, and binge drinking.
Drugs	8, 9, 10	7257*	A general question regarding whether the person has ever taken drugs, followed-up with more specific questions on the type of drugs taken and the frequencies of drug taking.
Gambling	8, 9, 10	6284*	Questions regarding the types and frequency of gambling practices
Social Media	8, 9, 10	7555**	Questions regarding social media use, frequency of use, and positive and negative experiences of use
Natural environment	8, 9, 10	6791 - 6964	Questions regarding access to green space in winter and summer months, opinions on air quality, and feelings regarding the future of the environment
In-game purchases	8, 9, 10	6802*	Questions regarding money spent on in-game purposes.

\* Initial questions, not including follow-up responses

\*\* No/NA responses are unclear for some variables