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Behaviour Research and Therapy 43 (2005) 293–308

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## Inferential confusion in obsessive–compulsive disorder: the inferential confusion questionnaire

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Received 15 August 2003; received in revised form 12 February 2004; accepted 13 February 2004

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### Abstract

The current article represents the further validation of the construct of inferential confusion amongst clinical samples. Inferential confusion is proposed to be a meta-cognitive confusion particularly relevant to obsessive compulsive disorder (OCD) that leads a person to confuse an imagined possibility with an actual probability. As such, it conceptualizes OCD as a form of belief disorder similar to a delusion or overvalued idea that is a product of distorted reasoning processes. In contrast, other cognitive models of OCD emphasize a phobic model of development in OCD, and thus consider the exaggerated interpretation of intrusions as an essential element in OCD. The present study administered a revised version of the Inferential Confusion Questionnaire, and the Obsessive Belief Questionnaire (OBQ), to a total of 183 participants in three clinical groups and a non-clinical control group. Results suggest that OCD, at least in part, follows a non-phobic model of development with inferential confusion significantly related to obsessive–compulsive symptoms independently of cognitive domains as measured by the OBQ, and mood states. Further, scores on inferential confusion were particularly high in those with OCD and delusional disorder as compared to anxious and non-clinical controls.

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*Keywords:* Obsessive–compulsive disorder; Delusional disorder; Reasoning; Beliefs; Cognitive distortions; Questionnaires

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## 1. Introduction

Recent cognitive models of obsessive–compulsive disorder (OCD) locate the origin of obsessions in intrusive cognitions, whose significance is derived from their appraisal (Rachman, 1997). The appraisal model of OCD considers intrusions to be a universal phenomenon and not specific to OCD. There is some evidence that intrusions in the normal population have a similar content to obsessions found in OCD patients (Rachman & De Silva, 1978; Salkovskis & Harisson, 1984), although it is not entirely clear how appraisal translates normal intrusions into abnormal obsessions (Jakes, 1996), and it has been suggested that some obsessive–compulsive beliefs may be a product rather than a cause of obsessions (Mancini, D'Olimpio, Del Genio, Didonna, & Prunetti, 2002). O'Connor (2002) suggests it may be incorrect to conceptualize obsessions as 'intruding' thoughts that require no further explanation, since the onset of the intrusion is contextual and seems linked to coping with current events and behaviours. Despite some obsessions sharing similarities in content with intrusive cognitions found in the normal population, in the obsessional case, obsessions may arise in inappropriate situational contexts, and as the result of distorted inductive reasoning processes (O'Connor & Robillard, 1995, 1999). Such a reasoning or inference-based approach (IBA) conceptualizes obsessions as inferences about possible states of affairs in reality, arrived at on the basis of an inductive narrative which in itself carries strong idiosyncratic emotional themes and associations (O'Connor, 2002). While initially the person with OCD may perceive reality correctly, he/she is more susceptible to be influenced by self-generated narratives, which leads the person to doubt reality and infer a hypothetical state of affairs (Pélissier & O'Connor, 2002).

The imaginary nature of representations has always figured as an important cognitive characteristic in delusional and related disorders where the person's beliefs deviate to a great extent from objective and/or consensus reality, but has found no wide application in cognitive models of OCD that emphasize rather the role of exaggerated and catastrophic interpretations. However, if the main obsessional concern revolves around themes only distantly related to objective events and objects there may be reason to assume that OCD does not follow a phobic model of development (O'Connor & Robillard, 1995).

Instead of conceptualizing OCD solely as the result of the appraisal of objective events (or intrusions) IBA highlights the *remoteness* of obsessional cognitive representation from the objective qualities of the feared object or event. This to the extent that "...the person with OCD does not react to what is there, and not even to the exaggerated consequences of what is there, but to what might possibly be there even though the person's senses say otherwise" (O'Connor & Robillard, 1995, p. 889). This would appear to be most evident in OCD with overvalued ideation where the content of the obsession is often bizarre and non-sensical, but may also play a role in the production of seemingly 'normal' obsessions where the justification for the obsession is constructed on a purely imaginary basis. Thus, all OCD *could* be viewed as a form of belief disorder similar to a delusion or overvalued idea. Such a conceptualization is consistent with a continuum hypothesis between OCD and delusional disorder (Jaspers, 1913, 1963; Spitzer, Williams, Gibbon, & First, 1991), and adds to current debates on whether OCD is best conceptualized as an anxiety disorder or schizotypal disorder (Aardema, Kleijer, Trihey, O'Connor, & Emmelkamp, 2004; O'Dwyer & Marks, 2000; Lysaker et al., 2000; Norman, Davies,

Malla, Cortese, & Nicholson, 1996; Tallis & Shafran, 1997). Similarly, others have emphasized the “hallucinatory vividness” of obsessions, and the strong level of absorption and reality value that appears to accompany obsessions, which may form a particular challenge in treatment (Guidano & Liotti, 1983; O’Connor & Aardema, 2003). However, treatment based on specifically targeting reasoning errors associated with obsessions has recently been shown to increase the efficacy of CBT for those with strong obsessional convictions resembling overvalued ideation. (O’Connor et al., 2003).

O’Connor & Robillard (1995) have observed several reasoning errors that could give credibility to the obsessional inference. In particular, inference processes such as category errors, drawing inferences from irrelevant memories, facts, and unrelated associations, and a dismissal of actual evidence and sense information in favor of basing action on a hypothetical reality. Ultimately, these reasoning errors give rise to *inferential confusion* where a person confuses an imagined possibility with an actual probability based in the senses, and then acts ‘as if’ the imagined possibility is real. A crucial element of inferential confusion is *inverse inference*, the reverse of normal inference, where a person starts out with the veracity of a hypothesis despite evidence to the contrary (i.e. ‘A lot of people must have walked on this floor, therefore, it must be dirty’). In contrast, normal inference would start with observing a state of affairs, and then coming to a conclusion as to what is present. This particular type of inverse processing degrades the role of the senses, and limits the incorporation of sense information in the decision to disengage from neutralizing behavior, and could explain how attempts to neutralize actually increase doubt regarding a state of affairs in reality (O’Connor & Robillard, 1995; Van den Hout & Kindt, 2003).

An inference-based model is not at all incompatible with appraisal-based models of OCD where the focus is on beliefs guiding the appraisal of intrusive cognitions in the development and maintenance of OCD. However, whereas appraisal models are mostly concerned with the appraisals and their associated beliefs following the intrusion, inferential confusion refers to a reasoning process characteristic of OCD present at the occurrence of intrusions. Thus, inferential confusion is also distinct from other cognitive concepts such as thought-action fusion (TAF), which is linked with appraisals of responsibility and has been defined as the *belief* that an event can increase the likelihood of the event occurring or that having a particular thought is the moral equivalent of acting out the event (Rachman & Shafran, 1999). Despite the phonetic similarity the constructs of TAF and inferential confusion were developed independently as theoretical constructs, and inspired by distinct clinical observations (O’Connor & Robillard, 1995; Shafran, Thordarson, & Rachman, 1996). However, the presence of inferential confusion as a process may make ‘fusion experiences’ and magical beliefs more likely to occur (O’Connor & Aardema, 2003).

The relevance of the concept of inferential confusion to obsessive–compulsive behaviour was established in two previous studies with non-clinical samples, which showed consistent moderate to strong relationships with obsessive–compulsive symptoms (Emmelkamp & Aardema, 1999; Aardema, Kleijer, Trihey, O’Connor, & Emmelkamp, 2004). In particular, the initial study carried out by Emmelkamp & Aardema (1999), using the predecessors of the Inferential Confusion Questionnaire (ICQ), found inferential confusion (‘inverse inference’) to be related to most forms of obsessive–compulsive behaviours, while controlling for 13 competing cognitive domains as well as depressive mood. Subsequent analyses in another study, which controlled for neuroticism also revealed a relationship between inferential confusion and schizotypal symptoms (Aardema,

Kleijer, Trihey, O'Connor, & Emmelkamp, 2004). These studies appear to suggest that inferential confusion is a characteristic of all OCD whether or not overvalued ideation is present. However, the studies were limited to non-clinical samples and the aim of the current study was to validate the construct of inferential confusion in clinical samples. The current study hence included an OCD group, an anxiety group, and a delusional disorder group. The rationale for inclusion of a delusional disorder group was to test for overlap between OCD and delusional disorder, and it was expected in accordance with the continuum model that participants with delusional disorder would score as high or higher on inferential confusion to those with OCD. Finally, we expected inferential confusion to show a unique contribution to the variance in obsessive–compulsive symptoms.

## 2. Method

### 2.1. Recruitment and participants

#### 2.1.1. Obsessive–compulsive disorder group

Participants in the study were recruited under the auspices of the OCD research program already in place at Centre de Recherche Fernand-Seguin (CRFS). This recruitment involved telephone interviews, face-to-face diagnostic interview, and administration of a semi-structured interview (ADIS-IV, Brown, DiNardo, & Barlow, 1994; Y-BOCS; Goodman et al., 1989a; Goodman et al., 1989a). All who conducted semi-structured interviews were registered psychologists or doctoral level students who received prior professional training in ADIS/Y-BOCS administration. Assessments were audio recorded for supervision purposes. Diagnosis in the majority of participants (73%) was based on a semi-structured interview (ADIS-IV), while in the remainder of participants (27%) diagnosis was based on a clinical interview by a trained psychiatrist using DSM-IV criteria (American Psychiatric Association, 1994), which was subsequently confirmed by an experienced clinical psychologist. Entry criteria for inclusion in the study were: (a) a primary diagnosis of OCD, (b) no evidence of current substance abuse, and (c) no evidence of current or past schizophrenia, bipolar disorder or organic mental disorder. In a subgroup of the current sample another criterion was the presence of *compulsive* symptoms for at least one hour a day. This subgroup was particular to one of the ongoing studies at CRFS targeting the overt compulsions subtypes and consisted of 42% of the total sample. However, this criterion did not appear to compromise the representativeness of the OCD sample. Out of a total group of 93 potential participants only 8 were excluded for not meeting the entry criteria. The final group consisted of 85 participants (54 female, 31 male). The average age was 37.6 years (SD=11.9; range 17–59). Educational levels were distributed as follows: 23.8% secondary education, 31.7% college education, and 40% university education. The marital status of participants was as follows: 43.5% single, 28.6% married or cohabiting, and 12.7% separated or divorced. OCD subgroups determined according to the most severe symptoms were as follows (obsessional impulses were categorized under rumination): 15% rumination, 13% checking, 20% washing, 4% hoarding. A further 48% showed equal severity in symptoms in two or more of these subtypes: 11% checking/washing, 13% checking/ruminations, and 9% washing/ruminations, or other mixed symptoms.

### 2.1.2. Anxiety disorder group

Participants in this group were recruited from several programs in place at the CRFS, which included a study on social phobia, generalized anxiety disorder, and panic disorder. Recruitment in these programs followed the same general procedures as the recruitment in the OCD study, and included telephone interviews, face to face diagnostic interview, and administration of a semi-structured interview (ADIS-IV, Brown, DiNardo, & Barlow, 1994). For the purposes of the present study inclusion criteria were (1) a primary diagnosis of an anxiety disorder other than OCD, (2) no secondary diagnosis of OCD, (3) no evidence of current or past schizophrenia, bipolar disorder or organic mental disorder. All participants met these criteria, and the final group consisted of 31 participants (12 social phobia, 7 generalized anxiety disorder, and 12 panic disorder). This group consisted of 10 males and 21 females. The average age of participants was 34.7 (SD = 11.5; range 21–60). Educational levels were as follows: 9.5% primary education, 9.5% secondary education, 57.1% college education, and 23.8% a university education. Marital status was: 38.1% single, 52.4% married/cohabiting, and 9.6% separated or divorced.

### 2.1.3. Delusional disorder group

Participants in the delusional group were recruited from an ongoing treatment trial at CRFS. The group was diagnosed with a primary disorder of delusion by two independent clinicians, and on the basis of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Spitzer, Gibbon, Williams, 1997) and Maudsley Assessment of Delusions Scale (MADS; Wessely et al., 1993). A criterion for exclusion for the present study was a secondary diagnosis of OCD. However, none of the participants fulfilled the criteria for a diagnosis of OCD, which resulted in a final group consisting of 16 participants (10 males, 6 females). Average age was 39.3 (SD = 10.2; range 22–52). Educational levels were as follows: 6% primary education, 25% secondary education, 38% college education, and 41% university education. In terms of marital status: 63% were single, 31% were married/cohabiting, and 6% were divorced.

### 2.1.4. Non-clinical control group

Participants in the non-clinical group were recruited from several sites (hospital staff, university students, working population) in order to ensure a representative sample. Non-clinical participants were not screened for psychopathology. Epidemiological research indicates a point prevalence of approximately 1.9–2.5% lifetime based in the general population (Weissman et al., 1994). and very few participants in the non-clinical sample would be expected to have had OCD. The non-clinical group consisted of a total of 51 participants with 17 males (33%) and 34 (67%) females. Average age was 32.2 (SD = 12.3; range 17–70). Educational levels were as follows: 16.2% secondary education, 35.1 college, and 48.6% a university education. Marital status was: 45.0% single, 40.5% married or cohabiting, and 13.5% separated or divorced.

### 2.1.5. Demographic differences

We calculated demographic differences in each of the different groups and analyses of variance (ANOVA) revealed a significant overall difference in age ( $p = 0.03$ ). However, individual comparisons among the different groups with bonferroni correction did not reveal any group differences. No significant differences were found for any of the other demographic variables.

## 2.2. Measures

### 2.2.1. All participants in the OCD group were administered the following questionnaires

The *Inferential Confusion Questionnaire* (Aardema, Kleijer, Trihey, O'Connor, & Emmelkamp, 2004). This questionnaire measures two key aspects of inferential confusion as formulated by O'Connor & Robillard (1995), namely a distrust of the senses and inverse inference. The 15 items ( $\alpha = 0.85$ ) of the ICQ-15 are scored on a 5-point scale: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree. A few adaptations were made to the item-pool of the ICQ-15. Five items were removed which had relatively low item-total correlations in previous studies, and did not seem to capture the definition of inferential confusion sufficiently. Further, an additional five new items were added to the questionnaire to replace the items that were removed. This revised version of the ICQ with 15 items was administered to participants in the study.

The Padua Revised (Padua Inventory Washington University Revision; Burns, Keortge, Fornea, & Sternberger, 1996) is a comprehensive 39-item self-report inventory of obsessions and compulsions, based on the original version of the Padua Inventory (Sanavio, 1988; French translation by Freeston et al., 1994). Items are rated on a 5-point scale (0=not at all typical to 5=very typical) The Padua Revised measures content dimensions relevant to OCD: (1) Obsessional Thoughts about Harm to Self and Others about harm to self or others (7 items), (2) Contamination Obsessions and Washing Compulsions, (10 items), (3) Checking Compulsions (10 items), (4) Dressing and Grooming Compulsions (3 items) and, (5) Obsessional Impulses to Harm Self or Others (9 items). The total scale ( $\alpha = 0.95$ ) and the subscales are reliable ( $\alpha = 0.75-0.91$ ).

The *Obsessive Beliefs Questionnaire* (OBQ-87; Obsessive Compulsive Cognitions Working Group, 2001; French translation by Rhéaume, Freeston, Bouvard, & Cottraux, 1998). This instrument has been developed collaboratively by the Obsessive Compulsive Working Group between 1995 and 1998. The OBQ-87 version consists of six cognitive belief domains based on consensus of the working group members, namely responsibility (16 items;  $\alpha = 0.89$ ), over-estimation of threat (14 items;  $\alpha = 0.91$ ), tolerance for uncertainty (13 items;  $\alpha = 0.88$ ), Importance of Thoughts (14 items; 0.91), Control of Thoughts (14 items;  $\alpha = 0.92$ ) and Perfectionism (16 items;  $\alpha = 0.93$ ). Initial validation studies indicate excellent reliability for each subscale ( $\alpha = 0.82-0.91$ ) and evidence of convergent and construct validity (OCCWG, 2003).

The *Thought Action Fusion Scale* (TAF; Shafran, Thordarson, Rachman, 1996; French translation by Pélissier, 2002) was administered to 41 participants in the OCD sample, and consists of 19 items distributed over three subscales: TAF-moral subscale (12 items), TAF-likelihood for others (4 items), and TAF-likelihood for self (3 items). The factorial structure of the TAF scale has been confirmed in an obsessional sample, and the subscales have been shown excellent reliability (Cronbach alpha 0.85–0.96).

The *Beck Anxiety Inventory* (Beck, Epstein, Brown, & Steer, 1988; French translation by Freeston, Ladouceur, Thibodeau, Gagnon, & Rhéaume, 1994) is a 21-item anxiety symptom checklist rating symptom intensity for the last week on a 0–3 scale ( $\alpha = 0.91$ ).

The *Beck Depression Inventory* (Beck, Steer, & Garbin, 1988; French translation by Bourque & Beaudette, 1982) is a 21-item measure of depressive symptoms for the last week on a 0–3 scale ( $\alpha = 0.91$ ).

### 3. Results

#### 3.1. Means and standard deviations

Means and standard deviations of the questionnaires in the OCD group ( $n = 85$ ) are shown in Table 1.

Inspection of the means on the subscales of the Padua Revised shows that the means of 4 of the 5 subscales were comparable to those found by Burns, Keortge, Formea, and Sternberger (1996). However, the means of the impulses subscale was rather low, and may indicate that this subgroup was not very well represented in the current OCD sample.

#### 3.2. Factor analysis, scale construction and reliability

There were a sufficient number of participants in the OCD group to permit factor analysis with oblique rotation on the items of the revised version of the ICQ (ratio 5.7:1). Consistent with previous findings a large first factor emerged with an eigenvalue of 6.2 explaining 41.5% of the variance, followed by three more factors, explaining an additional 23.2% of the variance with eigenvalues respectively of: 1.4, 1.2 and 1.1. The screen plot clearly indicated that most variance was explained by the initial factor, followed by a large drop in eigenvalues. Therefore, it was decided to extract one factor and select items on the basis of factor loadings on this principal factor. The presence of a single factor also made conceptual sense since the questionnaire was

Table 1  
Means and standard deviations of the OBQ and symptom measures in the OCD sample ( $n = 85$ )

	<i>M</i>	<i>SD</i>
OBQ-Total score	386.0	101.7
Overestimation of threat	58.0	21.3
Tolerance for uncertainty	64.1	16.8
Control of thoughts	67.6	19.2
Importance of thoughts	51.1	18.3
Responsibility	71.7	22.3
Perfectionism	73.4	22.7
TAF-Total score	24.8	15.4
Moral TAF	17.5	10.9
Likelihood other TAF	2.8	4.1
Likelihood self TAF	4.5	3.9
Padua Revised-total score	63.2	24.0
Thoughts about harm	10.7	6.1
Impulses about harm	3.5	4.8
Contamination	18.0	11.1
Checking	21.4	9.5
Dressing/grooming	5.7	4.0
Beck depression inventory	19.5	11.6
Beck anxiety inventory	20.3	13.2

Table 2  
Inferential Confusion Questionnaire items and factorloadings

Items	Loading
1. I am sometimes more convinced by what might be there than by what I actually see.	0.69
2. I sometimes invent stories about certain dangers that might be there without paying attention to what I actually see.	0.67
3. I sometimes know there is a danger solely on the basis of my understanding of something and so there is no need to look.	0.48
4. No matter where you are, you can never be sure whether you are safe.	0.45
5. As soon as I think there might be danger, I immediately take precautions to avoid it.	0.48
6. I often cannot tell whether something is safe, because things are not what they appear to be.	0.60
7. Sometimes I have the idea that danger is near even though there is no obvious reason.	0.68
8. Even if I don't have any actual proof of a certain danger, my imagination can convince me otherwise.	0.78
9. There are many invisible dangers.	0.63
10. Just the thought that there could be danger is proof enough for me that there is.	0.77
11. I often know a problem exists even though I don't have visible proof.	0.65
12. My imagination can make me lose confidence in what I actually perceive.	0.77
13. Even if I have all sorts of visible evidence against the existence of a certain danger, I still feel that it will occur.	0.66
14. I am more often afraid of something that I cannot see rather than something I can see.	0.45
15. I often react to a scenario that might happen as if it is actually happening.	0.78

designed to measure two closely related key aspects of inferential confusion. Items and factor loadings are shown in Table 2.

As can be seen in Table 2 all factor loadings exceeded 0.45, which is generally considered satisfactory to retain an item. Thus, no items were removed, resulting in a final version of the ICQ with 15 items. Coefficient alpha computed as a measure of internal consistency showed an excellent internal reliability of 0.90. The average item-total correlation was 0.65 with a range of 0.38–0.72. The mean total score of the ICQ in the OCD group was 49.1 (SD = 12.0; range 16–72). High scores indicating higher inferential confusion.

### 3.3. Differences between groups

In order to test criterion-related validity of the ICQ, differences between the groups were calculated using multivariate analyses of variance (see Table 3).

Analysis of variance showed an overall significant difference between the four groups ( $F(3, 175) = 34.4$ ;  $p = 0.000$ ). Post hoc Student-Newman-Keuls (SNK) tests showed that both the OCD and delusional disorder group scored significantly higher than non-clinical and anxious controls. ICQ scores were also significantly higher in the anxious group as compared to the non-clinical controls. No significant differences were found between the delusional disorder and OCD group.

Also represented in Table 3 are differences between groups on the Padua Revised total scale and subscales. Analysis of variance showed significant differences between the groups on the Padua Revised total score ( $F(3, 173) = 46.68$ ;  $p = 0.000$ ) and the subscales: thoughts about harm ( $F(3, 174) = 29.60$ ;  $p = 0.000$ ), impulses about harm ( $F(3, 173) = 4.81$ ;  $p = 0.003$ ), contamination



Table 3

Differences between groups on the Inferential Confusion Questionnaire (ICQ) and Padua Revised<sup>a</sup>

	1. OCD ( <i>n</i> = 85)		2. DD ( <i>n</i> = 16)		3. AC ( <i>n</i> = 30)		4. NCC ( <i>n</i> = 51)		Post hoc comparisons ( <i>p</i> < 0.05)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Inferential confusion	49.1	12.0	51.2	10.8	42.8	12.1	29.8	9.3	1,2 > 3 > 4
Padua Revised total	59.3	24.5	39.1	25.8	23.2	21.4	17.1	13.2	1 > 2 > 3,4
<b>Thoughts about harm</b>	10.9	6.1	7.5	5.7	6.7	6.0	2.0	2.1	1 > 2,3 > 4
<b>Impulses about harm</b>	3.3	4.6	2.7	3.0	1.8	4.0	0.75	1.5	1 > 4
Contamination	18.3	11.5	12.5	10.1	6.3	6.6	8.3	7.5	1 > 2 > 3 1 > 4
Checking	21.3	9.3	14.0	9.5	7.3	7.1	4.7	4.3	1 > 2 > 3,4
<b>Dressing/grooming</b>	5.6	4.0	2.5	2.5	1.2	2.0	1.4	2.6	1 > 2,3,4

<sup>a</sup>OCD = Obsessive–compulsive disorder group; DD = delusional disorder group; AC = anxious control group; NCC = non-clinical control group.

( $F(3, 175) = 16.46$ ;  $p = 0.000$ ), checking ( $F(3, 174) = 53.46$ ;  $p = 0.000$ ) and dressing and grooming compulsions ( $F(3, 175) = 23.98$ ;  $p = 0.000$ ). Post hoc SNK tests showed significant differences on the Padua Revised total score and most of its subscales with the OCD group scoring higher than any of the other groups. However, for the subscale impulses about harm there was a significant difference only between the OCD group and non-clinical controls. Overall, participants in the delusional disorder group scored significantly higher on obsessive–compulsive symptoms than those in the anxious and non-clinical control groups. In particular, significant differences were found on the Padua Revised total scale and checking compulsions with the delusional disorder group scoring significantly higher than participants in the non-clinical and anxious groups. Also, the delusional disorder group scored significantly higher on the subscale obsessional thoughts about harm than non-clinical controls, but no significant differences were found between the delusional group and anxious controls. Finally, scores were higher in the delusional disorder group on the contamination subscale as compared to anxious controls, but surprisingly, not significantly higher than the scores found in the non-clinical group.

#### 3.4. The relationship of inferential confusion with OCD symptoms

We calculated the correlations of the ICQ with obsessive–compulsive symptoms for each of the different groups. In addition, the relationship between the ICQ and the BDI and BAI was calculated in the OCD group in order to establish whether inferential confusion could be adequately distinguished from anxiety and depression. Zero-order correlations in the different groups are shown in Table 4.

Moderate relationships were found between the ICQ and anxiety and depression as measured by the BAI and BDI. Also, several significant relationships were found between the ICQ and obsessive–compulsive symptoms as measured by the Padua Revised. The ICQ was positively related to obsessive–compulsive symptoms overall as measured by the Padua Revised total score, the subscale thoughts about harm, the subscale contamination and the subscale checking.

Table 4

Correlations between the Inferential Confusion Questionnaire (ICQ) and symptoms measures in the different groups

	OCD ( <i>n</i> = 85) ICQ	DD ( <i>n</i> = 16) ICQ	AC ( <i>n</i> = 31) ICQ	NCC ( <i>n</i> = 51) ICQ
Beck Depression Inventory	0.33**	—	—	—
Beck Anxiety Inventory	0.48***	—	—	—
Padua Revised total	0.52***	0.68**	0.23	0.50**
Thoughts about harm	0.72***	0.64*	0.26	0.46**
Impulses about harm	0.20	0.55*	0.09	0.00
Contamination	0.38***	0.52*	0.35	0.48**
Checking	0.26*	0.55*	0.01	0.39**
Dressing/grooming	0.12	0.54*	0.32	0.27

OCD = Obsessive-compulsive disorder group; DD = delusional disorder group; AC = anxious control group; NCC = non-clinical control group.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

\*\*\*  $p < 0.001$ .

However, no significant relationships were found with the subscale impulses about harm and the subscale dressing and grooming.

Interestingly, scores on the ICQ were significantly related to *all* obsessive–compulsive symptoms in the delusional disorder group, while no significant relationships were found in the anxious control group. In particular, in the delusional disorder group, strong relationships were found with the Padua Revised total score and the subscale thoughts about harm. Finally, significant relationships were found between the ICQ and obsessive–compulsive symptoms in the non-clinical control group.

### 3.5. Inferential confusion and other cognitive measures

The identification of OCD relevant cognitive beliefs is complicated by high intercorrelations among OCD-related cognitive domains (OCCWG, 2003). Thus, it is important to establish whether cognitive measures proposed to be relevant to OCD can be adequately distinguished from other cognitive domains. For this purpose, we calculated the correlations between the ICQ and OBQ belief domains in the OCD group. In general, the relationship between the ICQ and the OBQ total score was relatively high ( $r = 0.61$ ;  $p < 0.001$ ). In particular, inferential confusion was significantly related to all the OBQ belief domains overestimation of threat ( $r = 0.72$ ;  $p < 0.001$ ), responsibility ( $r = 0.60$ ;  $p < 0.001$ ), intolerance to uncertainty ( $r = 0.47$ ;  $p < 0.001$ ), overimportance given to thoughts ( $r = 0.48$ ,  $p < 0.001$ ), control of thoughts ( $r = 0.49$ ;  $p < 0.001$ ), and perfectionism ( $r = 0.29$ ;  $p < 0.05$ ). Also, there was a moderately strong relationship between inferential confusion and the TAF total scale ( $r = 0.42$ ;  $p < 0.01$ ), and with the subscales moral TAF ( $r = 0.36$ ;  $p < 0.05$ ), the likelihood-other TAF ( $r = 0.33$ ;  $p < 0.05$ ) and the likelihood self-TAF ( $r = 0.34$ ;  $p < 0.05$ ).

Given the moderate to strong correlations of the ICQ with the OBQ belief domains it is difficult to determine the unique relevance of inferential confusion on the basis of zero-order correlations. Partial correlations on the other hand, can reveal whether a particular variable significantly adds

to what is already explained by other variables, since it computes the expected correlation between two variables when others are held constant (Nunnally & Bernstein, 1994). So we chose to calculate partial correlations to determine whether inferential confusion was independently related to obsessive–compulsive symptoms while controlling for other cognitive domains. In order to establish whether inferential confusion showed an independent relationship with obsessive–compulsive symptoms we chose a rather stringent test where we not only controlled for each individual OBQ belief domain, but also for all of the six OBQ domains together. Regrettably, we could not include TAF as an additional control to the six OBQ belief domains, due to differences in sample size of TAF and OBQ data. However, thought-action fusion is already partly represented in the OBQ subscale responsibility. Partial correlations of the ICQ with the PI-WUSR total scale and subscales while controlling for OBQ domains are represented in Table 5.

As can be seen in Table 5 inferential confusion adds a substantial amount of unique variance to the prediction of obsessive–compulsive symptoms even when strictly controlling for all OBQ domains. In fact, controlling for overestimation of threat alone has more impact on the relationship between inferential confusion and obsessive–compulsive symptoms than controlling for all OBQ domains. This is likely due to one or more OBQ belief domains contributing negatively to the prediction of obsessive–compulsive symptoms when controlling for all the others.

However, it could still be argued that the independent relationships of inferential confusion with obsessive–compulsive symptoms could be accounted for by anxiety and depression. In order to exclude this possibility we once again calculated partial correlations between inferential confusion and obsessive–compulsive symptoms while not only controlling for all OBQ belief domains, but also for anxiety and depression. Results of this analyses showed that even under these conditions, inferential confusion remained significantly related to obsessive–compulsive

Table 5

Partial correlations between the inferential confusion questionnaire and Padua-Revised controlled for OBQ domains ( $n = 85$ )

	Inferential confusion questionnaire						
	Controlled for all OBQ domains	Controlled for THR	Controlled for RES	Controlled for IMP	Controlled for CER	Controlled for CON	Controlled for PER
Padua Revised total	0.32**	0.26*	0.44***	0.46***	0.43***	0.46***	0.49***
Thoughts about harm	0.44***	0.45***	0.60***	0.61***	0.64***	0.62***	0.67***
Impulses about harm	0.09	0.05	0.18	0.06	0.15	0.18	0.15
Contamination	0.28*	0.27*	0.36**	0.38**	0.36**	0.37**	0.40***
Checking	0.08	0.01	0.13	0.24*	0.10	0.22	0.19
Dressing/grooming	0.15	0.04	0.16	0.13	0.04	0.06	0.09

THR = Overestimation of threat, RES = responsibility, IMP = overimportance given to thoughts, CER = intolerance to uncertainty, CON = control of thoughts, PER = perfectionism.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

\*\*\*  $p < 0.001$ .

symptoms overall as measured by the Padua Revised total score ( $r=0.29$ ;  $p<0.05$ ) and thoughts about harm ( $r=0.44$ ;  $p<0.001$ ), and almost reached significance for contamination ( $r=0.22$ ;  $p=0.06$ ).

#### 4. Discussion

The present study represents a further validation of the construct of inferential confusion as measured by the ICQ, a self-report questionnaire developed to measure distorted inference processes proposed to be relevant to OCD (O'Connor & Robillard, 1995). Overall, the current study found encouraging results for the role of inferential confusion in OCD. Inferential confusion was significantly related to obsessive–compulsive symptoms as measured by the Padua Revised total score even while controlling for the six OBQ belief domains. The results also confirmed inferential confusion as a distinct construct from other cognitive domains such as TAF. However, there was a decrease in the strength of the relationship between inferential confusion and obsessive–compulsive symptoms in the partial as compared to the zero-order correlations, and this appears mostly due to an overlap between inferential confusion and the OBQ subscale overestimation of threat.

As noted by Clark (2002) cognitive measures considered to be relevant to OCD are often difficult to distinguish from threat, since obsessions in one way or another often imply an element of threat. However, despite this overlap, inferential confusion accounted for an independent amount of variance in obsessive–compulsive symptoms while controlling for overestimation of threat. This result would be expected, since although the items in the ICQ involve threat or danger, they contain the conceptually distinct element of inferential confusion whereby the person persists in his/her obsession in preference to contradictory evidence coming through the senses. Controlling for any of the other OBQ belief domains did not appear to have much effect on the relationship of inferential confusion to obsessive–compulsive symptoms. Further, even under quite stringent conditions where we not only controlled for all OBQ domains, but also for measures of anxiety and depression, inferential confusion continued to be significantly related to obsessive–compulsive symptoms. This leads us to suggest that inferential confusion can be conceptually and empirically distinguished from other cognitive constructs, including overestimation of threat.

With respect to specific Padua Revised subscales, inferential confusion was independently related to the subscale obsessions about harm to self or others. Inferential confusion was also independently related to the Padua Revised subscale washing obsessions and compulsions. However, inferential confusion showed no independent relationship with the Padua subscales obsessional impulses, checking compulsions and dressing and grooming compulsions. It should be noted that the lack of an independent relationship between inferential confusion and these subscales was not due to controlling for the OBQ belief domains, but rather because the zero order correlations between inferential confusion and these subscales were already non-existent or negligible.

The results suggest that inferential confusion is a common process underlying OCD and delusional disorder with both these groups scoring higher than anxious and non-clinical controls. Also, participants in the delusional disorder group tended to report significantly more

obsessive–compulsive symptoms than non-clinical and anxious controls. Interestingly, while scores on the ICQ were related to obsessive–compulsive symptoms in the OCD and delusional disorder groups, no relationships were found in the anxious control group. This may suggest that inferential confusion has clinical impact depending on the clinical group, and that the ICQ taps into a process that has a unique relevance to OCD and Delusional Disorder and less so for anxiety disorders in general. These results highlight the importance of investigating OCD from the perspective of a non-phobic model of development, and in particular, point towards the overlap between OCD and other schizotypal symptoms (Aardema, Kleijer, Trihey, O'Connor, & Emmelkamp, 2004). In this regard, it is interesting to note the high Padua scores in the delusional disorder group sample despite this group diagnostically speaking showing no OCD comorbidity. We suspect that some items of the Padua may be interpreted by those with DD in the light of paranoid preoccupation rather than obsessional concerns and we are exploring this possibility.

An investigation of OCD from a non-phobic point of view does not, of course, detract from the role of OBQ belief domains in OCD. Recently, it has been suggested that an IBA approach may perhaps complement the appraisal model. Clark and O'Connor (in press) argue that inference processes could shed further light on the genesis of obsessions, and as such would not be incompatible with the appraisal accounts of OCD, which mainly focus on beliefs and appraisals involved *after* the occurrence of obsessions. However, it has been noted by Aardema and O'Connor (2003) that appraisals follow logically from the fearful content and experiential reality value of the initial primary inference or obsession. In this respect, inferential confusion as a reasoning process associated with the occurrence of the initial intrusions, may contribute to the formation of specific obsessive–compulsive beliefs driving appraisals of the intrusion.

It should be noted that since inferential confusion is a process that is proposed to underlie all forms of OCD, it would be expected to independently explain also variance in obsessive–compulsive symptoms other than found in the present study. In the current study inferential confusion was not related to checking compulsions and obsessional impulses in contrast to previous studies with non-clinical samples (Emmelkamp & Aardema, 1999; Aardema, Kleijer, Trihey, O'Connor, & Emmelkamp, 2004). The lack of a significant relation between the ICQ and the subscale obsessional impulses to harm could perhaps be due to the small number of participants with obsessional impulses in our current sample, which may have attenuated results. It is also possible that other aspects of inferential confusion not measured by the ICQ are more relevant to specific subtypes of OCD. Yet, inferential confusion was independently related to the Padua Revised total score and obsessions about harm while controlling for obsessive–compulsive beliefs and negative mood states. This is largely consistent with a cognitive formulation of inferential confusion as a general meta-cognitive confusion in OCD, which is particularly relevant to the occurrence of obsessions.

Of course, the current version of the ICQ is not exhaustive with respect to the measurement of inferential confusion, since it mainly focuses on inverse inference and a dismissal of sense information in favour of an imagined reality. Other dimensions of inferential confusion such as irrelevant associations, category errors, facts taken out of context, and individual differences in level of absorption, have not yet been incorporated into the ICQ, even though these cognitive factors have been linked to inferential confusion (Aardema & O'Connor, 2003; O'Connor & Aardema, 2003; O'Connor et al., 2003; O'Connor & Robillard, 1995). Therefore, further investigation of other processes and dimensions of inferential confusion might provide a more

refined understanding of the inferential confusion process and its specificity to anxiety disorders, OCD and delusional disorder. A further limitation is the use of a general OCD sample, since some of the cognitive domains investigated in the current study may not be equally relevant to all subtypes of OCD. Also, there are obvious limitations with questionnaire research, especially when it comes to measuring a reasoning process, and the construct validity of inferential confusion still needs to be further established by research that links the ICQ to both experimental reasoning data and behavioural measures.

## Acknowledgements

The authors wish to thank Julie Charette, Dominic Cole, Andrea Gonzales-Leduc, Cathy Leveillé and France Quevillon and for their assistance with data entry, data management and data analysis.

The study was in part supported by Grant No. 004109 from the Fonds de la Recherche en Santé Québec.

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