

Abstract

Background and Objectives

Intolerance of Uncertainty (IU) may be important for the development and maintenance of anxiety disorders but research with preadolescent children has relied entirely on questionnaire measures to assess IU. Here we aimed to develop a behavioural measure of IU that was appropriate for preadolescent children by adapting the beads task (Jacoby, Abramowitz, Buck, & Fabricant, 2014).

Methods

Participants were 51 typically developing children (26 female; 7 to 11 years). We examined first whether preadolescent participants could understand and complete the task, then how participants responded to varying levels of uncertainty. We also conducted exploratory analyses regarding associations between task measures and questionnaire measures of IU, anxiety and worry.

Results

Overall, the adapted Beads Task appears suitable for preadolescent children and is able to capture reactions to uncertainty. At least some of these reactions are related to questionnaire measures of IU and anxiety. Implications and areas for future research are discussed to provide insights into how behavioral tasks examining responses to uncertainty can improve our understanding of IU.

Limitations

The sample size was relatively small. There was no control task or condition without uncertainty.

Conclusions

Overall, the adapted Beads Task appears suitable for preadolescent children and is able to capture reactions to uncertainty. This type of behavioral task would be appropriate for use in future research that aims to improve our understanding of IU in children.

Keywords: Anxiety, Uncertainty, Behavioural assessment, Decision making

Recent theoretical and empirical work suggests that a fundamental fear of the unknown underpins anxiety (Carleton, 2016a). This is captured by the construct Intolerance of Uncertainty (IU). Individuals who are high in IU are described as having a “dispositional incapacity to endure an aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty” (Carleton, 2016b, p. 32). IU in adults is associated with elevated worry and anxiety in clinical and nonclinical samples (e.g. Counsell et al., 2017; Holaway, Heimberg, & Coles, 2006; Mathes et al., 2017; Sexton & Dugas, 2009). A recent meta-analysis confirmed these associations exist in children and young people as well (Osmanağaoğlu, Creswell, & Dodd, 2018); however, IU research with children has relied heavily on questionnaire measures to capture IU; of the 31 studies included in the Osmanağaoğlu et al., (2018) meta-analysis, 29 relied on questionnaires. Limitations of questionnaires include socially desirable responding, shared method variance with symptom measures, and that respondents can only report on behaviors and internal states they are conscious of.

Behavioral tasks that capture responses to uncertainty can overcome these limitations and have a number of other benefits. First, task parameters can be manipulated to inform the context within which people who are high in IU and anxiety/worry respond differently to uncertainty, which will help to clarify the precise nature of IU as a construct. Second, behavioural tasks may be able to capture IU in preadolescent children, where self-report may be unreliable (Comer et al., 2009; Cowie, Clementi, & Alfano, 2016) and ultimately be used to examine the role of IU in the development of anxiety.

IU related behaviours were described by Sankar, Robinson, Honey, and Freeston (2017) to include avoidance, flip-flopping between decisions, making snap decisions, and seeking more information. Behavioral tasks that have been used in adults to assess reactions to uncertainty have shown that higher uncertainty is associated with greater worry

(Ladouceur, Gosselin, & Dugas, 2000), expectations of threat (as measured by skin conductance and self-report) (Grupe & Nitschke, 2011), anticipatory anxiety (Oglesby & Schmidt, 2017), threat bias (Calvo & Castillo, 2001), a need for more information (Jacoby et al., 2014) and a need to end the uncertainty, even at the expense of being right (Bensi & Giusberti, 2007). Responses on behavioral tasks appear to be significantly associated with self-reported IU in adults (Grupe & Nitschke, 2011; Jacoby et al., 2014; Ladouceur et al., 2000; Oglesby & Schmidt, 2017).

No studies have examined behavioral manifestations of IU in pre-adolescent children. However, two studies have used a behavioral task based on a higher or lower card game to examine IU in adolescents aged 13 and 17 years (Krain et al., 2008; Krain et al., 2006). Longer reaction times were found among uncertain conditions indicating that the task captured behavioral responses to uncertainty. Notably, self-reported IU was significantly associated with task-related anxiety and certainty ratings (Krain et al., 2008) but not with decision making time (Krain et al., 2008; Krain et al., 2006).

In this study we examined whether ‘The Beads Task’ (TBT), a task previously been used to explore IU in adults (Jacoby et al. (2014), could be used to capture reactions to uncertainty in preadolescent children. TBT is a probabilistic inference task that involves deciding which jar a series of beads have been drawn from, with uncertainty manipulated via the colour ratio of beads within each jar. In adults, increased uncertainty resulted in longer decision making time, greater information seeking behaviour and more distress; and TBT variables showed associations with IU and worry (Jacoby et al., 2014).

Our first and primary aim was to adapt TBT and examine the suitability of the adapted task for assessing reactions to uncertainty in preadolescent children. TBT had three levels of uncertainty (low, moderate, high) and was deemed suitable if the following criteria

were met: participants could complete the task; accuracy of responses significantly different to chance; and subjective task-related certainty decreased as uncertainty level increased. The second aim was to explore how uncertainty affected decision making time, information seeking behavior, and task related worry. We also checked whether responses to uncertainty were significantly associated with age and cognitive ability. The final aim was to conduct a preliminary evaluation into whether the reactions to uncertainty captured by the task are related to self-report IU, anxiety, and worry. The study was not powered for this final aim and it should be considered exploratory.

Given that all conditions included some uncertainty, we hypothesized that IU, anxiety, and worry would be associated with the number of beads requested, decision making time, task-related certainty and worry. Given that associations may vary across levels of uncertainty, interactions between uncertainty level and IU, anxiety and worry were also examined, although these were exploratory.

Method

Participants

Participants were 51 typically developing children (26 female) aged between 7.58 and 11.54 years ($M=9.42$, $SD=1.1$) recruited via local advertising through schools, magazines and flyers in public places. Table 1 provides further details of the sample. To have 80% power to detect a medium-sized effect of partial eta squared = 0.06 for repeated measures within factors ($\alpha = .05$, non-sphericity correction = 1), 42 participants are needed. Using these parameters, with 51 participants, the study had 98% power to detect a medium-sized effect.

Measures

Intolerance of Uncertainty for Children (IUS-C)-Child & Parent Report. The IUS-C is adapted from the Intolerance of Uncertainty Scale for adults (Freeston et al., 1994), and has been validated for use with children aged between 7 and 17. The full IUS-C is a 27-item self-report measure with two parallel forms (child and parent). Responders indicate how characteristic each item is of themselves/their child. Both the child and parent form have demonstrated strong convergent validity and internal consistency (Comer et al., 2009). Recent research indicates that there are some problems with the factor structure of the full IUS-C and recommend using the 12 items from the full IUS-C that correspond to the IUS-12, most commonly used with adults (Osmanağaoğlu, Creswell, Snuggs, Stuijzand & Dodd, in press). Internal consistency was Cronbach's $\alpha = .89$ for the child report and Cronbach's $\alpha = .95$ for child report.

Spence Child Anxiety Scale (SCAS) – Child & Parent Report. The SCAS is a measure of child anxiety symptoms comprising 38 items (Spence, 1998). Responders indicate how often each of the items happens to them/their child. The internal consistency is excellent and the measure shows convergent and divergent validity (Nauta et al., 2004; Spence, 1998). In this sample, internal consistency was high (.87 child report; .89 parent report).

Penn State Worry Questionnaire for Children (PSWQ-C). The PSWQ-C is a 14 item self-report measure of worry (Chorpita, Tracey, Brown, Collica, & Barlow, 1997). Responders indicate how typical each of the items is of them. The measure demonstrates convergent and discriminative validity (Chorpita et al., 1997; Pestle, Chorpita, & Schiffman, 2008). Internal consistency here was high (.91).

Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II). The WASI-II is a reliable and time-efficient assessment of intelligence composed of four subtests (vocabulary, similarities, block design, and matrix reasoning) suitable for ages 6 to 90 years. The WASI demonstrates good concurrent validity, has excellent internal consistency and

good test-retest reliability (McCrimmon & Smith, 2012). Here, only the vocabulary and matrix reasoning subtests were administered. These can be used to provide an estimate of Full Scale IQ (WASI-II; Wechsler, 2011) but raw scores are used here to allow comparison of absolute rather than relative cognitive ability across children of varying ages.

The Beads Task (TBT)

TBT was designed for participants to work out which jar a selection of beads had been taken from. Following Jacoby et al. (2014) there were three conditions that varied in uncertainty (Low Uncertainty (LU); Moderate Uncertainty (MU) and High Uncertainty (HU)), and 3 trials per condition gave 9 trials in total (see Figure 1). As in Jacoby et al. (2014), the selected jar and the sequence of bead presentation were random but predetermined and identical across participants. Participants were able to see the beads taken from the jars to eliminate memory bias. We adapted the task used by Jacoby and colleagues in the following ways: we conducted TBT in person using pom-poms to make TBT more engaging; the ratio in the high uncertainty condition was changed from 44:28:28 to 50:25:25; we added a visual of the jars to remove reliance on memory; the maximum number of beads requested before making a decision was changed from 30 to 20.

Prior to the task, we checked that participants could identify the colours. The set of jars was then introduced and participants' understanding of the proportions in each set of jars was checked (e.g. which jar has more red beads?). Participants were told that one set of jars (LU/MU/HU) would be used at a time. The jars were then hidden from sight but a picture of the jars was placed in front of the child. The participants were informed that the experimenter would take beads out of one of the jars, one at a time, and that their job was to judge which jar had been chosen on the basis of the colour of the beads that children retrieved. After each bead was drawn and shown, the participants were given two options: (1) decide which jar the

participants thought the beads had been drawn from, (2) request another bead. Participants could only select one jar per bead and could not change their decision. They were told to be as certain as possible before deciding. During the task, participants tracked the colour of the beads drawn using a tracking sheet to ensure memory did not affect performance. They were told that the maximum number of beads that could be requested for each trial was 20. When participants reached the maximum number of beads the participants were given two options: (1) make a decision or (2) skip making a decision and go on to the next trial.

For each trial, the experimenter recorded (a) number of beads requested before making a decision (information seeking behaviour), (b) number of times the participant skipped making a decision (avoidance), and (c) accuracy of decision. Decision making time was extracted from audio-recordings, specifically (d) total time taken to reach a decision from the first bead presentation to the decision point, and (e) average decision-making time per bead, calculated by dividing (d) by the number of the beads requested. Two postgraduate students (NO & CLP) independently coded the audio data for all participants to calculate the total decision making time across each trial. If calculations differed by more than 1 second between coders, such cases were discussed until consensus was reached. Where differences were less than 1 second, the mean of the two estimates was used for analysis. The average measure ICC was .89.

At the end of each trial, before being told the answer, participants were asked to respond to three questions using a scale from 0 (not at all) to 100 (very much): (f) How certain are you about your decision? (g) How anxious/worried do you feel right now? (h) How important it is for you to get the answer right? (to assess participants' engagement in the task). The task was practiced once and clarification provided if necessary.

Procedure

Participants completed a range of tasks during a 2-hour visit to a campus laboratory. All study procedures were approved by the institutional ethics committee. Parents were informed about the study and demographic information was collected prior to their visit. Parental consent and child assent were obtained at the start of the session. Families were compensated £5 for their time and children were given a small souvenir.

Data preparation

There was a small amount of missing data from the beads task ($< 6\%$ for any variable) due to audio recorder failure or participant non-compliance. Given the low percentage of missing data and the small sample size, we used Expectation Maximization (EM) imputation (Little & Rubin, 1989). Variables were collapsed across trials by calculating the mean for each condition (LU/MU/HU). Five data points were $3.29SDs$ above and below the mean were considered outliers and excluded (three for beads task (two from the same participant) and two for parent SCAS). Task-related certainty and worry ratings were added after data collection had started so analyses involving these variables were conducted with 41 participants. No participants chose not to make a decision after requesting the maximum number of beads, so no analyses are conducted with that variable. Scores on the questionnaire measures were all centred to make interpretation of the results in the general linear model straightforward.

Results

Preliminary analyses

Table 2 shows correlations between questionnaires. Means and standard deviations for questionnaires and cognitive ability are presented in Table 3. Table 4 shows the correlations between age, gender and cognitive ability and each of the four dependent variables from TBT. There was a significant point biserial correlation between gender and

decision-making time ($r=.29, p=.041$), with girls slower than boys. WASI-II scores were significantly positively associated with the number of beads requested ($r=.35, p=.011$), and self-reported certainty ($r=.42, p=.007$) (see Table 4). Results were consistent irrespective of whether gender and cognitive ability were included as covariates or not; for simplicity, the results are presented without covariates.

The suitability of the task

Table 5 shows the means and standard deviations for each variable measured during TBT. All but one participant completed all trials of TBT indicating that participants could complete the task. Participants indicated that it was somewhat important for them to get the answer right across conditions (LU: $M=29.16, SD=31.81$; MU: $M=28.07, SD=30.97$; HU: $M=30.05, SD=32.44$).

Accuracy varied significantly across conditions (see Table 5), $F(2, 100)=58.941, p<.001, \eta^2=.541$. Post-hoc tests revealed significantly higher accuracy for the LU condition than both the MU ($t(50)=11.649, p<.001$) and HU ($t(50)=8.328, p<.001$) conditions, but no significant difference between the MU and HU conditions, $t(50)=1.066, p=.29$.

Self-reported certainty also varied across condition (Table 5), $F(1.267, 50.693)=17.726, p<.001, \eta^2=.307$. Post-hoc tests showed that higher certainty for the LU condition than both the MU, $t(40)=4.355, p<.001$; and HU, $t(40)=4.420, p<.001$, conditions and more certain for MU than HU, $t(40)=2.183, p=.035$.

Overall, these results indicated that the task appears suitable for preadolescent children.

The effect of uncertainty

We conducted three repeated measures ANOVAs to examine the effects of condition on three dependent variables (decision making time, number of beads requested and self-reported worry).

Subjective task measure. The main effect of condition was significant for task-related worry, $F(1.673, 66.913) = 12.333$, $p < .001$, $\eta^2 = .236$. Participants' worry was significantly lower for the LU condition than both the MU, $t(40) = 2.501$, $p = .017$, and HU, $t(40) = 4.216$, $p < .001$ conditions. The participants were also less worried for MU than HU trials, $t(40) = 3.142$, $p = .003$.

Objective task measures. Decision making time did not significantly vary by condition, $F(2, 98) = 2.381$, $p = .098$, $\eta^2 = .046$; but the number of beads requested did, $F(1.639, 78.695) = 28.101$, $p < .001$, $\eta^2 = .369$. Children requested more beads on HU than MU, $t(48) = 4.050$, $p < .001$, and LU, $t(48) = 6.333$, $p < .001$, trials, and more beads on MU than LU trials, $t(48) = 4.306$, $p < .001$.

Does the task capture self-reported IU, anxiety, and worry?

There were five variables from questionnaire measures: IU reported by children and parents, anxiety reported by children and parents, and worry reported by children. General Linear Models were conducted with condition as a repeated measures factor (LU, MU, HU) and each of the questionnaire measures included independently as a continuous predictor. The models were conducted with the following dependent variables: task-related worry, task-related certainty, mean decision making time and number of beads requested. Because these analyses were exploratory, we chose not to correct for multiple comparisons but the findings should be treated as preliminary; only effects that were significant at $p < .05$ or approaching significance are described.

For IU, there was a significant main effect of child-report IU on task-related worry, $F(1, 39) = 7.839, p = .008, \eta^2 = .167$, and a significant interaction between IU and condition on task related worry, $F(1.721, 67.108) = 3.331, p = .049, \eta^2 = .079$. To explore this interaction, IU scores were centred at 1SD above and 1SD below the mean. A significant main effect of condition was found when IU was high, $F(1.721, 67.108) = 13.636, p < .001, \eta^2 = .259$; but not when IU was low, $F(1.721, 67.108) = 2.174, p = .121, \eta^2 = .053$ (see Figure 2). For certainty rating, there was a medium-sized main effect of IU on task-related certainty, that did not reach statistical significance, $F(1, 39) = 2.007, p = .164, \eta^2 = .049$, and an interaction between IU and condition on certainty ratings, which approached significance, $F(1.275, 49.736) = 2.892, p = .086, \eta^2 = .069$. To explore this interaction IU scores were centred at 1SD above and 1SD below the mean. A significant main effect of condition was found when IU was high, $F(1.275, 49.736) = 17.076, p < .001, \eta^2 = .305$; but not when IU was low, $F(1.275, 49.736) = 3.469, p = .059, \eta^2 = .082$ (see Figure 3).

For parent-reported IU these results were not replicated. There was some evidence of a main effect of IU on task-related worry based on the effect size, but this did not reach statistical significance, $F(1, 39) = 2.401, p = .129, \eta^2 = .058$. There was no main effect of parent-reported IU on task-related certainty, $F(1, 39) = 0.100, p = .753, \eta^2 = .003$. Interestingly, there was a significant main effect of parent-report IU on decision making time, $F(1, 47) = 7.013, p = .033, \eta^2 = .093$; children who have greater IU as reported by parents also took longer to make a decision across task conditions. The same effect was not found for child-reported IU.

For anxiety, a significant interaction was found between child-reported anxiety and condition on task related worry, $F(1.730, 67.469) = 3.632, p = .038, \eta^2 = .085$. To explore this interaction, anxiety scores were centred at 1SD above and 1SD below the mean. A significant main effect of condition was found when anxiety was high, $F(1.730, 67.469) = 14.787,$

$p < .001$, $\eta^2 = .275$; but not when anxiety was low, $F(1.730, 67.469) = 2.023$, $p = .146$, $\eta^2 = .049$ (see Figure 4). This interaction was not supported by the parent-reported anxiety measure but a significant main effect of parent-reported anxiety on decision-making time was found, $F(1, 48) = 7.526$, $p = .009$, $\eta^2 = .136$; children reported to have higher anxiety had longer decision making times across all conditions. The main effect of child-reported anxiety on decision making time was not significant.

Discussion

This is the first study to examine behavioural reactions to uncertainty in preadolescent children. Our first aim was to adapt the beads task and examine the suitability of the adapted task for preadolescent children. Overall, the results indicated that children were able to follow the task instructions, there was minimal missing data, the participants were more accurate and more certain in conditions where uncertainty was low, as would be expected, and the children rated that it was at least somewhat important for them to be accurate indicating the participants engaged in the task.

The second aim was to examine reactions to uncertainty in preadolescent children. Based on research with adults, we hypothesized that there would be changes in decision making time, information seeking behavior, and task related worry across levels of uncertainty. These hypotheses were partially supported. As anticipated, participants were more worried and requested more information as uncertainty increased. However, uncertainty condition did not affect decision making time.

The final aim was to explore whether the task might capture responses to uncertainty that are related to questionnaire measures of IU, anxiety, and worry. The analyses were exploratory but the results provide some indication that the adapted task is able to capture reactions to uncertainty that are associated with IU and anxiety. Taking IU first, task-related worry and certainty on the beads task were both associated with self-reported IU. These main

effects were qualified, in both cases, by an interaction with condition; the uncertainty manipulation across condition had a stronger effect on certainty and worry ratings for children higher in IU than those lower in IU. For worry, the highest ratings were found for children high in IU in the most uncertain condition, as would be expected (see Figure 2). Surprisingly though, for certainty, although children higher in IU were more affected by uncertainty level, their ratings of certainty were consistently higher (they felt more certain; see Figure 3) than the ratings of children lower in IU.

The main effects and interactions found for child-reported IU were not replicated with parent-reported IU. Interestingly though, parent-reported IU was associated with decision-making time across condition, with children higher in IU taking longer to make decisions. Neither child nor parent reported IU was significantly associated with the number of beads requested. This pattern of results could be interpreted as evidence that questionnaire measures of IU may capture subjective, affective reactions to uncertainty when pre-adolescent children self-report. This is consistent with the findings of Krain and colleagues (Krain et al., 2006; Krain et al., 2008) who also found that self-reported IU was associated with subjective worry and certainty but not behavioural measures such as decision making time. Parents, on the other hand, may be more likely to respond to items on the questionnaire measure of IU on the basis of observable behaviour and we may therefore expect to see more associations with behaviour when we use parent-report of IU. This is very speculative but may be of interest to consider in future research.

For anxiety, there was also some evidence of association with task variables. For example, parent-reported anxiety was positively associated with decision-making time. In addition, a significant interaction was found between uncertainty level and child-reported anxiety in relation to task-related worry. This was driven by uncertainty having a greater

effect on worry in participants with higher levels of anxiety than those with lower levels of anxiety.

Surprisingly, child-reported worry as measured using the PSWQ did not correspond to any of the task-related variables. This is surprising given that one of these variables was a rating of worry. The reasons for this remain unclear but could relate to the children having difficulty providing valid responses to the PSWQ after having already completed the IUS-C and SCAS.

Taken together, the results provide some support for the construct validity of the task as associations were found with both IU and anxiety, albeit not consistently across reporters. One of the challenges of designing and validating behavioural measures of IU is that the latent construct of IU may affect behaviour and performance under uncertainty in ways that are not easily captured by IU questionnaires. This means that responses on behavioural tasks may not always align with scores from questionnaire measures of IU. This does not necessarily mean though that they are not capturing behaviour that is relevant to IU as a latent construct. What is needed, as outlined by Shihata et al. (2016), is experimental studies that capture reactions to uncertainty and that can be used alongside measures of anxiety, worry and self-reported IU to better clarify the construct of IU.

It is important to note that we had anticipated that IU, anxiety and worry might interact with task uncertainty level such that stronger effects would be found at higher levels of uncertainty. There was some evidence for this but it was not found consistently. This is difficult to interpret fully because the beads task has no certain condition and there was no comparison task without uncertainty. This raises the question of whether we would find that children higher in IU and anxiety would feel less certain, more worried and take longer to make decisions, regardless of what task they were completing. This is a limitation of the study design but the interactions between IU/anxiety and uncertainty level demonstrates that

these effects were related to uncertainty. If the effects were generic, we would not expect to see any systematic variation by uncertainty condition.

Sankar et al. (2017) highlight that a range of behaviors may be observed when individuals who are high in IU are faced with uncertainty (e.g. avoidance, flip-flopping between decisions, making snap decisions, and seeking more information). This range of behaviours can be captured by the beads task, with the exception of avoidance. We provided an option to skip making a decision in an attempt to capture avoidance however no participants chose to skip at any point. The reason for this might be that avoidance was only an option after all possible information had been sought and uncertainty had therefore decreased. Future studies might benefit from an option to avoid making a decision about the jar after each bead has been given rather than waiting until the maximum number of beads has been reached.

It is important to highlight that TBT relies on probabilistic uncertainty, yet there are of course many other types of uncertainty, for example, uncertainty when information is vague or open to interpretation (ambiguity), when one is aware that information is missing (known unknowns), and when one is not aware that information is missing (unknown unknowns). We can also distinguish between epistemic uncertainty, which resides in the internal world due to lack of knowledge, and physical uncertainty which resides in the external world (Robinson, Martin, Beck, Dan, & Apperly, 2006). We don't yet know whether individuals high in IU are consistent in their reactions to all types of uncertainty or whether certain types of uncertainty are particularly problematic and for whom. The development of a wider battery of behavioural tasks to assess responses to the broad range of types of uncertainty is likely to be required to answer these questions.

Although the study has a number of strengths, the findings need to be considered in the context of limitations. In particular that we used a community sample which lacked

diversity. It is possible therefore that different results would be found with a clinically anxious group. We made a decision to focus first on the development of the task with preadolescent children before beginning research with a clinically anxious sample. This paper presents the task, along with evidence that it is appropriate for use with children and, in doing so, paves the way for future research with clinically anxious samples. A second limitation is that while the sample size was appropriate for our primary aims, investigations of associations with questionnaire measure can only be considered to be exploratory and some potentially important small or medium sized effects may have been missed.

Conclusion

The vast majority of studies of Intolerance of Uncertainty in children have used questionnaire measures which bring a number of limitations. We have provided evidence that a behavioural task can be used to capture reactions to uncertainty among preadolescent children. We strongly encourage researchers to apply behavioural tasks of IU going forwards in order to improve understanding of the nature of children's responses to uncertainty and, in particular, how responses to uncertainty vary across children with and without anxiety disorders.

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Table 1.*Sample Demographics (Parents)*

Total Sample (N=51)	
Marital Status (%)	
Married	80.4
Separated	5.9
Never Married	13.7
Living Arrangements (%)	
Two Parent	90.2
Single Parent	5.9
Step or Blended Family	2.0
Other	2.0
Employment Status (%)	
Full-time Employed	27.5
Part-time Employed	56.9
Full or Part-time Student	2.0
Combined Employment & Study	2.0
At home by choice	7.8
Illness/Disability	3.9
Education Level (%)	
Year 10 or equivalent	5.9
Year 12 or equivalent	9.8
Tafe/Apprenticeship	2.0
Certificate/Diploma	9.8
Undergraduate	25.5
Postgraduate	47.1
Origin (%)	
White-British	84.3
African	2.0
Indian	3.9
Other	9.8

Table 2.*Correlations between self-report measures*

	SCAS-Child Report	SCAS-Parent Report	IUSC – Child Report	IUSC- Parent Report
SCAS-Child Report				
SCAS- Parent Report	.170			
IUSC- Child Report	.769**	.094		
IUSC-Parent Report	.228	.783**	.273	
PSWQ	.659**	.098	.676*	.201

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

SCAS: Spence Child Anxiety Scale, IUSC: Intolerance of Uncertainty Scale for Children, PSWQ: Penn-State Worry Questionnaire

Table 3.*Means & Standard Deviations*

	Mean (SD)		t-test
	Females (N=26)	Males (N=25)	
SCAS Child Report	26.96 (13.07)	28.47 (13.85)	t(49)=.400, p=.69
SCAS Parent Report	21.75 (7.40)	22.49 (14.06)	t(49)=.717, p=.48
IUS-C Child Report	24.20 (9.84)	24.96 (10.57)	t(49)=.266, p=.79
IUS-C Parent Report	24.77 (10.82)	25.66 (12.43)	t(49)=.272, p=.79
PSWQ	14.98 (7.70)	17.52 (10.54)	t(49)=1.173, p=.25
WASI-II	114.89 (14.92)	116.64 (14.59)	t(49)=.252, p=.80

SCAS: Spence Child Anxiety Scale, IUSC: Intolerance of Uncertainty Scale for Children, PSWQ:

Penn-State Worry Questionnaire, WASI-II: Wechsler Abbreviated Scale for Intelligence (Raw Scores)

Table 4.

Correlations Between Dependent Variables, Age, Gender, and WASI-II scores (p-values shown in brackets)

	Age	Gender	WASI-II	Decision-Making Time	Beads Requested	Task-Related Certainty	Task-Related Worry
Age		.046	.177	-.141	.104	.009	-.121
Gender	.046		-.036	.287*	.048	-.233	-.084
WASI-II	.177	-.036		-.147	.353*	.417**	.000
Decision-Making Time	- .141	.287*	-.147		-.115	-.276	.154
Beads Requested	.104	.048	.353*	-.115		-.037	-.083
Task-Related Certainty	.009	-.233	.417**	-.276	-.037		-.013
Task-Related Worry	- .121	-.084	.000	.154	-.083	-.013	

*. Correlation is significant at the 0.005 level (2 tailed)

**. Correlation is significant at the 0.01 level (2 tailed).

Note that 10 cases (19.6%) of task-related self-report certainty and self-reported worry were missing because the task related self-report questions were added to the task after data collection started and 10 children had already completed the whole procedure prior to this amendment.

Table 5.*Means and Standard Deviations for Task Variables*

		Mean (SD)	Sample Size (N)
Self-Reported Certainty *	Low Uncertainty	65.97 (24.71)	41
	Moderate Uncertainty	52.10 (25.36)	41
	High Uncertainty	48.17 (26.38)	41
Self- Reported Worry *	Low Uncertainty	15.54 (16.44)	41
	Moderate Uncertainty	20.09 (21.17)	41
	High Uncertainty	24.62 23.56)	41
Decision- Making Time	Low Uncertainty	4.57 (0.76)	51
	Moderate Uncertainty	4.75 (0.87)	51
	High Uncertainty	4.57 (0.82)	51
Beads Requested *	Low Uncertainty	4.28 (1.95)	51
	Moderate Uncertainty	5.76 (3.13)	51
	High Uncertainty	6.81 (3.40)	51
Accuracy *	Low Uncertainty	2.82 (0.43)	51
	Moderate Uncertainty	1.58 (0.60)	51
	High Uncertainty	1.72 (0.92)	51

Note: * indicates that the repeated measure ANOVA was significant.

Note: 10 cases (19.6%) of task-related self-report certainty and self-reported worry were missing because the task related self-report questions were added to the task after data collection started and 10 children had already completed the whole procedure prior to this amendment.

Figure legends

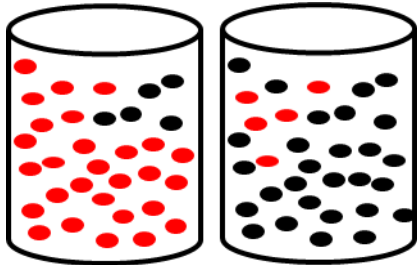
Figure 1: The visual of the beads task.

Figure 2: Interaction between uncertainty level and IU on task-related worry.

Figure 3: Interaction between uncertainty level and IU on certainty ratings.

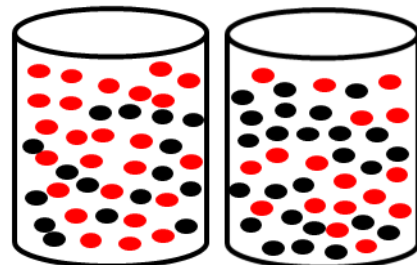
Figure 4: Interaction between uncertainty and anxiety on task-related worry.

Low Uncertainty



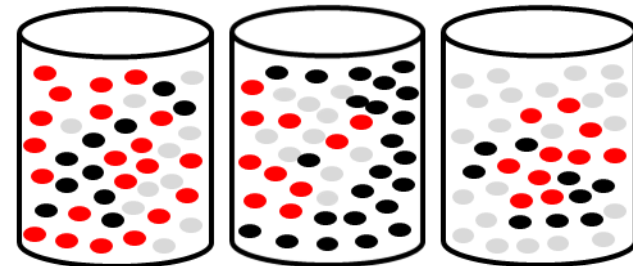
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15 black 15 red

Moderate Uncertainty

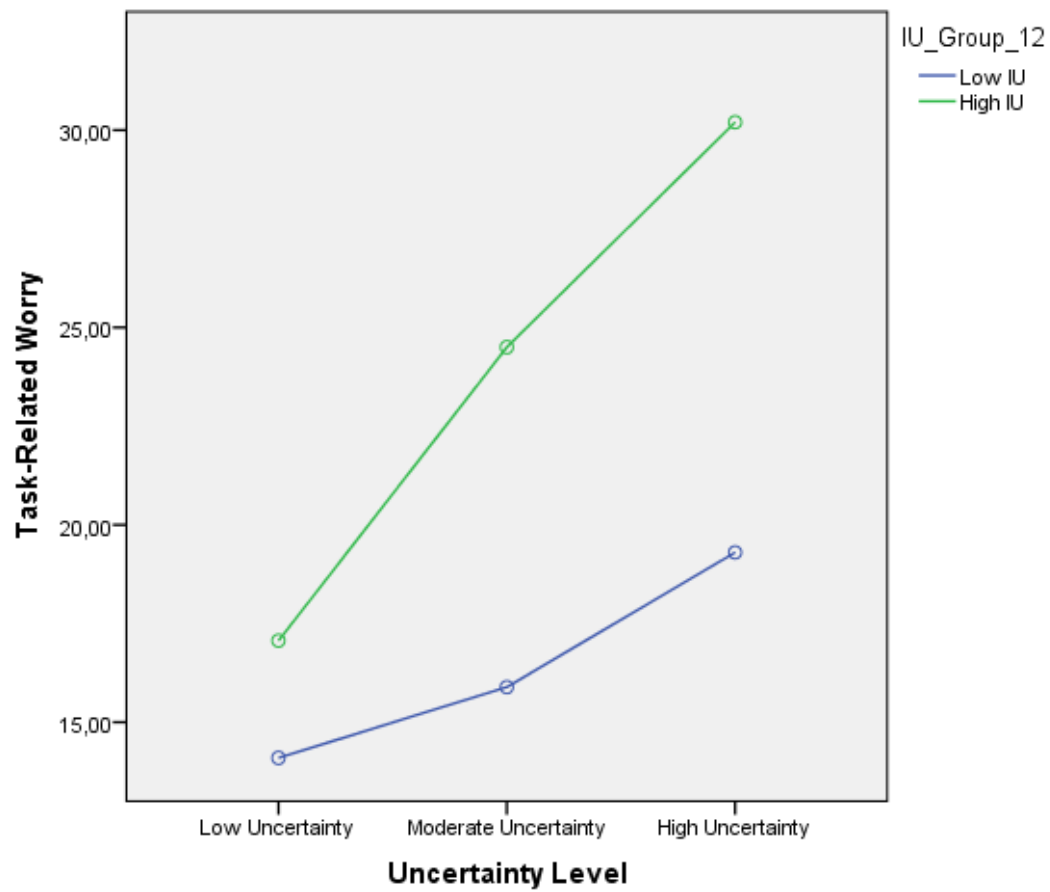


60 red 60 black
40 black 40 red

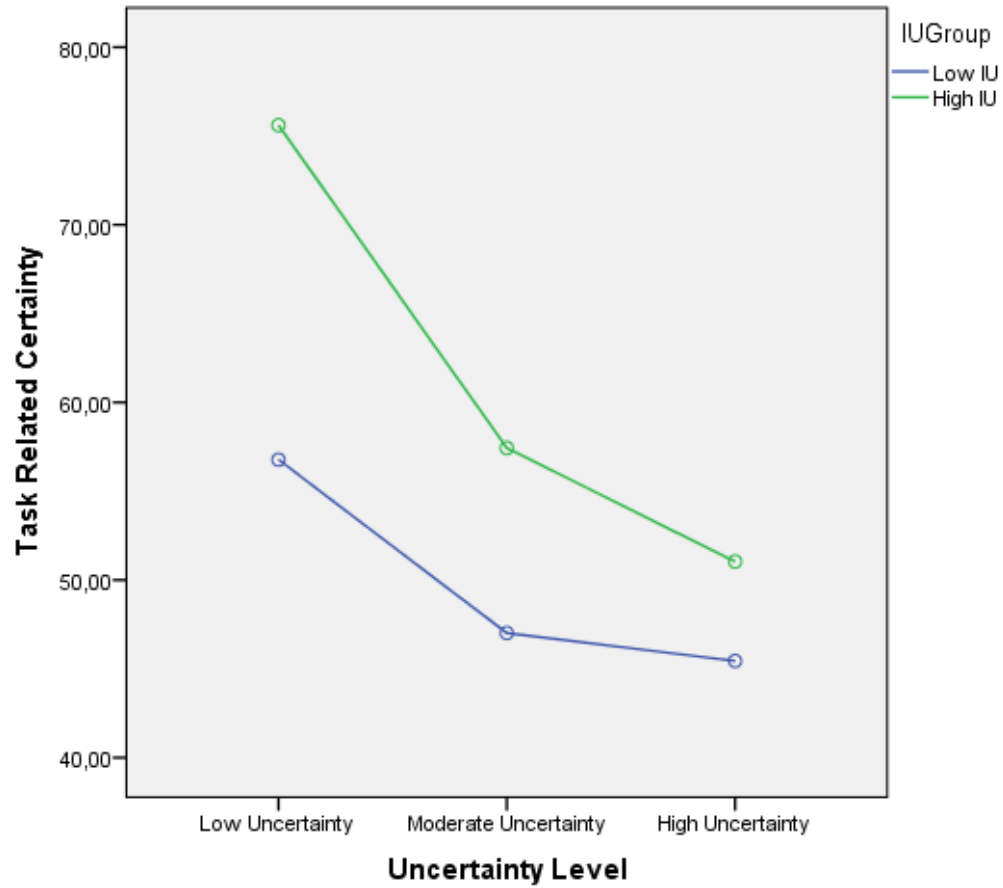
High Uncertainty



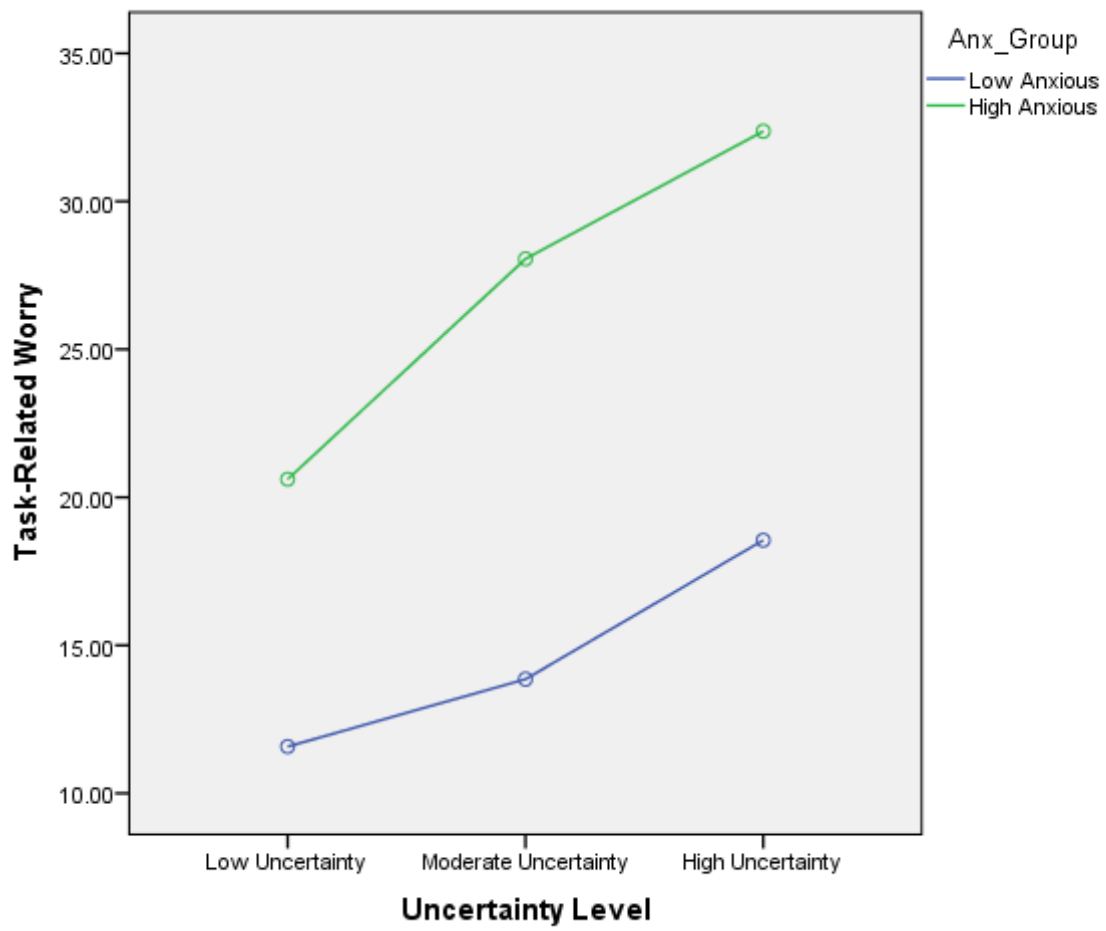
50 red 50 black 50 white
25 black 25 white 25 red
25 white 25 red 25 black



Note: 'For illustrative purposes, participants were divided in to two groups at a cut-off point of the child reported median value (score=23.0)



Note: 'For illustrative purposes, participants were divided in to two groups at a cut-off point of the child reported median value (score=23.0)



Note: 'For illustrative purposes, participants were divided in to two groups at a cut-off point of the child reported median value (score=26.0)