Looking for mediators: cognition, perceived control and coping in the treatment of anxiety-disordered children
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Chapter 3
Perceived control in clinically anxious and non-anxious children indirectly measured with the Implicit Association Procedure (IAP)

Abstract

**Background:** Perceived control is thought to play an important role in the development and maintenance of anxiety disorders in children. The objective of the present study was to further investigate the Perceived Control Implicit Association Procedure (IAP, Hogendoorn et al., 2008) as an indirect measure of perceived control in children.

**Methods:** The IAP was completed by 136 anxiety disordered children (aged 8-18 years old, $M = 12.51$) and 31 non-selected children (8-15 years old, $M = 11.65$). A second control group of 38 non-selected children (aged 8-18 years old, $M = 12.08$) was used to validate the pictorial stimuli in the computer task.

**Results:** First, children were able to correctly classify the pictures into Control and No control categories. Second, as predicted, anxious children reported less perceived control than the control group on both the direct measure (the ACQ-C) and the indirect measure (IAP). For the No Control score however, this was only the case for children younger than twelve years old. Third, test-retest correlation in the anxious group was fair to good ($ICC_{s} .57-.58$).

**Conclusions:** These results suggest that the perceived control IAP is still quite experimental, but could be an interesting departure point for future research on perceived control in children.
Perceived control is assumed to play an important role in the development and maintenance of anxiety disorders in children. Early experiences with uncontrollable situations may lead to a cognitive style of not feeling in control, which in turn may act as a vulnerability to develop negative affect and anxiety (Chorpita, 2001; Chorpita & Barlow, 1998). It has indeed been found that perceived control mediates between family environment (especially high affective involvement and controlling parenting behavior) and negative affect (Ballash, Pemble, Usui, Buckley, & Woodruff-Borden, 2006; Chorpita, Brown, & Barlow, 1998). Moreover, clinically anxious children report lower levels of perceived control than non-anxious children (Weems, Silverman, Rapee, & Pina, 2003). Finally, a reduction of anxiety symptoms after treatment is associated with an increase in self-reported perceived control (Muris, Mayer, den Adel, Roos, & Van Wamelen, 2009). Although the direction of the relationship between perceived control and anxiety is not clear (low perceived control could also be a consequence of heightened anxiety), the two concepts at least seem interrelated.

Perceived control has mainly been studied with a questionnaire, the Anxiety Control Questionnaire for Children (ACQ-C; Weems et al., 2003). However, direct self-reports may be influenced by self-presentational concerns and are bound to introspective limits (Schnabel, Asendorpf, & Greenwald, 2008). An alternative to questionnaires (direct measures) are indirect measures, which have been developed since the late nineties (Hofmann & Schmitt, 2008). These indirect measures, like the Implicit Association Test (IAT) or the Affective Priming task, use reaction times to study the topic of interest, such as anxiety, self-esteem or racial attitudes (see De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009 for a review). The advantage of indirect measures is that they are less susceptible to social desirability or faking (Schnabel et al., 2008) and are not dependent on introspective abilities (Greenwald, Nosek, & Banaji, 2003). Furthermore, indirect measures are assumed to measure other aspects of attitudes and behavior than direct measures. Attitudes are thought to be composed of both propositional (conscious/controlled) and associative (unconscious/uncontrolled) representations (Gschwendner, Hofmann & Schmitt, 2008). These different representations are the result of different forms of information processing and they influence behavior in different ways. Direct measures (questionnaires) are thought to mainly predict controlled behavior and indirect measures (reaction time tasks) are more useful to predict automatic or uncontrolled behavior (Greenwald, Poehlman, Uhlimann, & Banaji, 2009).

In a previous study, we developed the perceived control IAP (Implicit Association Procedure) to measure perceived control in children in an indirect way (Hogendoorn et al., 2008). The perceived control IAP is based on the fact that it is easier to react with a (approach) movement towards oneself (e.g. flexing one's arm) when a concept is associated with oneself, than with a (avoidant) movement away from oneself (e.g. extending one's arm). Conversely, when a concept
is not associated with oneself, it is easier to react with a movement away from oneself than with a movement towards oneself (Schnabel, Banse, & Asendorpf, 2006).

In the perceived control IAP, children see different pictures on a computer screen. Children use a joystick to push the pictures away from themselves or to pull them toward themselves. There are two sets of critical pictures: Control pictures and No control pictures. These pictures respectively represent situations were a child is or is not in control over an anxious situation. It is hypothesized that anxious children find it more difficult than non-anxious children to pull Control pictures towards themselves than to push them away. Also, it is hypothesized that in comparison with non-anxious children, anxious children find it easier to pull No control pictures towards themselves than to push them away. These hypotheses are tested in the IAP with the combination of two different test phases. In one phase of the task children have to pull the No control pictures towards themselves and push the Control pictures away (noncompatible phase). In another phase they have to pull the Control pictures towards themselves and push the No control pictures away (compatible phase). Reaction times from the compatible phase are subtracted from the incompatible phase separate for Control (IAP Control score) and No control pictures (IAP No control score). A positive IAP Control and No control score both reflect a stronger association between oneself and perceived control. The hypothesis is that anxious children have lower IAP Control and No control scores than non-anxious children, indicating less perceived control.

The perceived control IAP proved to be sensitive to anxiety level in a non-selected sample. Children with higher anxiety levels had lower IAP Control and No control scores (Hogendoorn et al., 2008). The objective of the present study was to further investigate the perceived control IAP in a sample of anxious children and a control group. The first research question concerned the validity of the pictorial stimuli in the IAP. Although in an earlier study a relation was found between anxiety and both a direct and indirect measure of perceived control, the correlation between the direct and indirect measure was small and not significant ($r$ .03 to .17; Hogendoorn et al., 2008). Small correlations between direct and indirect measures are not uncommon (Hofmann, Gawronski, Gschwendner, Le and Schmitt, 2005) and may be due to method related factors. Another possible explanation is that direct and indirect instruments measure different components (propositional vs. associative) of an attitude or trait (Gschwendner et al., 2008). However, for the perceived control IAP it has not been ruled out yet that low construct validity (related to the pictures) caused the small correlations with a direct measure of perceived control. For example, it is conceivable that the IAP pictures do not represent Control and No control, but merely positive and negative attributes. Thus, before drawing conclusions based on the IAP, the validity of the pictorial stimuli should be determined. We hypothesized that children would be able to divide the pictures in two categories, but that they spontaneously would characterize them as positive and negative. However, we predicted that when children were forced to divide the pictures in Control and No control (as they are instructed to do in the IAP) they were able to do so.
Second, we examined whether the IAP is able to discriminate between clinically anxious and non-anxious children. We hypothesized that anxious children would have lower IAP Control and No control scores than children in the control group.

Third, we explored age differences on the IAP. In our previous study an interaction effect between anxiety and age was found on the IAP No control score (but not on the IAP Control score): higher anxious children had lower IAP No control scores than lower anxious children, but only if they were younger than 12 years of age (Hogendoorn et al., 2008). As no age difference was found on the direct measure of perceived control, the ACQ-C (Weems et al., 2003; Weems, Costa, Watts, Taylor, & Cannon, 2007), it was hypothesized that this previous result could be due to a lack of anxiety variability in the older group.

The fourth research question concerned the temporal stability of the IAP. Before treatment sensitivity of the IAP can be studied it should be determined whether IAP Control and No control scores remain stable without treatment. We examined eight week test-retest reliability of the IAP in clinically anxious children.

Method

Participants
The anxious group consisted of 136 children referred to one of two centers for child and adolescent psychiatry in the Netherlands (AMC / de Rascule in Amsterdam and UCKJP / Accare in Groningen). Their mean age was 12.51 (SD = 2.85, range 8-18 years) and 44.1% (n = 60) of the sample were boys. They participated in a larger study on mechanisms of change in cognitive behavioral therapy (CBT) for childhood anxiety disorders. Children were included in the study if they had a primary anxiety disorder according to the Anxiety Disorders Interview Schedule for Children (ADIS-C/P) with an exception of OCD or PTSD. Primary diagnoses were Social Phobia (n = 46, 33.8%), Separation Anxiety Disorder (n = 15, 11.0%), Specific Phobia (n = 30, 22.1%), Generalized Anxiety Disorder (n = 31, 22.8%) and Panic Disorder with or without Agoraphobia (n = 14, 10.3%). Eighty-three children (61.0%) had one or more comorbid anxiety or mood disorders or ADHD. The total number of diagnoses per child ranged from 1 to 6 (M = 2.24, SD = 1.36). Exclusion criteria were suicidal ideation, use of an SSRI, earlier CBT in the previous half year, an IQ below 80, or problems with drugs or alcohol. Children were randomized to an eight week waitlist condition (n = 47) or to an immediate treatment condition (n = 89). Children who did not go to school due to the severity of their disorder were not randomized because of ethical reasons.

There were two different control groups in this study. Group A was used to validate the IAP pictures. Group B was used to compare IAP Control and No control scores with the anxious sample. The reason to use two different control groups was to prevent a cross-over effect from first validating the pictures and then performing the computer task (or vice versa).
Group A consisted of 38 non-selected children from different schools in the Netherlands. They were all between 8 and 18 years old ($M = 12.08$) and 39.5% ($n = 15$) were boys. These children also participated in a validation study for a new anxiety interview. All children were screened for psychiatric problems with the ADIS-C/P and the Strength and Difficulties Questionnaire (SDQ; Goodman, 1997). No children received a diagnosis or a clinical score on the SDQ.

Group B consisted of 31 non-selected children from different schools in the Netherlands. They were between 8 and 15 years old ($M = 11.65, SD = 1.87$) and 38.7% ($n = 12$) were boys. Children were screened with the Child Behavior Checklist (CBCL; Achenbach, 2005) for emotional and behavioral problems. No parents reported a clinical score on the Internalizing Scale or Total Problems Scale of the CBCL.

**Measures**

**Implicit Association Procedure (IAP)**

*Task design and instructions.* The IAP combined the discrimination of target pictures (Me versus Not me) with the discrimination of attribute pictures (Control versus No control) on a computer screen. Children had to pull a joystick towards themselves or push it away from themselves, depending on the pictures displayed and the instructions. The participants were instructed to hold on to the joystick and respond as accurate and quick as possible. The task duration was approximately 20 minutes.

In the first-target-phase, participants learned to discriminate three Me and three Not me pictures. During all phases the Me pictures had to be pulled towards themselves; the Not me pictures had to be pushed away. Following this phase the concept of “control” was introduced and the five Control and five No control pictures were shown on paper. Control was described as knowing what to do in situations and the feeling that one can handle something on one’s own. In the second-noncompatible-phase, the five Control and five No control pictures were added to the computer task. Control pictures had to be pushed away from oneself and No control pictures had to be pulled towards oneself. In the third-compatible-phase, Control pictures had to be pulled towards oneself and No control pictures had to be pushed away from oneself. The noncompatible phase was preceded by ten practice trials. The number of practice trials for the compatible phase was increased from ten to forty, to control for a possible learning effect (Nosek, Greenwald, & Banaji, 2005). Each practice phase was followed by a self-spaced pause. The test trials in the noncompatible and compatible phase were randomized within six blocks of 16 trials. Stimulus order was the same for each participant.

The IAP Control score was computed by subtracting mean reaction times for Control pictures in phase 3 (compatible) from phase 2 (noncompatible). The IAP No control score was computed in the same way using the mean reaction times for No control pictures. A positive IAP Control and No control score reflect a stronger association between oneself and perceived
control. The IAP was programmed in the same fashion as described in Hogendoorn et al. (2008), with some minor changes (see the appendix). As in the previous study we do not report one IAP score (for the combined Control and No control pictures) because we were interested in the results for Control and No control pictures separately. With one overall IAP score it is possible that there is only an effect for one picture type (e.g. Control) and that participants are equally fast in pushing or pulling the other picture type.

**Stimuli.** Pictures created by a professional drawer represented the target and attribute concepts. We included three Me and three Not me pictures and five Control and five No control pictures. We used different versions for boys and girls. The five Control pictures included both positive and negative controlled situations. The No control pictures only included negative situations where no control was displayed. For the validation of the pictures, we added one extra picture depicting a positive, no control situation, namely a laughing child that was pushed from a raft into the water.

**Questionnaires**

**Child behavior problems.** Parents of the anxious children and control group B filled out the *Child Behavior Checklist* (CBCL; Achenbach, 2005). The CBCL was used to screen for psychiatric problems and consists of 118 items on a 3-point ordinal scale. The items can be summed into eight narrow band symptom scales, two broad band symptom scales (Internalizing and Externalizing problems) and one Total Score. Parents from children in control group A filled out the *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 1997). This is a brief questionnaire (25 items) that assesses the psychological adjustment of children and adolescents. The total problem score based on 20 items was used to determine if children had substantial psychological problems.

**Anxiety Symptoms.** Anxiety disordered children and their parents and children in control group A were assessed with the *Anxiety Disorders Interview Schedule for DSM-IV Child and Parent Version* (ADIS-C/P; Silverman & Albano, 1996). The ADIS-C/P is a widely used, reliable and valid semi-structured interview that assesses the prevalence and severity of different DSM-IV disorders, with a focus on anxiety disorders. Children and parents are interviewed separately by experienced psychologists. Clinicians rate severity of symptoms based on interference in school, peer relationships, family life and internal distress on a 9-point scale, ranging from 0 to 8. A CSR (clinician severity rating) of four or higher is indicative of a diagnosis.

The *Spielberger State Trait Inventory for Children* (STAIC; Spielberger, Edwards, Lushene, Montuori, & Platzeck, 1973), trait subscale (20 items) was used to measure anxiety level. For adolescents (15 years and older), the adult version of the trait subscale was used (*Spielberger State Trait Inventory;* STAI, Spielberger, 1983). Deciles for the STAI and STAIC were calculated using Dutch norm scores. The reliability (Cronbach’s α) of the STAIC-trait was .86 in the anxious

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1 To check whether results would be different with one total score, we performed all analyses with one total score. Results and conclusions were the same as for the IAP Control score.
group and .69 in the control group. The STAI-trait was only used in the anxious group, α was .93.

Perceived control. The Anxiety Control Questionnaire for Children (ACQ-C; Weems et al., 2003) was used to measure perceived control over anxiety-related situations (emotional/bodily reactions and external threats). The ACQ-C consists of 30 items scored on a 5-point scale. Lower scores reflect less perceived control. Cronbach’s α in the anxious and control group were .94 and .92 respectively.

Data analysis

For data reduction on the IAP we followed the procedure described by Schnabel et al., (2006). Reaction times below 300 ms were recoded as 300 ms. Error trials (i.e. trials were the joystick was pushed in the wrong direction) were not included in the analysis of the reaction times. Practice trials were not analyzed. We analyzed the results using the D score algorithm which has been suggested by Greenwald and colleagues (2003). Results reported in the Tables are raw scores.

Because sample size differed between the anxious and control group, the homogeneity of variance was tested by calculating the $F_{\text{max}}$. This is the ratio of the largest cell variance to the smallest. Tabachnik and Fidel (2001, p. 80) recommend an $F_{\text{max}}$ of at most three when the sample size ratio is larger than 4:1. Mean scores for both the anxious and the control group on all measures were compared with two-tailed independent sample $t$ tests or Mann-Whitney tests for nonparametric data.

Reliability of the IAP (Cronbach’s α) was calculated for the difference between the compatible and noncompatible phase for four blocks of test trials, containing the trials 1-24, 25-48, 49-72, and 73-96. The IAP scores were examined in more detail by a $2 \times 2 \times 2$ factorial ANOVA with picture type (Control, No control) and response direction (pull, push) as within-subjects factors and group (anxious or control) as a between-group factor. To examine the influence of age on IAP Control and No control scores, two $2 \times 2$ ANOVAs were performed for each IAP score separately, with group (anxious or control) and age group (8-11 years and 12-17 years) as between subjects factors. Test-retest correlations (ICCs) of the IAP Control and No control scores are reported for the waitlist group. Cohen’s $d$, $\eta^2$ or Cramer’s $V$ are reported as effect sizes.

8 In our first study with the IAP (Hogendoorn et al., 2008) we did not report results analyzed with the D measure as they were not different from results analyzed without the D measure. However, on the advise of an anonymous reviewer we did use the D measure in this study. Results without the D measure were less strong, i.e. there was no difference between anxious and non-anxious children on the IAP Control score and correlations between the direct and indirect measures were less strong.
Overall Procedure

All children and their parents provided written informed consent. The validation study incorporated different steps. First, pictures were shown one by one and children had to describe the picture. Second, children were asked to divide the pictures in two piles (one with six and one with five pictures) and were asked to name each pile. Third, the concepts of Control and No control were explained. Children were asked to sort the pictures in Control and No control pictures with a self-determined amount per pile. Finally, children were asked to rate each picture on valence and arousal on two 5-point ordinal scales (1-5), with lower scores on the valence scale indicating a positive rating; and lower scores on the arousal scale indicating more arousal. Pictures were shown in two different counterbalanced orders.

Results

Validity of the IAP Pictures in a Control Sample

Thirty-eight children rated the five Control and five No control pictures used in the IAP and an extra (positive) No control picture. None of these children had a clinical score on the SDQ Total score or the ADIS-C/P and their mean decile score on the STAI(C)-trait was not elevated ($M = 4.68$, $SD = 2.59$). Most pictures were described correctly, with an overall percentage of 84.9% (range 52.6%-100%). Two pictures were difficult for most children: 47.4% described them incorrectly. The picture of a child thinking of something positive while scared was often described as a child being scared or a child thinking about the weather. The picture where a child has trouble breathing was often described as a child committing suicide or as having a sore throat. When the children were asked to divide the pictures in two piles (without a sorting rule), they classified 92.1% of the pictures correctly. When asked how they grouped the pictures, most children said they based it on whether pictures were related to being scared or not (55.3%). In addition, a considerable number of children (21.1%) correctly said the piles had something to do with (not) being in control, even without the introduction of the concept of control. A minority of children (15.8%) said they divided pictures in “negative” and “positive” categories. When asked to classify the pictures according to control or no control, most pictures ($M = 93.95$, range 70%-100%) were correctly classified. Again, some children had trouble with the picture of a child thinking of something positive: almost 40% was wrong. The filler picture of a child that is pushed into the water (positive no control picture) was rated incorrectly by 68.4% of the children. Finally, the mean valence of the five Control pictures was 1.95; meaning children rated them as positive. The mean valence of the five No control pictures was 4.00; children rated these significantly more negative than the Control pictures, $t(37) = -19.67$, $p < .001$, $d = 3.80$.

9 All analyses were repeated without those two pictures, but results remained unchanged.
Similarly, Control pictures were rated as less arousing (\(M = 4.19\)) than No control pictures (\(M = 2.56\)), \(t(37) = 13.76, p < .001, d = 2.23\).

**IAP Perceived Control: Anxious Versus Control Group**

**General characteristics.** General characteristics of the anxious group and control group are reported in Table 1. Homogeneity of variance was not violated. The \(F_{max}\) ratio ranged between 1.06 and 1.18 with a sample size ratio of 4.4:1. The two groups did not differ on age, sex and age distribution (8-11 years vs. 12-18 years). The anxious group had significantly higher anxiety levels than the control group (Table 1), as reflected in higher scores on the STAI (-C)-trait deciles, CBCL total score and CBCL internalizing score. The anxious group reported lower perceived control on the ACQ-C.

**Table 1.** General characteristics, questionnaire and IAP Control and No control scores for anxious and control children

<table>
<thead>
<tr>
<th></th>
<th>Anxious n = 136</th>
<th>Control n = 31</th>
<th>Difference test, (p), effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 12 years</td>
<td>58 (42.6%)</td>
<td>13 (41.9%)</td>
<td>(\chi^2(1) = 0.30, p &gt; .05)</td>
</tr>
<tr>
<td>12 years</td>
<td>83 (57.4%)</td>
<td>20 (58.1%)</td>
<td>Cramer’s (V = 0.04)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>60 (44.1%)</td>
<td>12 (38.7%)</td>
<td>(\chi^2(1) = 0.01, p &gt; .05)</td>
</tr>
<tr>
<td>Girls</td>
<td>76 (55.9%)</td>
<td>22 (61.3%)</td>
<td>Cramer’s (V = 0.01)</td>
</tr>
<tr>
<td><strong>M (SD)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>12.51 (2.85)</td>
<td>11.56 (1.87)</td>
<td>(U = 1764.00, p &gt; .05, d = 0.35)</td>
</tr>
<tr>
<td>ADIS-C CSR</td>
<td>6.30 (1.06)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>STAI (-C) decile</td>
<td>7.27 (2.99)</td>
<td>2.77 (1.91)</td>
<td>(U = 533.00, p &lt; .001, d = 1.60)</td>
</tr>
<tr>
<td>ACQ-C</td>
<td>47.84 (19.24)</td>
<td>73.03 (15.23)</td>
<td>(t(163) = -6.69, p &lt; .001, d = 1.34)</td>
</tr>
<tr>
<td>CBCL (t-score)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score</td>
<td>62.49 (8.04)</td>
<td>41.00 (7.47)</td>
<td>(U = 90.56, p &lt; .001, d = 2.74)</td>
</tr>
<tr>
<td>Internalizing score</td>
<td>67.90 (9.02)</td>
<td>44.61 (7.71)</td>
<td>(U = 138.50, p &lt; .001, d = 2.67)</td>
</tr>
<tr>
<td><strong>IAP scores</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control score</td>
<td>161.22 (162.05)</td>
<td>218.04 (189.82)</td>
<td>(t(165) = -2.55, p &lt; .05, d = 0.51)</td>
</tr>
<tr>
<td>No control score</td>
<td>-12.05 (180.93)</td>
<td>99.43 (170.69)</td>
<td>(t(165) = -4.30, p &lt; .001, d = 0.89)</td>
</tr>
</tbody>
</table>

**IAP Control and No control scores.** The mean error rate (i.e. incorrect responses) on the IAP did not differ between the anxious group (\(M = 3.96\%, SD = 4.29\%\)) and the control group (\(M = 3.99\%, SD = 3.35\%\)), \(U = 1983.00, p > .05\). Cronbach’s \(\alpha\) of the IAP was .62 in the anxious group and .68 in the control group.

The IAP Control and No control score did differ between the two groups (see Table 1). Anxious children had lower IAP Control and No control scores than control children. The
correlation between the IAP Control score and IAP No control score was large and significant ($r = .76, p < .001$). The correlations between the ACQ-C and the IAP Control and No control score were small and significant (respectively $r = .24, p < .01$ and $r = .30, p < .01$).

The mean reaction times separate for each combination of group, picture type, and response direction (push or pull) are reported in Table 2. A 2 (response direction) × 2 (picture type) × 2 (group) ANOVA showed that there was a main effect for direction: on average, children reacted faster by pulling than by pushing, $F(1, 165) = 51.17, p < .001, \eta^2 = .02$. There was also a main effect for picture type: children reacted faster to the No control pictures than to the Control pictures, $F(1, 165) = 5.44, p < .05, \eta^2 = .00$. The main effect of group was not significant, $F(1, 165) = 0.30, p > .05$. The three-way interaction effect of group, response direction and picture type was significant, $F(1, 165) = 14.31, p < .001, \eta^2 = .04$. To disentangle this interaction effect, two separate ANOVAs were performed for each picture type. For Control pictures, both the main effect of response direction, $F(1, 165) = 171.07, p < .001, \eta^2 = .50$ and the interaction effect of group and response direction, $F(1, 165) = 8.24, p < .01, \eta^2 = .02$ were significant: both groups responded to Control pictures faster by pulling than by pushing, but this effect was stronger for non-anxious children. For the No Control pictures, both the main effect of response direction, $F(1, 165) = 51.50, p < .001, \eta^2 = .22$ and the interaction effect of group and response direction, $F(1, 165) = 16.79, p < .001, \eta^2 = .07$, were significant. The control group was faster in pushing than pulling No control pictures, while for the anxious children there was no difference between pulling and pushing.

Table 2. Mean reaction times in milliseconds (with SD) depending on group, picture type, and response direction and IAP Control and No control scores

<table>
<thead>
<tr>
<th>Picture type</th>
<th>Group</th>
<th>Response Direction</th>
<th>Pull (SD)</th>
<th>Push (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Anxious</td>
<td>Pull</td>
<td>996.33 (233.82)</td>
<td>1157.55 (262.23)</td>
</tr>
<tr>
<td>Control</td>
<td>Non-anxious</td>
<td>Push</td>
<td>949.05 (211.82)</td>
<td>1167.10 (274.49)</td>
</tr>
<tr>
<td>No Control</td>
<td>Anxious</td>
<td>Pull</td>
<td>1063.78 (252.23)</td>
<td>1075.83 (267.39)</td>
</tr>
<tr>
<td>No Control</td>
<td>Non-anxious</td>
<td>Push</td>
<td>1074.72 (261.83)</td>
<td>975.30 (195.34)</td>
</tr>
</tbody>
</table>

Age differences. To investigate age differences on the IAP, a 2 (group status) × 2 (age group) ANOVA was performed for each IAP score. For the IAP Control score the main effect for group was significant, $F(1, 163) = 7.58, p < .001, \eta^2 = .04$: anxious children had lower IAP Control scores than non-anxious children (see Figure 1). There was no main effect for age, nor an interaction effect for group and age. For the IAP No control score the main effect for group was significant, $F(1, 163) = 22.02, p < .001, \eta^2 = .12$. There was no main effect for age. However, there was a significant interaction effect for group and age: $F(1, 163) = 4.39,$


$p < .05$, partial $\eta^2 = .03$ (see Figure 1). Anxious children younger than twelve years old had a lower IAP No control score ($M = -69.85$, $SD = 156.16$) than young children in the control group ($M = 126.36$, $SD = 229.40$). IAP No control scores did not differ between older ($\geq 12$ years old) anxious children ($M = 30.92$, $SD = 186.96$) and control children ($M = 79.98$, $SD = 115.39$).

Figure 1. IAP Control and No control scores for younger (8-11 years) and older (12-18 years) anxious and non-anxious children

Table 3. Baseline characteristics, questionnaire and IAP Control and No control scores for the anxious children pre- and post-waitlist

<table>
<thead>
<tr>
<th></th>
<th>T0 (M, SD)</th>
<th>T1 (M, SD)</th>
<th>Difference score, p, effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAI (-C) decile</td>
<td>6.98 (3.42)</td>
<td>7.04 (3.24)</td>
<td>$t(45) = -0.18, p &gt; .05, d = 0.02$</td>
</tr>
<tr>
<td>ACQ-C</td>
<td>49.71 (15.72)</td>
<td>48.49 (21.80)</td>
<td>$t(44) = 0.46, p &gt; .05, d = 0.06$</td>
</tr>
<tr>
<td>CSR ADIS-C/P</td>
<td>6.17 (0.92)</td>
<td>5.85 (0.93)</td>
<td>$t(46) = 2.05, p &lt; .05, d = 0.35$</td>
</tr>
<tr>
<td>CBCL (t-score)</td>
<td>63.17 (8.72)</td>
<td>60.86 (8.56)</td>
<td>$t(35) = 2.54, p &lt; .05, d = 0.34$</td>
</tr>
<tr>
<td>Internalizing score</td>
<td>68.86 (8.90)</td>
<td>66.47 (8.72)</td>
<td>$t(35) = 2.33, p &lt; .05, d = 0.27$</td>
</tr>
<tr>
<td>IAP scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control score</td>
<td>161.38 (184.99)</td>
<td>105.39 (154.11)</td>
<td>$t(46) = 0.02, p &gt; .05, d = 0.00$</td>
</tr>
<tr>
<td>No Control score</td>
<td>-49.71 (194.33)</td>
<td>-48.97 (185.15)</td>
<td>$t(46) = -0.12, p &gt; .05, d = 0.03$</td>
</tr>
</tbody>
</table>

Test-Retest Reliability

Test-retest reliability was assessed by comparing the IAP Control and No control scores of the anxious waitlist group ($n = 47$) before and after the waitlist period (see Table 3). Self-reported anxiety (STAI-C) and perceived control (ACQ-C) did not change from pre- to post-waitlist. However, scores on the ADIS-C/P and CBCL (parent report) did differ significantly: the CSR of the ADIS-C/P decreased after the waitlist period. Further, parents reported less Total problems...
and Internalizing problems on the CBCL. The IAP Control and No control did not differ between pre- and post-test. Test-retest reliability scores were significant and fair to good: ICC = .58 ($p < .01$) for the IAP Control score, and ICC = .57 ($p < .01$) for the IAP No control score.

**Discussion**

The objective of the current study was to further investigate an indirect measure of perceived control, the Implicit Association Procedure (IAP), in a clinically anxious and a non-referred sample. First, we investigated the validity of the used pictures. It appeared that children spontaneously divided pictures in frightening and non-frightening pictures. However, after an instruction similar to the procedure in the IAP, most of them were able to divide the pictures in Control and No control. Being in control is an abstract concept and because the pictures represent (not) being in control over frightening situations, it is plausible that children attend to the depicted frightening situations first. In this study, we showed that children do understand the pictures and are able to understand the concept of being in control. However, there is an overlap in theme and valence: Control pictures were rated as more positive and less arousing than No control pictures. Therefore, it is still possible that children recode the pictures in “positive” and “negative” or “non frightening” and “frightening” categories.

Our second and third research question concerned differences between anxious and control children on the perceived control IAP and the interaction with age. As expected, anxious children reported lower perceived control than the control sample on the direct measure (ACQ-C). On the indirect measure the results were similar to results in a non-selected sample (Hogendoorn et al., 2008). Overall, all children reacted faster with a movement towards themselves when they saw pictures reflecting control over a situation; and they reacted faster with a movement away from themselves when they saw pictures concerning no control. The crucial question was whether there was an interaction effect of group and reaction time for the pull and push movements. For the Control pictures, anxious children were expected and found to have more difficulties pulling the pictures towards themselves than the children in the control group (and/or fewer difficulties pushing them away).

For the No control pictures anxious children were expected to have fewer difficulties pulling the pictures towards themselves than the children in the control group (and/or more difficulties pushing them away). This effect was found, but it was fully accounted for by children younger than twelve years old. In a previous study with the IAP in a non-selected sample, a similar interaction effect with age was found for the IAP No control score (Hogendoorn et al., 2008). In that study a potential explanation was a low variability of anxiety symptoms in the older children. However, this argument does not apply here. Therefore, we cannot rule out that especially younger children with an anxiety disorder may experience less perceived control than older children with or without an anxiety disorder, at least as measured with an indirect
measure. This was unexpected, as no age differences have been reported for a direct measure of perceived control (the ACQ-C), either in this study ($r = .02, n.s.$) or earlier studies (Weems et al., 2003, 2007).

The fourth and last research question in this study was the temporal stability of the IAP. The eight week test-retest correlation in the anxious group was fair to good, with ICCs of .57 (IAP No control score) and .58 (IAP Control score). However, most studies report Pearson's $r$ correlations and those were of medium strength ($r = .40$ for IAP No control score and $r = .41$ for IAP Control score). This is somewhat lower compared to what is typically found for indirect measures, namely between .50 and .60 (Egloff, Schwerdtfeger, & Schmukle, 2005; Hofmann et al., 2005) irrespective of time interval (e.g. one week or one year; Egloff et al., 2005). Medium test-retest correlations indicate that the IAP is not yet sensitive enough to measure intraindividual differences. Additionally, indirect measures like the IAP likely capture state variance next to trait variance, resulting in lower temporal stability (Egloff et al., 2005). At this point, we suggest using the perceived control IAP for correlational or experimental research only.

The relatively small samples size of the control group is a limitation of this study. Another limitation is that due to practical reasons the children in the control group were not interviewed with the ADIS-C/P to verify that they did not have an anxiety disorder. However, no children in the control group received a clinical score on the CBCL and they all had low scores on the anxiety measures. Further, anxious children reported substantially higher anxiety levels and less perceived control on the direct measures (questionnaires).

To conclude, in this study anxious children proved to have less perceived control than a control sample, as measured with an indirect measure. We believe that the IAP can be a point of departure for future research on indirectly measured perceived control. For example, it would be interesting to examine whether perceived control as measured by the IAP increases after treatment (which has been found with a direct measure) and whether this change precedes or follows a change in anxiety level. Further, the use of the IAP as a new treatment modality (by indirectly retraining a lack of perceived control) could be investigated.

Appendix

All pictures, with the exception of one, were the same as in a previous study (Hogendoorn et al., 2008). One different Not me picture was used: the picture of a chicken (a non-human) was used instead of a child with the letter "q" on its chest, because many errors were made with this picture in the first IAP (Hogendoorn et al.). The programming of the IAP was similar to the previous study with some exceptions. First, the reversed phase preceded the combined phase in the current task. This was done to guarantee that longer reaction times in the reversed phase were not the result from unlearning the instructions from the combined phase. Second, in the current study the fixation cross lasted for 500 ms instead of 600 ms. Third, the interstimulus
interval (ISI) was shortened from 1000 ms to 600 ms. Fourth, the feedback "too slow" was given when there was no response after 3000 ms instead of 2000 ms. Fifth, previously reaction times were not recorded when the joystick was not back in the middle of the screen before the next trial. Therefore, in the current study the next trial only started when the joystick was right back in the middle of the screen.